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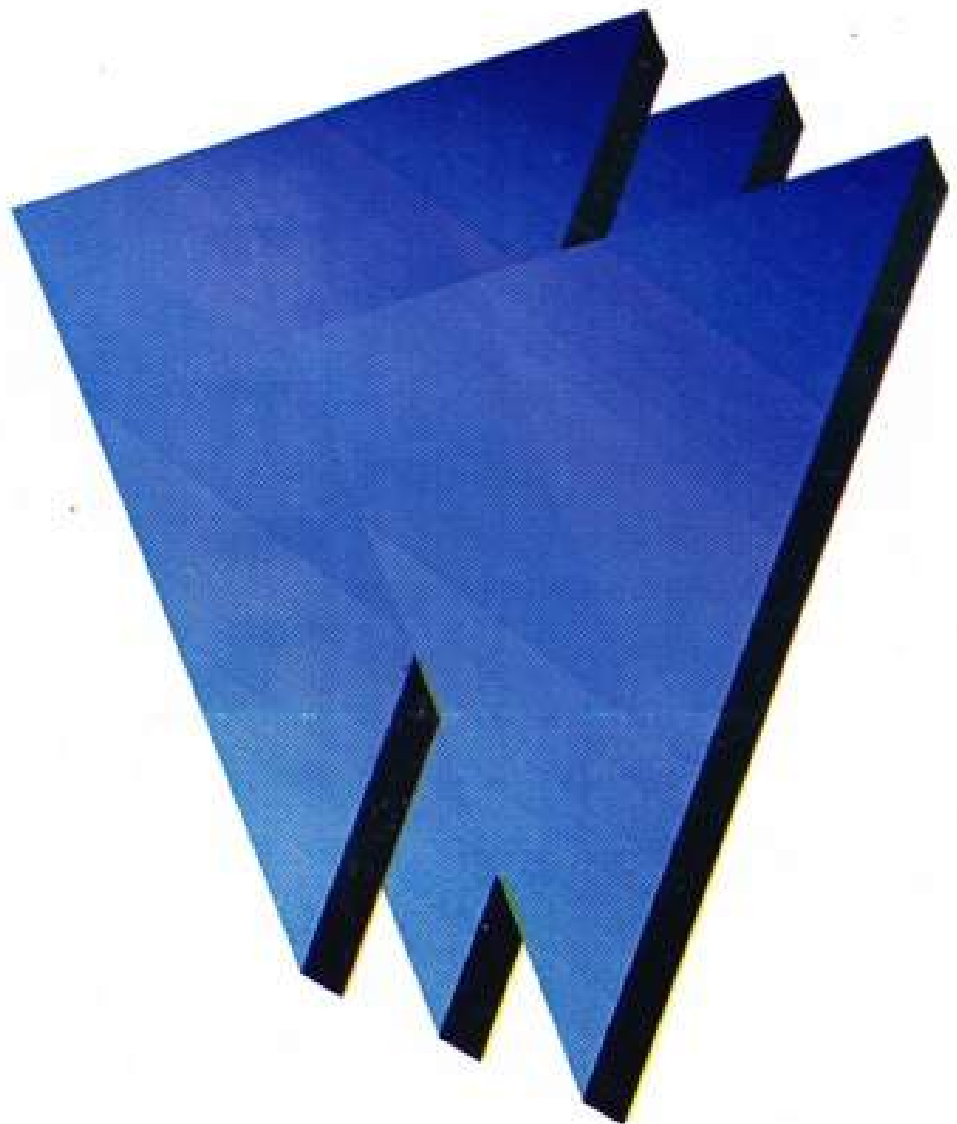
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# JURNAL ILMU KESEHATAN

POLTEKITA



Original Article

## ***Worm Infections (Soil-Transmitted Helminthiasis) in Elementary School Students***

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### **ABSTRACT**

*Environmental sanitation factors and human behavior factors are factors that greatly influence the occurrence of worm disease. The high incidence of worms is caused by environmental factors or demographic conditions in an area and is also influenced by community behavior. This study aims to determine the factors associated with the incidence of worms in elementary school students in Manggala District, Makassar City. This type of research is observational analytic with a cross-sectional study design. The population in this study were elementary school children in grades IV, V, and VI who attended SD Komplek Inpres, SD Perumnas Antang II, Manggala District, Makassar City, with a total sample of 61 samples. Sampling used the Systematic Random Sampling technique. This research found that 29.5% of elementary school students were positively infected, where *Ascaris lumbricoides* and *Tricuris trichiura* were the main infections. The results of the analysis showed that hand washing behavior ( $p=0.003$ ), nail cleanliness ( $p=0.031$ ), and clean water facilities ( $p=0.001$ ) were significantly related to the incidence of worm infections in elementary school students, and the variable clean water facilities were the variable that most dominant in the incidence of worms in elementary school students.*

**Keywords :** Worms, Behavior, Environment, Personal Hygiene

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## **INTRODUCTION**

Soil Transmitted Helminthiasis (STH) or worm infection is an infectious disease transmitted through the soil by intestinal nematode worms<sup>1</sup>. This infectious disease has increased and has quite a high prevalence worldwide<sup>2</sup>. Data from the World Health Organization (WHO) shows that more than 1.5 billion people, or around 24% of the world's population, were infected in 2016, 60% of whom were students, and around 870 million students are at high risk of being infected with this disease<sup>3</sup>.

Soil Transmitted Helminthiasis (STH) is spread in almost all regions of the world, especially in areas with tropical and sub-tropical climates<sup>4</sup>. The air humidity is quite high in Indonesia, a country with a tropical climate, causing Soil-Transmitted Helminthiasis (STH)

to develop well<sup>5</sup>. This is influenced by warm and wet soil so that eggs and larvae can develop more quickly. The prevalence rate proves this in several regions in Indonesia, which has reached more than 20%, reaching 76.6%. Based on the survey results, the prevalence figures obtained in Sulawesi, West Nusa Tenggara, West Java, Papua and Sumatra were 88%, 92%, 90%, 50% and 80%, respectively<sup>6</sup>.

South Sulawesi has quite high rainfall, which causes Soil-Transmitted Helminthiasis (STH) to develop well and has the potential to increase the prevalence of worm infections. The number of worm sufferers in South Sulawesi from 2011 to 2014 was quite high, namely 11,884 cases, 9,476 cases, 12,949 cases, and 13,375 cases<sup>7</sup>.

As the capital of South Sulawesi Province, Makassar City has the highest number of worm sufferers. Most worm

infection sufferers are students aged between < 1 year to 14 years<sup>8</sup>.

With the high number of worm cases in Makassar City, this research aims to identify the status of worms in elementary school students and to analyze factors related to the incidence of worms in elementary school students in Makassar City, which include personal hygiene factors and environmental sanitation factors.

## METHOD

This research uses quantitative research with observational analytical methods and a Cross-Sectional Study design. The research population was all students in grades IV, V, and VI of SD Inpres Perumnas Antang II, Manggala District, Makassar City. Meanwhile, the number of samples in this study was 61 students, calculated using the Lemeshow (1991) sample formula for observational research with a limited population and sampling using Systematic Random Sampling with an interval value of 3.

Data collection regarding students' worm status was obtained by examining worm eggs or larvae of the Soil-Transmitted Helminthiasis group through fecal examination. Data collection began with the signing an informed consent sheet by the student's parents. Students who have received approval are interviewed with the assistance of their parents regarding personal hygiene (hand washing behavior, use of footwear, habits of cutting and cleaning nails) using a questionnaire as well as an assessment of environmental sanitation conditions (clean water facilities, wastewater disposal facilities, and latrine sanitation) using an observation sheet. Meanwhile, for data on worm status,  $\pm$  100 mg of feces (the size of a marble or thumb) was taken and put into a feces pot, which had been coded according to the code written in the questionnaire. Feces are examined in the laboratory using the Kato-Katz method. The data obtained was then processed and analyzed univariately, bivariate, and multivariately. Bivariate analysis was carried out using the Chi-Square test with an alpha value of 0.05. Meanwhile, multivariate analysis was carried out using the Logistic Regression

test.

## RESULTS

The research results on age, gender, class level, education, and income are presented in Table 1. In the age characteristics of the 61 students, the most dominant was ten years old, 19 students, namely 31.1%, and 13 years old, the least was 31.1%. 2 respondents, namely 3.3%. Regarding gender characteristics, there were 20, or 32.8%, male students and 41, or 67.2%, female students. Regarding class level characteristics, the largest number of students was at the class IV level, with 26 students or 42.6%, and the lowest was at the class V level, with as many as 15 students or 24.8%. Regarding income characteristics, the most dominant parents had an income of <2.5 million, as many as 34 respondents or 55.7%, and those with an income of at least >5 million were five respondents or 8.2%.

**Table 1.** Characteristics of Respondents

Characteristics	n	%
Age (years)	9	8,2
	10	31,1
	11	29,5
	12	27,9
	13	3,3
Gender	Man	32,8
	Woman	67,2
Class	IV	42,6
	V	24,6
	VI	32,8
Parental income	< 2.5 Million	55,7
	2,5–5 Million	36,1
	> 5 Million	8,2
<b>Jumlah</b>	61	100,0

Regarding income characteristics, the most dominant parents had an income of <2.5 million, as many as 34 respondents or 55.7%, and those with an income of at least >5 million were five respondents or 8.2%. In the distribution regarding the worm status of elementary school students, as many as 43 students, or 70.5%, were negative, and as many as 18 students, or 29.5%, were positive for worms.

**Table 2.** Bivariate Analysis

Variable		Worm Infections		Total	p-Value
		positive	Negative		
Hand Washing Behavior	Not Good	n	14	14	0,003
		%	50,0	50,0	
	Good	n	4	29	
		%	12,1	87,9	
Use of Footwear	Not Good	n	1	3	1,000
		%	25,0	75,0	
	Good	n	17	40	
		%	29,8	70,2	
Nail Hygiene	Not Good	n	11	12	0,031
		%	47,8	52,2	
	Good	n	7	31	
		%	18,4	81,6	
Clean Water Facilities	Not eligible	n	9	4	0,001
		%	69,2	30,8	
	Eligible	n	9	39	
		%	18,8	81,3	
Fecal Disposal Facilities	Not eligible	n	2	1	0,205
		%	66,7	33,3	
	Eligible	n	16	42	
		%	27,6	72,4	
Waste Water Sewerage	Not eligible	n	1	2	1,000
		%	33,3	66,7	
	Eligible	n	17	41	
		%	29,3	70,7	
<b>Total</b>	n	18	43	61	
	%	29,5	70,5	100,0	

Based on the results of statistical tests, the analysis of hand-washing behavior shows that 12.1% of elementary school students who have good hand-washing behavior are positive for having worms, and 87.9% are negative or do not experience worms and have good hand-washing. The results of the bivariate test obtained a p-value = 0.003 < 0.05. These results indicate a relationship between hand-washing behavior and the incidence of worms in elementary school students.

Analysis of footwear usage behavior shows that 29.8% of elementary school students with good footwear habits tested positive for worms. Meanwhile, 70.2% were negative or did not experience worms. Based on the results of the bivariate test, the p-value = 1.000 > 0.05. This shows no relationship between footwear usage behavior and the incidence of worms in elementary school students.

18.4% of elementary school students with good nail hygiene were positive for having worms, while 81.6% were negative or did not experience worms because they had good nail hygiene. The bivariate test results found a p-value = 0.031 < 0.05. Thus, it can be concluded

that there is a relationship between nail hygiene behavior and the incidence of worms in elementary school students.

In clean water facilities, 18.8% of elementary school students who had clean water recommendations met the requirements experienced worm infections. Meanwhile, 81.3% did not experience worm infections. The bivariate test found a p-value = 0.001 < 0.05. so that clean water facilities are significantly related to the incidence of worms in elementary school students.

Based on fecal disposal facilities, as many as 27.6% of elementary school students with fecal disposal facilities met the requirements and were positive for having worms. In comparison, 72.4% were negative or did not experience worms. The bivariate test found a p-value = 0.205 > 0.05. Thus, the means of feces disposal is not significantly related to the incidence of worms in elementary school students.

Analysis of wastewater disposal facilities shows that 29.3% of elementary school students who have wastewater disposal facilities that meet the requirements are positive

for having worms. In comparison, 70.1% are negative or do not have worms. The results of the bivariate test found a value of  $p = 1,000 > 0.05$ . This means that there is no relationship

between wastewater disposal facilities and the incidence of worms in elementary school students.

**Table 3.** Logistic Regression Test Analysis

Variable	p-Value	OR	95% C.I for OR	
			Lower	Upper
Hand Washing Behavior	0,006	10,599	1,969	57,067
Nail Hygiene	0,051	4,312	0,993	18,727
Clean Water Facilities	0,002	17,900	2,760	116,075

Multivariate analysis with logistic regression tests shows that the most dominant variable among all variables related to the incidence of worm infections is clean water facilities, which influence  $B = 17,900$ .

## DISCUSSION

WHO explains that worms are closely related to poverty, where the family income level is relatively low. Parents with good education, work, and income can bring their families to a good and healthy environment<sup>9</sup>.

The types of worm eggs that can infect elementary school students in Manggala District are *Ascaris lumbricoides* and mixed infections, namely *Ascaris lumbricoides* and *Tricuris trichiura*. This can be caused because the life cycle of these two types of worms is almost the same, which can enter the human body orally<sup>10</sup>. *Ascaris lumbricoides* worms can be found in all positive samples. This is because the worm can lay between 100,000 and 200,000 eggs daily. This type of worm is the most common type found<sup>11</sup>.

Hand-washing behavior is a personal hygiene factor closely related to the incidence of worms<sup>12</sup>. From the research results, 12.1% of elementary school students with good hand-washing habits were positive for having worms, and 87.9% were negative or did not have worms or had good hand-washing. From the results of observations that have been made, the majority of respondents wash their hands well using running water and soap. On the other hand, some respondents who tested positive for worms, even though they had washed their hands well, did not wash their hands with running water. In line with this, research by Limbong O.S. (2020) found that washing hands before eating, after defecating, and after playing was significantly related to the incidence of worms<sup>13</sup>.

According to the Republic of Indonesia Minister of Health Regulation no. 15 of 2017, the habit of washing hands to prevent transmission of worm eggs should be done before and after eating, every time your hands are dirty, and after defecating. Washing your hands using running water and soap can more effectively remove dirt and dust mechanically from the skin's surface<sup>14</sup>. It can significantly reduce the number of disease-causing microorganisms. The eggs of the worm species *Ascaris lumbricoides* are sticky easily, so soap and running water are necessary to remove the eggs from the hands when washing hands<sup>15</sup>.

The influence of nail hygiene behavior on the incidence of worms. From the research results, 18.4% of elementary school students with good nail hygiene were positive for having worms, while 81.6% were negative or did not experience worms because they had good nail hygiene. Based on the results of the logistic regression test, the value of  $p=0.051 < 0.05$  was obtained, so it can be concluded that there is an influence between nail hygiene behavior and the incidence of worms in elementary school students in Manggala District. The habit of students to bite their nails, which can influence the incidence of worms<sup>16</sup>. If nails that are long and dirty are bitten, it can cause worm eggs that might be stuck in the nails to be swallowed<sup>17</sup>. Worm infections can be transmitted in various ways. One is that long, dirty nails may contain worm eggs and can later be swallowed when eating or sucking fingers<sup>18</sup>. Well-groomed and clean nails also reflect a person's personality<sup>19</sup>. Long and unkempt nails will become a place for various types of dirt containing various substances and microorganisms, including bacteria and worm eggs, which are often trapped in dirty nails<sup>20</sup>. This condition often occurs in students who often play on the field. Long and dirty nails and cutting nails at least once every two weeks cause worms<sup>21</sup>.

The influence of clean water facilities on the incidence of worms. That 18.8% of elementary school students with clean water supplies that meet the requirements are positive for having worms. In comparison, 81.3% are negative or do not experience worms because they have clean water facilities that meet the requirements. Based on the results of the multivariate test, a value of  $p = 0.002 > 0.05$  was obtained, so it can be concluded that clean water facilities influence the incidence of worms in elementary school students in Manggala District. Most respondents access clean water from PDAM, while the rest use drilled and dug wells. Several respondents' locations were found to be close to landfill areas (final waste disposal sites), where some of these respondents used drilled wells or dug wells, which could be contaminated with bacteria that cause worms<sup>22</sup>. Clean water facilities are related to the incidence of worms. Water facilities that are near pollutants can cause worm eggs to contaminate the water<sup>23</sup>. Groundwater, such as dug and drilled wells with a depth of <10 meters, is more easily contaminated by disease germs<sup>24</sup>. If contaminated water is used daily, such as drinking, bathing, and washing, it can cause worm eggs/larvae to enter the human body. Therefore, clean water facilities must consider the source and distance from pollutants. Clean water sources such as tap water/PDAM are good to use because they have gone through physical, chemical, and biological processing processes so that they are more protected from contamination by disease germs<sup>25</sup>.

## CONCLUSION

This study concluded that hand-washing behavior, nail hygiene, and clean water recommendations were significantly related to the incidence of worm infections, where clean water facilities are the most dominant factor in the incidence of worm infections.

It is recommended that schools collaborate with the nearest health service facilities in a worm prevention program through routine administration of worm medicine. Carrying out periodic nail checks and teaching school students how to wash their hands properly will help them get used to clean and healthy behavior to avoid worm infections. For the community to always maintain sanitation

and the environment inside and outside the home. Teach and supervise students to behave in a clean and healthy lifestyle.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Original Article

## ***Exploring Spiritual-Based Transformational Leadership Indicators in Palu City Hospital: A Qualitative Study***

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### **ABSTRACT**

*Due to contextual issues, including social culture and pluralism, spiritual-based leadership in the nursing field has rarely received attention, resulting in comparatively few research projects. Whereas such research can lead to a spiritually supportive environment, benefiting the patients, nurses, and organizations. Current research aims to explore indicators of spiritual-based transformational leadership in Palu City Hospital. This research was done qualitatively through a grounded theory approach and Focus Group Discussion (FGD). In this case, 12 informants were chosen by purposive sampling. The instrument used was Focus Group Discussion (FGD) guidelines. In this study, the results of the FGD were analyzed using the N Vivo 12 Plus. Based on the qualitative data analysis results, a spiritual-based transformational leadership required three primary skill indicators, namely emotional skills, including emotional proficiency and emotional intelligence, spiritual skills including spiritual attitudes and spiritual intelligence, and social skills, namely being able to behave socially. For further research, it is necessary to carry out model intervention and model evaluation under new normal conditions and add other variable components such as performance and commitment.*

**Keywords:** *Spiritual-Based Transformational Leadership, Palu City Hospital*

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## **INTRODUCTION**

In general, the era of globalization has influenced our lives. Humans in this era are required to be more creative in dealing with various kinds of problems, including those regarding leadership styles. Leadership factors in an organization is very important because it affects the process of achieving goals. The problem of leadership has long been a concern as well as evaluation material. Some assumptions that the leadership factor is an urgent problem which solution needs to be found, for instance, looking for a model for the formulation of an approach to leadership aspects suitable and appropriate to find solutions in the health sector, especially in the field of nursing services. Therefore, it is essential to apply a leadership style, one of

which is transformational leadership so that further it can be a strategy to achieve common goals.

Transformational leadership is the ability of a visionary leader to convince others to make significant changes, prioritize common interests and foster other people or groups to achieve goals<sup>1</sup>. In this case, transformational leadership is a relatively new model in leadership studies. This model describes quality leader as one that sees the interaction between leaders and their followers as elevating both sides to a higher moral level<sup>2</sup>. This leadership is reported as one of the effective future leadership styles in facing the globalization and modernization era and in improving human resources because it gives extra attention to the charismatic and affective elements of a leader<sup>3</sup>.

The spiritual component of human



connection in an organization was not taken into consideration by previous leadership theories, which instead focused on one or more components of the physical, mental, or emotional dimensions. A leader will bring the worldly dimension to the spiritual dimension in accordance with the emerging paradigm of spiritual leadership, which aims to create internal motivation to aid in the change of a business. Spiritual leadership approach is a leadership approach that is seen to be most successful in addressing contemporary issues as a consequence of the erosion of human values due to ethical crisis<sup>4</sup>. Research related to spiritual leadership conducted by Alimudin, Septian, Sasono, and Wulandari discovered a positive relationship between spiritual leadership and organizational culture. Furthermore<sup>3</sup>. Jahandar et al added that spiritual leadership can increase organizational productivity and nurse satisfaction. Despite the fact that a spiritually supportive workplace benefits patients, nurses, and organizations, spiritual leadership in the area of nursing is comparatively understudied due to contextual considerations including social and cultural heterogeneity<sup>4</sup>.

Not all of the organization's executives have yet embraced the fundamentals of transformational leadership and spiritual leadership. Our research is urgent because leaders need to have certain personality traits, moral principles, and spiritual beliefs in order to guide the business toward a culture of patient safety. The expected leader figures are those who have the capacity to lead by example, create influence by love, and move through other heavenly attributes<sup>5</sup>. Therefore, research aims to explore indicators of spiritual-based transformational leadership in Palu City Hospital.

## **METHOD**

This study was done qualitatively through a grounded theory approach applying Focus Group Discussion (FGD). FGDs aim to collect data regarding participants' perceptions and views of something, not trying to seek consensus or decision making. The FGDs in this study were conducted to look for additional indicators of transformational leadership styles and spiritual leadership. This activity consisted of three phases, namely the orientation phase, the work phase and the termination phase.

Focus Group Discussion (FGD) was conducted online through zoom meeting media. This research was conducted at Palu City Hospital from August to December 2020.

In order to select the informant subjects, the researchers applied purposive sampling. In this case, some criteria were determined, including having knowledge of the issue, possessing data, living in Palu area, and being prepared to offer thorough and accurate information. The informants consisted of 2 key informants, namely the top management of the hospital (Director/ head of the quality and patient safety team for the Head of Nursing at Anutapura Hospital), and 4 main informants namely, the head of the room and the implementing nurse and 6 supporting informants namely religious leaders, community leaders, organizations profession.

The instrument used in qualitative research was Guidelines for Focus Group Discussion (FGD) or directed, systematic discussion groups which are very popular for exploring specific issues or problems<sup>6</sup>. In this study, the results of FGDs were analyzed using N Vivo through the mechanism of draft coding, reduced coding, determining sub-themes and themes that were used as indicators or additional dimensions (sub-variables) in the study. Collecting data procedure carried out in this study was an application for a research ethics test from the Faculty of Public Health, University of Hasanuddin Makassar No : 7620/UN4.14.1/TP.02.02/2020.

Data analysis in this study aims to find additional indicators using the Nvivo 12 Plus application which is effective for data triangulation and researcher triangulation, so that it can assist in producing reliable qualitative research<sup>7</sup>.

## **RESULTS**

Research results were presented in the form of narratives, tables and/or pictures as well as statistical test results with explanations without discussion. The table title was written above it while the figure title was written below it. In this section, Focus Group Discussions (FGD) carried out online through the media zoom meeting. FGD activities were attended by informants whose characteristics can be seen in table 1.

**Table 1. Informants Characteristics in the Study of Spiritual-Based Leadership Variables**

No	Element	Gender	Education Degree	Occupation
1	Executive Nurse	Male	Bachelor	Nurse
2	Executive Nurse	Male	Bachelor	Nurse
3	Head of Room	Female	Bachelor	Nurse
4	Head of Room	Female	Bachelor	Nurse
5	Hospital Management	Female	Master	Nurse
6	Hospital Management	Female	Master	Nurse
7	Professional Organization of Indonesian National Nurses Association	Male	Master	Nurse
8	Professional Organization of Indonesian National Nurses Association	Male	Master	Lecturer
9	Islamic religious leaders (Spiritual advisor)	Male	Doctorate	Lecturer
10	Christian clergy	Male	Bachelor	Civil Servants
11	Hindu Priest	Male	Master	Civil Servants
12	Community Leader	Male	Doctorate	Retired

The characteristics of FGD informants consisted of elements of the Islamic religion with academic background as well as the chairman of the Indonesian Ulema Council in Palu City. Christian clergy and Hindu priest, had a health education background. Informants from community leaders had bureaucratic backgrounds. Further, there were two people from professional organization of the Indonesian National Nurses Association. While the hospital informants, there were 2 respondents from the hospital management, 2 head of room and 2 implementing nurses. The researcher acted as a moderator and the promoter team was also present at the activity. The results of qualitative data analysis in this study showed that indicators of spiritual-based transformational leadership are composed of 3 additional indicators, namely emotional skills, spiritual skills and social skills.

a. Theme 1: Emotional skills

- 1) Emotional Proficiency
- 2) According to the study's findings, the informants in the discussion group fit one of the definitions of a spiritually-based transformational leader, namely having emotional skills. It includes the ability to provide motivation and inspiration; becoming a role model, exemplary and committed; having empathy and sympathy; responding to conflict management and be able to be a motivator; able to work in a team, having good skills and comply with the

rules. Statements from informants include the following:

*“First, the leader should be able to motivate and take the patient directly so he does not get injured. The second, the leader should always inspire both his patients and his colleagues. When he gives motivation, he raises the patient's enthusiasm, for example, now it not just patient safety, everyone's safety, people do not want to wear masks”* (Group of professional organizations).

*“A leader definitely should have that skill. Nice skills....”* (Head of Personnel Department)

*“the important aspect is trust and commitment”* (community leader).

3) Emotional intelligence

The group of informants said that A leader should have a high emotional quotient (EQ), which includes the capacity to understand and control one's own emotions as well as those of others. It also includes the capacity to respond to others' emotions and engage in emotional negotiation. Statements from informants include the following:

*“A spiritual-based leadership style is closely related to a leadership style that upholds the values of trust, has a high sense of density or sensitivity in leading. A leader is not only able to move but must lead based on religious ethics and be able to control emotions. So, a leader not only has an Emotional*

*Quotient but must have an Emotional and Spiritual Quotient” (Group of executive nurses).*

b. Theme 2: Spiritual Skills

- 1) Spiritual attitude
- 2) The findings of this study showed that the group of informants views a leader as someone who thinks that all activities are deserving of worship and who makes work into a charity; a trustworthy leader to foster a sense of security; someone who has good character and attitude; upholds the value of trust; and presents Allah in all endeavors. Statements from informants include the following:

*“in carrying out its activities, there is God who is always watching and whatever is done is always worth worship. Whatever he does is forever solely because of the value of the worship we do both to ourselves and to others. Everything he does there is God there, whatever he moves. Wherever his footsteps then his thoughts, feelings and others are inspired or believed that there is God there, so the spiritual approach is trustful leadership. The Prophet said that a person does not have faith if he is not trustworthy, so one of the indicators is that person has faith if he carries out the mandate” (Group of religionists).*

- 3) Spiritual intelligence  
The group of informants said that having a high degree of awareness, being able to learn from mistakes, being flexible and adaptable, living up to the purpose and vision, and being autonomous are all qualities that a leader should possess. Statements of

informants include the following:

*“...there is faith or hope. Spiritual leadership has a clear vision and mission” (Group of room heads).*

*“...has a clear vision, a strong spiritual that is also seen in leading and sticking to the applicable rules” (Group of executive nurses).*

*“...rusts his spiritual ability” (Community leader).*

c. Theme 3: Social Skills

- 1) Being able to behave socially  
Informants stated that leaders must have honesty, patience and good faith; have a caring nature; using a bio, psycho, social, spiritual approach; respect others' rights, act responsibly, be kind, wisely choose our actions, have an optimistic outlook, and be aware of fundamental human needs. These qualities may be summed up as having the capacity for social behavior according to Abraham Maslow's Theory. Statements from informants include the following:

*“...here must be a dimension of patience in it. Leaders must be patient. Then be kind. Leaders must fully understand human beings in a biosocial-spiritual health approach” (Group of professional organizations).*

*“... what must be possessed is caring for patients” (Group of head of the room).*

*“Actually, the primary aspect is honesty, if a leader cannot be honest how about the others” (Head of Personnel Department).*

**Table 2. Analysis of the themes and sub-themes of the FGD Results Related to Spiritual-Based Transformational Leadership**

CODING	Coverage	SUBTHEME
<b>Emotional skills</b>		
1. Giving motivation and inspiration	10.42%	Emotional
2. Able to be a role model, and commitment	6.24%	Proficiency
3. Having empathy and sympathy	5.21%	
4. Responding to conflict management, becoming a mediator	4.16%	
5. Able to work in a team, have good skills, obey the rules	2.08%	
6. Have EQ (having the capacity to recognize and control one's own emotions, to be sensitive to others' feelings, to react and bargain with	6.24%	Emotional Intelligence

others on an emotional level, and to utilize emotions as a tool to inspire oneself)		
<b>Spiritual Skills</b>		
1. Believing that everything is worth worship, Working as a charity field	10.96%	Spiritual
2. A trustworthy leader who creates a sense of security	3.12%	Attitude
3. Have good character, good attitude	1.04%	
4. Uphold the values of trust	1.04%	
5. Presenting God in every activity	1.04%	
6. Have SQ (flexible, adaptable, have a high level of awareness, able to take lessons from a failure, live according to vision and mission, independent)	7.83%	Spiritual Intelligence
<b>Social Skills</b>		
1. Being able to be honest, patience, and good faith	22.92%	Being able to behave socially
2. Have a caring nature	6.25%	
3. Using a bio, psycho, social, spiritual approach	5.21%	
4. Maintain people rights, be responsible	4.17%	
5. Have concern, be wise in making decisions	4.16%	
6. Give a positive touch	3.12%	
7. Understand basic human needs (Abraham Maslow's theory)	1.04%	

Table 2 displays the coding of the FGD results, percentage coverage, namely the percentage of all quoted sentences from the respondents' dialog in the transcript that refer to coding so that it is used in determining the order of coding and categorizing sub-themes. Based on table 2 it can be concluded that a spiritual-based transformational leader needs to have three basic skills, namely emotional skills, spiritual skills and social skills.

## DISCUSSION

Emotional skills, spiritual skills and social skills are new findings from the FGD results which become indicators of forming spiritual-based transformational leadership.

### Emotional skills

A collection of crucial leadership abilities, known as emotional intelligence (EQ), includes how individuals perceive and express themselves, establish and sustain social connections, overcome obstacles, and use emotional information in productive and meaningful ways.

Several studies present a positive relationship between leaders with high emotional intelligence including having happiness, satisfaction, attention, trust, confidence and commitment at work. This is related to a leader's ability to understand his employees better and adjust his leadership behavior correctly.

Leaders who have emotional skills can recognize and understand their emotions and

the emotions of their employees, then manage and redirect these emotions into positive energy for change. Leaders are able to channel unsettling impulses and moods into energizing energy for organizational transformation by knowing when to engage with emotions and when to engage with reason, without passing judgment but rather thinking things through before acting. Emotional skills are very important for a leader to have because leadership is an emotionally charged process that involves recognizing other people's emotions, listening, caring about other people's emotional states, and helping others manage their emotions.

### Spiritual skills

Spiritual skills are a major part of the concept of spiritual intelligence or spiritual quotient (SQ) which is considered as the basis of rational and emotional intelligence. Reimer-Kirkham, Pesut, Sawatzky, Cochrane, and Redmond stated that spirituality in nursing leadership is rarely done due to many contextual factors. Nurse leaders in qualitative studies attest to awareness of the influence of spirituality and pay attention to the health care but are wary of integrating spirituality into leadership practice due to organizational and social influences<sup>7,8</sup>.

Research by Jahandar, Tafreshi, Rassouli, Atashzadeh-Shoorideh, and Kavousi concluded that organizational productivity and nurse satisfaction can both be increased via spiritual leadership. To obtain excellent

organizational results, nursing leaders must give this style of leadership more consideration; as a result, they require additional training in spiritual leadership. This potential may be used by nursing management to influence nursing care outcomes<sup>4</sup>.

Abdurrahman and Agustini concluded that the spiritual leadership behavior carried out by hospital leaders is highly valued by employees, in accordance with the facts observed by employees<sup>7</sup>. The role of mediation according to Chen, et al. and Chen, et al., emphasized the mediating role of spiritual well-being<sup>5,15</sup>. Their studies demonstrated that meaning and membership boost awareness, productivity, organizational behavior, and organizational commitment while also positively predicting employee benevolence toward coworkers. Spiritual leadership can improve organizational commitment, work unit productivity, and employee life satisfaction in addition to reducing burnout among medical laboratory professionals<sup>9</sup>.

Spiritual intelligence is very important for leaders, to create spirituality in place. Spirituality is a determining factor for the success of an organization in creating a positive work environment, and influences positive emotions. Spiritual intelligence can be a driving force for a leader.

### **Social skills**

Social intelligence is considered as a complex construct to understand how successfully a leader manages social relations. Leaders that are emotionally intelligent can use their social abilities to establish and sustain partnerships. The emotionally intelligent leader utilizes his social abilities to persuade those who are reluctant to join in organizational transformation initiatives by acknowledging the worry of specific members.

Social competence and social intelligence are intimately tied to the meanings of social skills<sup>10</sup>. Emotionally intelligent leaders can use their social skills in building and maintaining relationships<sup>11</sup>. In addition, emotionally intelligent leaders utilize their social abilities to persuade people who appear hesitant to take part in organizational transformation initiatives by identifying their individual members' concerns<sup>12</sup>. Social intelligence in organizations, refers to the effective use of leadership skills that will affect

others positively - impacts that are biologically based and observable<sup>13</sup>.

The core of social intelligence is leveraging knowledge of the important role connections play in performance to assist leaders in raising the bar for those they are in charge of<sup>14,15</sup>. As tools for leadership, individuals must demonstrate initiative, empathy, flexibility, and persuasion. Regardless matter how knowledgeable or skilled he is in his work, a leader might fail in management if they are unaware of their emotional influence on others<sup>16</sup>.

Since it is a leader's capacity to relate to, comprehend, and successfully engage with others, social intelligence is highly significant<sup>14</sup>. According to studies, defining these social intelligence traits is a crucial component of effective leadership. Most of social intelligence may be picked up within an organization. It can be concluded that social skills are the most important activity of a leader because they relate to other people to strengthen their leadership performance<sup>17,18,19</sup>.

Research limitations encountered in this research process become the concern to researchers and further research, namely: the condition of the Covid 19 pandemic and the existence of government policies in the form of social distancing and physical distancing. The limitation faced in this study was that Focus Group Discussion (FGD) activities with informants was carried out online (zoom meeting) so that expression, behavior, and communication were sometimes challenging due to signal interference, network and others.

### **CONCLUSIONS**

A spiritually based transformational leader requires three main skill indicators: emotional skills, including emotional skills and emotional intelligence, spiritual skills, including spiritual attitude and spiritual intelligence, and social skills, including the capacity to act in a socially appropriate manner.

Based on the results of the research, suggestions and recommendations are submitted to interested parties so that this research can contribute to the policy development at both the regional and national levels. It is hoped that elements of spiritual-based transformational leadership will be included in the elements of the Hospital

accreditation assessment. It is expected that the hospital will make a policy regarding the implementation of this leadership model to be implemented and allocate training funds related to the spiritual-based leadership model for heads of rooms who are front line leaders in the hospital.

For further research, it is necessary to carry out model intervention and model evaluation in this study under new normal conditions and add other variable components such as performance, commitment and so on.

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#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Original Article

## ***The Effect of 4 Pillars of Health Education on Blood Sugar Levels in Type 2 Diabetes Mellitus***

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### **ABSTRACT**

*Diabetes mellitus occurs more frequently in rural areas than urban areas and occurs more frequently in groups with low education. Type 2 Diabetes Mellitus disease management through the implementation of the four pillars of diabetes treatment, including education, dietary nutrients, exercise, and pharmacology. The study aimed to determine the effect of the 4 pillars of DM health education on blood sugar levels. Pre-experimental research design with a one-group pre-test and post-test design approach using paired t-test. The number of samples is determined by the sample formula to test the hypothesis on the average of two populations with a 33 sample. The samples involved in this study were selected by simple random sampling who met the criteria, namely DM > 3 months, could read and write and were willing to participate in the study. The results of this research is the 4 pillars of health education gave a change in the blood sugar levels of patients before and after health education with a P value of 0.0005 and did not affect the length of suffering from DM. The conclusion is there is an effect of health education on the 4 pillars of DM on the value of blood sugar levels. It is hoped that health workers will maximize health education on the 4 pillars of DM.*

**Keywords:** Health Education, DM, 4 Pillars.

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### **INTRODUCTION**

Non-communicable diseases (NCDs) have become a public health problem, both globally, regionally, nationally and locally. One non-communicable disease is Diabetes Mellitus (DM). Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both <sup>1</sup>. Diabetes Mellitus is a serious threat to health development because it can cause blindness, chronic kidney disease, diabetic foot (gangrene), cardiovascular problems even stroke<sup>2</sup>. In patients with type 2 DM, there is insulin resistance or impaired insulin secretion characterized by increased levels of glucose in the blood called as

hyperglycemia<sup>1</sup>. Hyperglycemia is the most serious condition that causes patients to be hospitalized and increases patient morbidity and mortality <sup>3,4</sup>.

Patients who experience hyperglycemia mostly deny that they have a history of high blood sugar levels <sup>3</sup>. Increased blood sugar levels are caused by several factors, including too much consumption of carbohydrates <sup>5</sup> not even adhering to taking insulin or insulin therapy <sup>6</sup>.

According to <sup>7</sup>, Diabetes Mellitus is also a chronic disease capable of causing a decrease in quality of life. In chronic conditions, the patient must make some adjustments in his life to maintain health. Patients suffering from DM must experience sudden changes in their



lives, such as taking regular medication, exercising regularly, controlling blood sugar, and setting a strict diet throughout. It's called 4 pillars DM<sup>8,9</sup>. The changes that occur suddenly in DM patients cause patients to become stressed and unable to manage themselves properly<sup>10</sup>.

It is not easy to achieve the desired blood sugar target because one of the reasons is that most patients often only rely on drugs<sup>1,11</sup>. Whereas medicine is not the determining factor main descent blood sugar levels<sup>12</sup>; many other factors that can affect, and help achieve the desired blood sugar level. The most important thing what is done is to regulate the food consumed, the amount, type, how to consume it, and do physical activity<sup>4</sup> even a person's basic knowledge about diabetes is also very important<sup>13,14</sup>.

The Ministry of Health stipulates that the management of DM in preventing further complications consists of four main pillars, namely, nutrition management, physical exercise, anti-diabetic drug therapy, education.<sup>6</sup> The Objective of management education 4 pillars of DM namely support success carry out self-care activities that are good and independent<sup>15,16</sup>. A number of study conclude good education especially by using the 4 pillars of DM model can cause decrease blood sugar levels of which there are difference blood sugar levels in DM patients who did not received 4 pillars of education for control and intervention patients at the health center Cimareme Bandung regency; in line with research<sup>13</sup> that education conducted on patients with will cause patient capable controlling blood sugar levels, obesity, family history and life style<sup>8,17</sup>. Based on background behind the on this study aims was to determine effect health education using 4 pillars of DM on blood sugar levels DM patients in the work area of the Health Center Kintom where is the Health Center Kintom is located in one district in Luwuk City.

## METHOD

The design was a pre-experimental design with a *one group-pretest and posttest design approach*<sup>18,19</sup>. The population was diabetes mellitus patients at the Kintom Health Center, Kintom District, Banggai Regency, with a total of 91 people registered at the primary Health Center. Kintom Regency is a border area between the district capital and the

countryside. This research has ethical clearance from the ethical commission of the Poltekkes of the Ministry of Health Palu with number 0065/KEPK-KPK/VI/2022. The number of samples is determined by the sample formula to test the hypothesis on the average of two populations<sup>19</sup>. Respondents who participated in this study were 33 people who were diabetes mellitus patients >3 month in the Kintom Health Center area. Study conducted in April 2022. Data collection was carried out for 4 weeks. Data was collected by asking directly to respondent, diagnosis from doctor and then measure level blood sugar of patients. Variables independent in this research is the 4 pillars of health education DM patients and the dependent variable was patients' blood sugar levels. The recommended blood glucose examination is an enzymatic examination of glucose with venous blood plasma material to establish the first diagnosis while monitoring the results of treatment can be done with a glucometer as was done in studies using sticks<sup>1</sup>. Blood sugar levels were measured 1 month after the intervention using leaflets and flipchart.

Data collection was carried out by providing education using leaflets, filling out questionnaires and measuring blood sugar levels before and after providing education. In addition, characteristic data were collected respondent in the form of data age, occupation, education level and duration of suffering from DM to obtain supporting data whether there is connection between duration of illness and change mark blood sugar level.

Data were analyzed using univariate analysis to collect demographic data, Data on the educational influence of the 4 pillars of DM were analyzed using bivariate analysis, namely the paired t-test analysis) to find out difference blood sugar levels pre and post health education using 4 pillars DM.

## RESULTS

Research results described by demographic data. As for demographic data depicted as following respondent youngest 46 years old. Respondents aged 46-55 years and 56-65 years are at the same value of 45.5%. So got concluded a lot of DM patients are also in the range age <55 years.

Table 2 shows average DM patient's sugar level decrease lowest as much as 14.72 mg/dl and the highest is 29.10 mg/dl. Research

results show there is difference blood sugar levels before and after health education treatment with a p value of 0.0005.

## DISCUSSION

Results show there is difference mark blood sugar levels before and after the DM education using 4 pillars. The self-management patient DM will influence quality life can be better obtained through DM education 4 pillars

<sup>20</sup> can manage stress well <sup>21</sup>. Self-management treatment plans are individually developed in consultation with a variety of health care professionals such as doctors, nurses, dietitians, and pharmacists <sup>21</sup>. One indicator of management good self can assessed as stable blood sugar levels by means of regular monitoring routine <sup>22</sup>.

Stable blood sugar level influenced by interest and motivation patient himself to remain maintain pressure his blood stable <sup>23, 24</sup>.

**Table 1.** Demographic Data

Variable	Frequency	Percentages	Means	Min	Max	SI
<b>Age</b>						
46-55 Y	15	45.5	56,76	44	80	7,7
56-65 Y	15	45.5				
>65 Y	3	9,1				
<b>Occupation</b>						
Work	19	19				
Not working	14	14				
<b>Education</b>						
Basic	23	69,7				0.8
Intermediates	3	9,1				
University	7	21,2				
<b>Sex</b>						
Male	23	69,7				0.4
Female	10	30,3				
<b>Duration of Suffering DM</b>			48	3	67,3	63..

**Table 2.** GDS level t test before and after education

	Paired differences					t	df	Sig-2 tailed
	Means	SD	SE	Lower	Upper			
Pre and post test	21.91	20,27	3.53	14.72	29,10	6,21	32	0.0005

Educators who provide health education and duration education given <sup>25</sup>, as well discipline patient to comply education <sup>8,21</sup>.

Stable blood sugar level influenced by interest and motivation patient himself to remain maintain pressure his blood stable <sup>23,24</sup>, educators who provide health education and duration education given <sup>25</sup>, as well discipline patient to comply education <sup>17,21</sup>.

Apart from that, the factor of health workers are also very influential education

provided among them attitudes and skills health workers when giving education <sup>14,26</sup>. For acutely ill patients admitted to hospital, the ability to identify those at high risk of inpatient death is helpful for health workers, as well as for patients and their families. In addition, the role of the nurse is in charge of maintaining the patient's blood sugar levels to remain stable by adjusting the diet and eating pattern, taking medication or injecting insulin regularly according to the recommended dosage <sup>27</sup>.

Patients will not be allowed to go home if they are not proficient in injecting insulin and promise to have regular health checks. In addition to being treated at the hospital, many diabetes mellitus patients also undergo outpatient care. The success of therapy and meeting the goals of outpatient sugar blood level is highly dependent on the patient himself so that education in the hospital has a huge impact on the patient's independent care at home. Selection of pharmacotherapy for outpatient glycemic management must consider various factors such as the patient's ability to follow treatment recommendations, availability of support systems, patient's cognitive status and assurance of patient safety<sup>27</sup>.

Patients who have not been able to master proper and accurate insulin injection techniques should be considered using non-insulin therapy upon discharge, whereas patients with conditions that require a stable decrease in GD due to comorbidities such as infection or are at risk of developing ketoacidosis should continue to use insulin upon discharge<sup>11</sup>.

Patient own control full to education or counseling provided which is influenced by the patient's education level. The higher the level of education, the better the self-management<sup>28</sup>. Patients who get counseling own mark blood sugar levels are more stable and can down compared to the non- getting group education<sup>14</sup>. Besides influenced by the education, provided another thing to consider when giving education is a health worker who provides education and learning media<sup>14</sup>. So got concluded obedience patient to maintain his blood sugar level still stable besides influenced by internal factors originating from within patient but also influenced by external factors especially health workers who have role strategic.

Fill in the education given to the patient is the way control blood sugar levels through diet , drink drug in a manner regular. Doing activities physique in a manner routine at least 30 minutes in healthy and management good<sup>29</sup>.

Education needs to be given to DM patients with the aim of promotion of life healthy and like effort prevention. Change blood sugar levels. Patients are greatly affected by adherence on diet or food consumed everyday and do sports or activities physical. So that a number of education that needs to be

given to the patient is put less sugar in, burn off remaining sugar. Besides control what to eat patients also need to be given what will happens to his body when his blood sugar levels always high or unstable. Possible effect what happens is damage to the heart, kidneys and liver. Heart attack, fatty liver, cirrhosis, foot ulcers and diabetic neuropathy<sup>3</sup>. These complications will have a negative impact on the patient's health and lead to an increase in health financing

## CONCLUSION

There was a significant effect on the 4 pillars of DM education using educational media to stabilize the blood sugar levels on DM patient .

Suggestion for health workers to give more intensively education on the 4 pillars of DM by using more interactive learning media. Not recommended advice using a oral communication when the patient visit. Besides the patient can given education in a manner special foods whatever causes rate glucose increased drastically.

In addition, it is necessary to have a DM special educator who is trained in a manner special especially for health centers because many DM patients are controlled by the primary health service and are motivated society to be routine check with Posbindu once a month. Taking a medication in a manner regularly do not consume drugs free to decrease blood sugar levels.

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## CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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## ***Profile of Cytostatic Drug Use in Breast Cancer Patients (Mammae carcinoma) at Medan Hospital***

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### **ABSTRACT**

*Breast cancer is the most common type of cancer in the world (2,261,419 cases) and in Indonesia (65,858 cases). This research aims to determine the class and type of cytostatic drugs most frequently used in breast cancer chemotherapy patients from January to March 2023 at RSUP Haji Adam Malik Medan. This study used a descriptive survey method with a saturated sample of 176 medical records. Data collection was done retrospectively by gathering information from the electronic medical records of the patients. The research results show that the characteristics of the patients are as follows: the majority were female, totalling 176 patients (100%). The most common age group was 45-54 years, with 111 patients (63.1%), and the prescription of cytostatic drugs was highest in March, with 80 patients (36.9%). In conclusion, the most commonly used class of cytostatic drugs was antibiotics, with 146 cases (32.88%), and the most commonly used type of cytostatic drug was Doxorubicin, with 114 cases (25.68%). This indicates that the use of antibiotics is a significant part of breast cancer treatment, and it is important to pay attention to the safety and regularity of drug use to prevent drug resistance and the severity of the disease.*

**Keywords:** Cytostatic Drugs, Chemotherapy, Breast Cancer

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### **INTRODUCTION**

The Minister of Health of the Republic of Indonesia has confirmed a transformation in the health sector and determined that six types of transformation will be carried out, one of which is the Referral Service Transformation. Referral Service Transformation will start with the three highest causes of death in Indonesia, one of which is cancer<sup>1,2</sup>. Cancer is a non-communicable disease characterized by the presence of abnormal cells or tissues that are malignant, grow quickly uncontrollably, and can spread to other parts of the patient's body.

Cancer cells can attack and damage normal cells around them and affect the function of these tissues. Cancer can strike anyone, whether male or female, children or the elderly. Many types of cancer attack humans, but there are several types of cancer that often attack certain genders or age groups<sup>3</sup>. Of all the types of cancer that exist, breast cancer occupies the most cases of cancer in the world and also in Indonesia. According to the results of data from Global Burden of Cancer (Globocan), 6% of a total of 396,914 new cases of cancer in Indonesia<sup>4</sup>.

Breast cancer, also known as carcinoma mammae (Ca Mammae), is a type of cancer that

can affect anyone, both women and men. Breast cancer is still a big problem in Indonesia because 68.6% of women with breast cancer go to the doctor at stages IIIA, IIIB, and IIIC, while at an early stage, only 22.4 %<sup>5</sup>.

Based on data from WHO, in 2020, 2.3 million women were diagnosed with breast cancer and 685 thousand deaths globally<sup>6</sup>. At the end of 2020, 7.8 million women had been diagnosed with breast cancer in the last five years, making it the most common cancer in the world. Based on data from RISKESDAS, the incidence of tumors/cancer in Indonesia shows an increase from 1.4 per 1000 population in 2013 to 1.79 per 1000 population in 2018. Meanwhile, the incidence of breast cancer in North Sumatra Province also shows an increase of 1.0 per 1000 population per person in 2013 and 1.55 per 1000 population in 2018<sup>7</sup>. There are several types of treatment management for breast cancer patients, one of which is chemotherapy. Chemotherapy is a type of treatment that uses cytostatic drugs with the main goal of destroying malignant tumor cells but also attacking healthy cells. Cytostatic drugs that are often used in chemotherapy are very diverse; some are generic, and some are branded. The type of cytotoxic drug used in chemotherapy depends on the type of cancer the patient is suffering from. In the study of Nuraini et al. 2022 at the Tangerang Regency General Hospital, the results of research that had been conducted on 22 medical record information for breast cancer patients undergoing chemotherapy in 2018 used a single treatment (9%) and a combination treatment (91%), with the results of the evaluation, namely the right drug (100%), the right time of administration (86%) and the right time interval (9%)<sup>8,9</sup>. Meanwhile, in Haryani's study at Fatmawati General Hospital in 2021, the research results obtained that the most used Cytostatic drug regimens were the CAF regimen in 8 patients (23.53%), followed by the Carboplatin and Paclitaxel combination drug regimen in 5 patients (14.71%) and the CEF regimen in 4 patients (11.77%). Drug therapy with the CAF regimen as the standard first-line was mostly used in 8 patients (23.53%) with appropriate doses and a deviation of 1-13% compared to the National Guidelines for Management of Breast Cancer. Regimen therapy that is not in accordance with the National Guidelines for Management of Breast Cancer that is most widely used is the combination of Carboplatin

and Paclitaxel in 5 patients (14.71%) with appropriate doses and deviations ranging from 0-79% lower<sup>10</sup>. Acting as the National Oncology Referral Hospital, Haji Adam Malik General Hospital in Medan has opened an Integrated Oncology Service, which has been started since 2014. The CAF regimen was the predominant first-line drug therapy in 8 patients (23.53%), and the doses were generally appropriate with a deviation of 1-13% from the National Guidelines for Breast Cancer Management. The combination of Carboplatin and Paclitaxel was the most frequently used regimen that did not align with the National Guidelines for Breast Cancer Management, with 5 patients (14.71%) receiving appropriate doses but deviations ranging from 0-79% lower. Haji Adam Malik General Hospital in Medan, serving as the National Oncology Referral Hospital, initiated an Integrated Oncology Service in 2014.

Therefore, it is essential to understand the use of cytostatic drugs in cancer patients, particularly in breast cancer cases, at RS Adam Malik. This research is crucial because safe chemotherapy regimens for cancer treatment are of utmost importance. The study aims to identify the classes and types of cytostatic drugs most commonly used in breast cancer chemotherapy patients during the period from January to March 2023 at Haji Adam Malik General Hospital in Medan.

## METHOD

This research has gone through the ethical clearance and was declared ethically appropriate with the number 01.1637/KEPK/Poltekkes Kemenkes Medan. This study used a descriptive survey research type which was conducted at the medical records installation of Haji Adam Malik General Hospital Medan from April to May 2023. Using a saturated sample technique, the entire population prescribed the use of cytostatic drugs in breast cancer chemotherapy patients during the period January to March 2023 in Haji Adam Malik General Hospital in Medan was used as a sample. Data collection was carried out retrospectively by collecting data on the patient's electronic medical records<sup>11</sup> and then analyzed descriptively, which was then presented in the form of frequency distribution tables and pie charts.

## RESULTS

**Table 1. Characteristics of Patients by Age.**

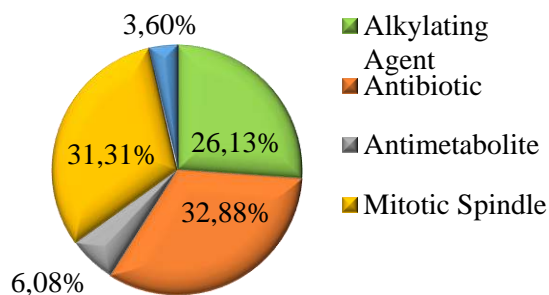
No.	Age (years)	N	%
1.	35-44	21	11,9
2.	45-54	111	63,1
3.	55-64	38	21,6
4.	>64	6	3,4
	Total	176	100

The characteristics of patients based on gender showed 176 patients (100%) were female. Based on Table 1, the characteristics of patients who have breast cancer are predominantly aged 45-54 years (63.1%).

**Table 2. Cytostatic Drug Prescription Based on Month of Use**

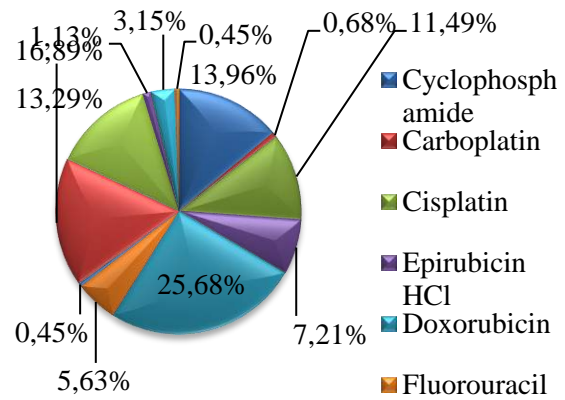
No.	Month	N	%
1.	January	69	31,8
2.	February	68	31,3
3.	March	80	36,9
	Total	217	100

Table 2 shows the number of breast cancer chemotherapy patients at Haji Adam Malik General Hospital from January to March 2023. Based on the number of cytostatic drug prescriptions, data shows an increase in drug prescriptions in March of 5.6% compared to the previous month.



**Figure 1. Profile of Cytostatic Drugs Based on Drug Classes**

Figure 1 shows that Haji Adam Malik Hospital used five classes of cytostatic drugs to treat breast cancer chemotherapy patients from January to March 2023, namely Alkylating Agents totaling 116 (26.13%), Antibiotics totaling 146 (32.88%), Antimetabolites totaling 27 (6.08%), Mitotic Spindle totaling 139 (31.31%) and Monoclonal Antibodies totaling 16 (3.60%).



**Figure 2. Cytostatic Drug Use Based on Drug Type**

The types of cytostatic drugs used by breast cancer chemotherapy patients at Haji Adam Malik General Hospital from January to March 2023, there were 12 types of cytostatic drugs with the five most used, namely Doxorubicin 114 (25.68%), Paclitaxel 75 (16.89%), Cyclophosphamide 62 (13.96%), Docetaxel 59 (13.29%), and Cisplatin 51 (11.49%). A complete profile of the use of medicinal items can be seen in Figure 2 below.

## DISCUSSION

Based on the research results obtained, it was shown that all breast cancer chemotherapy patients at Haji Adam Malik General Hospital from January to March 2023 were female. This is in line with research from Nuraini et al. (2022), who obtained research results with patient characteristics based on gender, namely the 100% female category, and in accordance with the theory, which states that women are at greater risk of developing breast cancer than men. One of the causes is the hormone factor that is owned by women, namely the hormones estrogen and progesterone<sup>12,13</sup>.

Whereas in terms of age, the average age range is 45-54 years, which indicates that the age group with more cancer is >44 years. The main risk of cancer is increasing age because the functions of organs and cells in the body experience degeneration and long exposure to hormones with age, and breast cancer is more likely to occur in the productive age group and even the elderly. The occurrence of cancer at the age of > 44 years can be caused by long-term use of hormonal contraception, which exposes the body to too much of the



hormone estrogen and turns off the function of estrogen receptors, which will increase the risk of breast cancer<sup>5,14</sup>.

There are two ways the hormone estrogen can cause cancer. The former causes breast tissue to undergo more cell division, or mitosis, by acting as a "mitogen." As a result of an increase in cell mitosis and the occurrence of errors in cell division (mutation), which results in cancer. Second, certain estrogen metabolism also acts as a carcinogen that damages DNA directly and causes the formation of cancer cells. This suggests that the hormone estrogen can increase the risk of developing breast cancer<sup>15</sup>.

Figure 1 shows that in the treatment of breast cancer, Haji Adam Malik General Hospital uses the most cytostatic drug classes, namely antibiotics, with an amount of 146 or 32.88%. This is different from the research by Elisya et al., which obtained the results of the most widely used class of cytostatic drugs, namely Alkylating Agents because this study used samples of all types of cancer present at the researcher's location<sup>16</sup>.

Anticancer antibiotics are one of the most important classes of antibiotics, which have a special inhibitory effect on cancer. *Anti-epithelial-mesenchymal-transition* (EMT) or inhibit the development and spread of cancer cells. In the process of surgical treatment of cancer, in some cases, the cancer cells have spread and entered the blood circulation; surgery can only remove cancer locally, not for cancer cells that have spread to the blood circulation. As a result, cancer surgery is often followed by systemic drug therapy with antibiotics to remove the cancer and minimize the risk of recurrence. However, during the use of antibiotics, bacteria become increasingly resistant to them, which causes antibiotic resistance. Antibiotic resistance can be intrinsic, meaning that the resistance of bacteria to naturally occurring antibiotics is obtained through a process of gene mutation or gene transfer. Therefore, it must be able to regulate the use of antibiotics to reduce bacterial resistance<sup>17</sup>.

Whereas for the use of cytostatic drugs based on the type of drug, the most widely used was Doxorubicin, with an amount of 114 or 25.68%. This is in line with Prawira Pramudita's research (2018), which obtained research results that Doxorubicin was the most widely used antibiotic in Dr. Kariadi Semarang<sup>18</sup>.

Doxorubicin is the most widely used type of cytostatic drug because it is one of the chemotherapeutic agents in first-line combination chemotherapy. For breast cancer, chemotherapy<sup>19</sup> has a strong cytotoxic effect. To date, Doxorubicin is the most widely used drug in standard chemotherapy regimens and is used to treat various types of cancer and hematology<sup>13,10</sup>.

Doxorubicin is part of the anthracycline antibiotic group, which acts as a chemotherapeutic agent by inhibiting DNA and RNA synthesis. Doxorubicin, derived from the bacterium *Streptomyces peucetius*, has been used extensively as a chemotherapeutic agent since the 1960s. In addition to treating breast cancer, Doxorubicin can also be used to treat ovarian, bladder, and thyroid cancer, acute lymphoblastic leukemia, acute myeloblastic leukemia, Hodgkin's lymphoma, and small cell lung cancer<sup>20</sup>.

The dose used for the treatment of breast cancer intravenously is 60 mg/m<sup>2</sup> combined with Cyclophosphamide on the first day of every 21-day treatment cycle, for a total of 4 cycles<sup>5,21</sup>. Meanwhile, according to the U.S. Food and Drug Administration 2013, in combination therapy, the dose used is between the range of 40 to 75 mg/m<sup>2</sup> given intravenously every 21 to 28 days<sup>21,22</sup>. The results of the study showed that all Doxorubicin uses doses between 57 and 138 mg; this shows that their use exceeds the literature dosage range.

The absorption of Doxorubicin is unstable in stomach acid, which causes the drug to experience little absorption. Therefore, it is administered intravenously, which has a faster absorption<sup>17</sup>. Doxorubicin is distributed into tissues, including the lungs, liver, heart, spleen, and kidney, with a distribution half-life of about 5 minutes and a terminal half-life of 20 to 48 hours. The binding rate of Doxorubicin and its main metabolite to plasma proteins is about 75%. Doxorubicin is detectable in breast milk after administration of 70 mg/m<sup>2</sup> over 15 minutes by continuous intravenous infusion<sup>19</sup>.

Doxorubicin is metabolized rapidly primarily in the liver by Aldo-keto reductase to the active Doxorubicin (adriamycin) and the inactive aglycones, conjugated sulfates, and glucuronides<sup>5,21</sup>.

The plasma clearance rate of Doxorubicin ranges from 324 to 809 mL/min/m<sup>2</sup> and is dominated by bile

metabolism and excretion. About 40% of the drug dose will be excreted in the feces within five days, and about 5-12% of the dose will be excreted in the urine with a terminal elimination half-life of 20-48 hours<sup>22</sup>.

Doxorubicin's side effects can give your urine, tears, and sweat a reddish color. These effects may begin within the first hours after treatment and can last up to several days. Doxorubicin is also associated with significant cardiac toxicity, which limits long-term use of the drug. Chronic and advanced cardiac toxicity can also occur after administration of Doxorubicin and is the most serious and potentially lethal side effect associated with Doxorubicin therapy<sup>20,22</sup>.

## CONCLUSIONS

The conclusion from this study was that the most widely used class of cytostatic drugs were antibiotics, with 146 (32.88%), and the types of cytostatic drugs were Doxorubicin, with 114 (25.68%).

It is suggested that future researchers conduct research on the effectiveness and side effects of using cytostatic drugs in outpatient breast cancer patients undergoing chemotherapy at Haji Adam Malik General Hospital Medan.

## ACKNOWLEDGMENTS

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## CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest in this research.

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Original Article

***The Relationship of Social Support with The Level of Independence for People with Mental Disorders (ODGJ) in Menur Mental Hospital (RSJ) Surabaya***

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**ABSTRACT**

*Mental health is one of the things that is currently becoming an international issue discussed in the SDGs (Sustainable Development Goals). The healing process for ODGJ is carried out by carrying out mental rehabilitation. The intense support that people with mental disorders receive from outside themselves sometimes goes unnoticed, whether it comes from family, friends or health workers. The aimed to study and analyse the relationship between support from family, friends, and health workers on the level of independence in ODGJ. This research is a type of observational analytical research with a cross-sectional approach. Data collection was carried out using a questionnaire. The data in this study were analysed univariately using frequency distribution tables and bivariate using cross tables and the chi-square statistical test with significance  $\alpha=0.05$  using SPSS. The research results show that there is a relationship between support and the level of independence of ODGJ ( $p= 0.012$ ), there is a relationship between friend support and the level of independence of ODGJ ( $p= 0.027$ ), and there is a relationship between support from health workers and the level of independence for ODGJ ( $p= 0.001$ ).*

**Keywords:** Social Support, Independence, People with Mental Disorders (ODGJ)

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**INTRODUCTION**

One of the important issues discussed in the SDGs (Sustainable Development Goals) is mental health. Of the 17 SDG goals, goal 3 focuses on the need for healthy and prosperous living for all age groups and in various circles. One of the points in the SDGs concerns mental health and the abuse of drugs and illegal substances. Mental health is included in the UN Sustainable Development Goals<sup>1</sup>.

Even though mental health has received world attention through the SDGs, not all people pay enough attention to the importance of mental health, especially in Indonesia. It cannot be denied that many Indonesians still have taboos and even tend to underestimate mental health. In fact, in the current era of social

media, it is very important to maintain mental health apart from physical health. As the Latin proverb says, "Mens Sana in Corpore Sano" which means that in a healthy body, there is a strong soul. This proverb concludes that the body and soul are two mutually sustainable things. These two things will be key in carrying out activities in daily life<sup>2</sup>.

The countries with the highest mental health cases are countries with middle to upper-income levels, in first place are North American countries (21.3%), followed by Western European countries (17.71%). The countries in the lower middle category that have the highest mental health cases are Latin America (15.4%) and Southeast Asia (13.2%). Even though the number of mental health cases in lower middle-class countries is lower, this will add to the

double health burden that these countries are facing, which will become even more severe, especially if people pay less attention to mental health or mental health<sup>3</sup>.

The prevalence of mental disorders in Indonesia has increased from 2013 to 2018, namely severe mental disorders, namely psychosis and severe schizophrenia. In 2013 there were 1.3 cases per mile reported as having a family member who had schizophrenia, while in 2018 the prevalence increased to reach 7 cases per mile. The prevalence of mental health disorders which is also increasing is the type of depression, although the figure is not as high as the prevalence of serious mental disorders, but from 2013 to 2018 the prevalence was quite high, namely from 6.0 to 9.0 family members per mil who experienced depression. Then, the prevalence of depression is also quite high, namely 6.0 cases per million in 2018<sup>4</sup>.

In the case of People with Severe Mental Disorders (ODGJ), a person will generally be seen experiencing a setback marked by a loss of responsibility and motivation within themselves and an inability to participate in activities and carry out social relationships. Apart from that, severe ODGJ also experience setbacks in terms of basic abilities, one of which is being unable to carry out Activities of Daily Living (ADL) such as bathing, eating, dressing, dressing, brushing teeth, ambulance, and so on<sup>5, 6</sup>. Because of the above, an intense rehabilitation process that is carried out optimally is the solution to speed up the recovery of ODGJ<sup>7</sup>.

The independence of ODGJ after rehabilitation is influenced by various things including social support, such as support from family, neighbors, work friends, and so on, so that former ODGJ become comfortable returning to society and this can avoid relapse<sup>8</sup>. In the rehabilitation process for ODGJ, various parties must make optimal efforts so that ODGJ have good social adaptation abilities and can stand on their own and return to being productive in social life, so that this is expected to reduce the recurrence rate of former ODGJ sufferers<sup>9</sup>.

Based on a preliminary study conducted at RSJ Menur Surabaya, data throughout 2021 shows that only 54% of ODGJ patients are regularly visited by their families, while friends visit less than 10% of ODGJ patients. Ayuningtyaset al. (2018) in his research, it was revealed that patients with

ODGJ had been declared cured but did not receive support from family, friends and the community, which often led to relapses or relapses which caused them to have to be rehabilitated again<sup>7</sup>.

The intense support that people with mental disorders receive from outside themselves sometimes goes unnoticed, whether it comes from family, friends or health workers<sup>10</sup>. In fact, social support is very important to provide to people with mental disorders. Therefore, this research aims to analyze the relationship between social support (family, friends and health workers) on the level of independence of ODGJ (People with Mental Disorders).

## METHOD

The method for carrying out this research is as follows:

### a). Preparation

At this stage, the team, involving students, prepares research instruments, identifies the tools and materials needed during the research, correspondence for research permission, and so on.

This research is a type of observational analytical research with a cross-sectional approach. Data collection was carried out using a questionnaire. The independent variables in this study are family support, friend support, and health worker support, while the dependent variable in this study is the level of independence of ODGJ. The population in this study were all ODGJ at RSJ Menur, 100 patients who met the criteria were used as research samples using simple random sampling techniques.

### a) This activity was carried out for 1 day at RSJ Menur Surabaya

- 1) Opening ceremony
  - 2) Giving questionnaires
  - 3) Providing counseling to families of ODGJ patients (in conjunction with PkM activities).
  - 4) Collecting research questionnaires
  - 5) Closing
- ### b) Follow-up

After the data is collected, editing, coding, scoring and tabulating will be carried out. The data will be processed univariately using a frequency distribution, then also bivariately using cross tabulation and the chi square statistical test with a significance of 0.05.

After the data is processed, the next step is to write the research results, discuss and draw conclusions.

## RESULTS

**Table 1. Characteristics of Respondents**

Characteristics	Σ	%
Age		
Late Teenagers	15	15
Early Adulthood	28	28
Late Adulthood	47	47
Early Elderly	7	7
Late Elderly	3	3
Gender		
Man	58	58
Woman	42	42
Educational background		
No school	5	5
Elementary School	21	21
Junior High School	29	29
Senior High School	35	35
D3/S1/S2	10	10
Race		
Madurese	29	29
Java	71	71
Religion		
Christian	4	4
Islam	96	96
Employment History		
Trader	8	8
Private Employees	5	5
Household Assistant	2	2
Laborer	10	10
Sales	4	4
Workshop	1	1
Never worked/no data	70	70
Diagnosis		
Schizophrenia	71	71
Non Schizophrenic	29	29
Long time of illness		
>5 years	36	36
≥5 years	64	64
History of Recurrence		
Never	12	12
Once	88	88

The results of the respondent characteristics data show that 47% are in the late adult age range, 58% are male, 35% have a history of high school education, 96% are Muslim, 70% have never worked/no data, 71% have a diagnosis Schizophrenia, 64% have been

ill for ≥5 years, 88% had experienced a recurrence.

**Table 2. Frequency Distribution of Support From Family, Friends and Health Workers**

Support Data	Σ	%
Family support		
Never	38	38
Always	62	62
Friend Support		
Never	33	33
Always	67	67
Health Worker Support		
Never	30	30
Always	70	70

Based on Table 2, it shows that more than half of the respondents have received support with the description: 62% always get family support, 67% always get support from friends, and 70% always get support from health workers.

**Table 3. Frequency Distribution of the Level of Independence of ODGJ**

ODGJ Independence Level	Σ	%
Depends on other people	42	42
Independent	58	58
Total	100	100

Based on Table 3, it shows that 58% of respondents are able to carry out ADL independently, and 42% still depend on other people.

**Table 4. Data on The Relationship Between Family Support and The Level of Independence of ODGJ**

Family support	ODGJ Independence Level			
	Depends on other people		Independent	
	Σ	%	Σ	%
Never	22	57.9	16	42.1
Always	20	32.3	42	67.7

*Pearson Chi-Square*( $p=0.012 < \alpha$ )

Based on Table 4, it shows that 67.7% of respondents who always received family support were able to carry out ADL independently. This is in accordance with the results of the analysis test *Chi-Square* with  $p$  value =  $0.012 < \alpha$ , which means that there is a relationship between family support and the level of independence of ODGJ.

**Table 5. Data on the Relationship Between Friend Support and The Level of Independence of ODGJ**

Friend Support	ODGJ Independence Level			
	Depends on other people		Independent	
	Σ	%	Σ	%
Never	19	57.6	14	42.4
Always	23	34.3	44	65.7

*Pearson Chi-Square*( $p= 0.027 < \alpha$ )

Based on Table 5, it shows that 65.7% of respondents who always get support from friends are able to carry out ADL independently. This is in accordance with the results of the Chi-Square analysis test with a value of  $p = 0.027 < \alpha$ , which means that there is a relationship between friend support and the level of independence of ODGJ.

**Table 6. Data on The Relationship Between Health Personnel Support and The Level of Independence of ODGJ**

Health Worker Support	ODGJ Independence Level			
	Depends on other people		Independent	
	Σ	%	Σ	%
Never	20	66.7	10	33.3
Always	22	31.4	48	68.6

*Pearson Chi-Square*( $p= 0.001 < \alpha$ )

Based on Table 5, it shows that 68.6% of respondents who always received support from health workers were able to carry out ADL independently. This is in accordance with the results of the Chi-Square analysis test with a value of  $p = 0.001 < \alpha$ , which means that there is a relationship between support from health workers and the level of independence of ODGJ.

## DISCUSSION

### A. Characteristics of ODGJ patients

ODGJ is an abbreviation for "People with Mental Disorders." This term is used to refer to individuals who experience mental health disorders that significantly affect their thinking, mood, behavior, or cognitive function. The term ODGJ is used to emphasize the human aspect of individuals and reduce the stigmatization that is often associated with mental illness. This aims to support the understanding that mental disorders are not a person's personal identity, but are medical conditions that can be treated and managed well with the right support and care<sup>11</sup>.

The emergence of mental disorders (including ODGJ) is influenced by various complex factors, including interactions between genetic, biological, psychological, social and environmental factors. Age-related risk factors have been identified to be associated with the onset of ODGJ. In research, Chen et al (2022) shows that in adolescence and early adulthood, hormonal changes, life transitions, academic stress, and increased socialization can trigger the onset of mental disorders in genetically vulnerable individuals<sup>11</sup>. In late adulthood, factors such as decreased physical and cognitive function, social isolation, or underlying physical illness may influence the high risk of mental disorders<sup>12</sup>.

Gender factors also influence the emergence of mental disorders. In the research of Suanrueang et al. (2022) shows that mental disorders are more common in men than women. Studies show that the incidence of mental disorders in men is around 1.4 to 1.6 times higher than in women<sup>12</sup>. Although these rates vary across populations and age groups, these differences remain consistent. Men tend to experience the onset of mental disorders at a younger age than women. The peak onset of symptoms often occurs between the ages of 16 and 30 years in men, while in women it usually occurs between the ages of 25 and 30 years. This means that early onset is more common in men, while onset in women is more common in early adulthood<sup>13</sup>.

Educational level can also reflect environmental conditions associated with mental disorders. For example, an unsupportive school environment, exposure to violence or trauma in an educational setting, or a lack of social and mental health support at school may contribute to the risk of schizophrenia<sup>13</sup>.

There is no evidence to suggest that any particular race or ethnic group directly causes or is associated with mental disorders. Mental disorders, such as depression, anxiety, schizophrenia, and bipolar, are related to more complex factors, including genetic, environmental, social, cultural, and individual factors. However, it is important to remember that the experience and risk of mental disorders may vary among racial and ethnic groups due to differences in social, economic, cultural factors, and access to health care<sup>14</sup>.

Job instability, such as unemployment, temporary employment, or frequent job changes, may also contribute to the risk of

schizophrenia and other mental disorders. Economic instability and job uncertainty can cause stress, social instability, and negative effects on mental health<sup>15</sup>.

It is important to remember that the factors above do not directly cause ODGJ in every individual. They interact in complex ways and affect individuals differently. Each individual has a unique vulnerability to the development of mental disorders, and these risk factors may interact with protective factors that may reduce risk or protect mental health. The role and impact of each factor in the occurrence of ODGJ can vary from one case to another.

### **B. Relationship between family support and the level of independence of ODGJ**

Family support has an important role in increasing the level of independence of people with mental disorders (ODGJ). Families who provide consistent emotional and moral support can help ODGJ feel supported and accepted. This can help increase self-confidence and motivation to achieve independence. Emotional support can involve listening attentively, providing encouragement, and validating the experiences of PLWH<sup>16</sup>.

Families who understand the condition of ODGJ and make efforts to learn more about this mental disorder can help provide more effective support. With a good understanding of symptoms, treatment, and management strategies, families can help PLWH develop the skills and strategies necessary to achieve a higher level of independence<sup>17,18</sup>.

Family support can involve active involvement in the care of ODGJ. This may include attending therapy sessions together, help remembering treatment schedules and managing medications, and participating in rehabilitation or community support programs. Involved family support can strengthen treatment efforts and help ODGJ achieve the goal of independence<sup>18,19</sup>.

Families can play a role in helping ODGJ develop the life skills necessary for independence, such as time management, financial management, self-care and social skills. Support in learning and practicing these skills gradually can help ODGJ feel more confident in facing daily challenges and develop greater independence.

### **C. The Relationship between Friend Support and the Level of Independence of ODGJ**

Support from friends also has an important role in increasing the level of independence of people with mental disorders (ODGJ). Friends who provide emotional support can be good listeners, provide encouragement, and provide a shoulder to rely on when ODGJ need a place to share experiences and feelings. This emotional support can help improve the emotional well-being of ODGJ and provide greater self-confidence in facing challenges<sup>20</sup>.

Involving ODGJ in social activities and providing practical support can help increase independence. Friends can invite ODGJ to get involved in social activities, such as sports, arts, or other group activities, which can help strengthen social skills and provide opportunities to build broader social relationships<sup>18</sup>.

In some cases, peers who also have experience of ODGJ can be an invaluable source of support. Peer support groups or friends who have gone through similar experiences can provide in-depth understanding, share management strategies, and provide inspiration for ODGJ to achieve a higher level of independence<sup>20</sup>.

Friends who understand the condition of ODGJ and try to learn more about this mental disorder can provide more effective support. With a good understanding of symptoms, treatment, and management strategies, friends can provide appropriate support and help PLWH develop independence<sup>19</sup>.

Friends who can encourage ODGJ's participation in daily activities, such as learning about work, obtaining education, or hobbies, and accepting them openly, can help build a sense of self-confidence and independence. Positive support and encouragement from friends can motivate ODGJ to overcome obstacles and achieve their goal of being able to function independently in society again.

### **D. The Relationship between Health Worker Support and the Level of Independence of ODGJ**

Support from health workers plays a vital role in increasing the level of independence of people with mental disorders (ODGJ). Health workers, including psychiatrists, psychologists, mental nurses,



therapists and other medical personnel, can provide various forms of support that help ODGJ achieve independence<sup>18</sup>.

Trained health workers can carry out a comprehensive assessment of the condition of ODGJ and make an accurate diagnosis. A correct diagnosis is an important first step in developing an appropriate treatment plan to increase independence<sup>17</sup>.

Health workers can develop an integrated care plan for ODGJ. This may involve a combination of drug therapy, psychosocial therapy, and targeted rehabilitation interventions to help PLWH develop the skills and strategies necessary to live independently<sup>19</sup>.

Mental therapists and counselors can provide emotional support, guidance, and teach skills to ODGJ. They can help PLWH understand and overcome symptoms that may hinder independence, such as managing stress, improving social skills, or developing effective self-management strategies<sup>21</sup>.

Health workers can provide important education and understanding to ODGJ and their families about the condition, symptoms and treatment of ODGJ. By understanding their condition well, ODGJ can take an active role in their own care and take steps to increase independence<sup>18</sup>.

Health workers can provide ongoing support during the recovery process for ODGJ. This involves providing feedback, providing encouragement, and working with PLWH to set realistic recovery goals. This ongoing support can help ODGJ overcome obstacles and achieve greater independence<sup>21</sup>.

Health workers have an important role in coordinating ODGJ care with various parties, such as family, rehabilitation services, community support, and other related parties. Good care coordination ensures that all aspects of care support the achievement of goals to help the success of ODGJ's independence.

## CONCLUSIONS

There is a relationship of social support with the level of independence for ODGJ (people with mental disorders) in Menur Mental Hospital (RSJ) Surabaya. Suggestions for future research to examine other factors that influence the independence of ODGJ, among others are; motivation, skill, and intention.

## ACKNOWLEDGMENTS

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## CONFLICTS OF INTEREST

To avoid conflict by researchers is to obtain consent (information) from related parties, both from respondents and the research site.

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Original Article

## ***The Effect of Ethanol Ants Nest Extract on Profil Lipid Mice Model Obesity with Type 2 Diabetes***

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### **ABSTRACT**

*The Ants Nest plant (Myrmecodia pendans) is known to have the potential to reduce blood glucose cholesterol, LDL (Low-Density Lipoprotein), and HDL (High-Density Lipoprotein) in obese patients with Type 2 Diabetes (T2D) because it contains high flavonoid and tannin content that can prevent oxidative stress and inhibit the work of pancreatic  $\beta$  cells,  $\alpha$ -glucosidase work, Glut-2, and lipase enzymes. This study aims to study the effect of the management of Ethanol Ants Nest Extract (EANE) on changes in the cholesterol, LDL, and HDL levels of obese rats with T2D. The extraction of the ants nest was carried out using the maceration method with ethanol solvent. Cholesterol, LDL, and HDL values will be obtained through the CHOD PAP. The rats were divided into 6 groups, namely: KNo (standard control), KN (T2D obesity), KP (T2D obesity given metformin), P1, P2, and P3 (T2D obesity given ethanol extract of ant nest 150mg/KgBW/day, 300mg/KgBW/day, and 600mg/KgBW/day for 14 days by gastric sonde). Induction of DM model using streptozocin and nicotinamide. Data were analyzed using Paired T-test and continued by using One-way ANOVA. There was a decrease in cholesterol, LDL, and HDL after 14 days of intervention, which was highest in the P3 group with cholesterol, LDL, and HDL of  $64,06 \pm 1,97$  mg/dl ( $p < 0.0001$ ),  $44,56 \pm 2,22$  mg/dl ( $p < 0.0001$ ), and  $45,33 \pm 2,56$  mg/dl ( $p < 0.0001$ ). The treatment of ethanol extract from ants nest has an effect in reducing cholesterol, LDL, and HDL.*

**Keywords:** Cholesterol, Ethanol Ant Nest Extract, Diabetes, LDL, HDL

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### **INTRODUCTION**

Ant's Nest (*Myrmecodia pendans*) from Papua is a typical Indonesian plant considered a traditional medicine with various benefits but has not been clinically tested. The anthill plant is also said to be antiobesity and antidiabetic. This is because the anthill plant contains high

antioxidants, namely flavonoids and tannins with an IC<sub>50</sub> value of 8.18 ppm and in the Ethanol Ant Nest Extract (EANE) obtained an IC<sub>50</sub> value of 32.48 ppm (very strong)<sup>1</sup>. The content cannot only ward off free radicals but also antimicrobial and anti-inflammatory<sup>2</sup>. Flavonoids preserve pancreatic  $\beta$ -cells, restore cellular insulin receptor sensitivity, and

maximize insulin sensitivity. Flavonoids keep pancreatic  $\beta$ -cells, restore cellular insulin receptor sensitivity, maximize insulin sensitivity, inhibit pancreatic lipase enzymes that lower cholesterol, TG, and BW levels, and reduce cholesterol synthesis by inhibiting acyl-CoA cholesterol acyl transferase (ACAT) enzyme activity<sup>3</sup>.

Diabetes Mellitus is a chronic metabolic disorder described by high blood sugar levels associated with impaired insulin resistance and secretion caused by the main factor, one of which is obesity<sup>4</sup>. According to the International Diabetes Federation (IDF) in 2021, there were 537 million people or 10.5% of the total number of adults in the world suffering from Diabetes, it is estimated that the number of Diabetes sufferers will increase to 643 million people, in 2030 and 783 million people, in 2045 in adults aged 20-79 years<sup>5</sup>. According to WHO, the largest increase in Diabetes sufferers occurred in Southeast Asia, including Indonesia, which ranked 5th at 19.5%<sup>6</sup>. *The World Health Organization (WHO)* estimates that in 2030, diabetes will become the 7th cause of death worldwide. According to Suwinawati et al. (2020), 90 - 95% of the disease burden that causes 70% of deaths from diabetes cases worldwide is T2D due to an unhealthy lifestyle. The number of patients is increasing due to the lack of knowledge of T2D management<sup>7</sup>. Infodatin data, 2020 noted that the prevalence of DM in the 2018 Riskesdas in the Papua region was 1.1%, while compared to the West Java, Central Java, and East Java regions, it was 1.7%, 2%, and 2.5<sup>5</sup>.

Antidiabetic drugs such as glinide, metformin, etc. Non-pharmacological therapy means planning nutritional therapy, namely 3J (schedule, type, and amount)<sup>7</sup>. Consumption of several diabetes drugs with a long duration has adverse side effects such as increased body weight (BW), allergy to insulin, gastrointestinal disorders, flatus, genital and urinary tract infections, and can trigger ketoacidosis<sup>8</sup>. People today prefer alternative medicine to traditional medicine, one of which is the Ant Nest plant. People today prefer alternative treatment to conventional medicine, one of which is the Ant Nest plant. The use of extracts from ant nest simplisia is thought to have a hypoglycemic mechanism and be able to reduce cholesterol levels, as well as affect LDL and HDL levels, which involve the inactivation of peroxide free

radicals that can damage pancreatic  $\beta$  pancreas<sup>3</sup>.

This study aims to determine the effect of anthill ethanol extract in reducing LDL and cholesterol levels and increasing HDL levels in obese conditions with T2DM. The results of this study are expected to be used as a reference for further research and may be applied to humans.

## METHOD

This study uses a true-experimental method to observe the impact of the administration of Ethanol Ant Nest Extract (EANE) on cholesterol, LDL, and HDL levels. The research design used was pre-posttest with a control group. The research was conducted from May to June 2022 at the Laboratory of the Center for Food and Nutrition Studies (PSPG), Gadjah Mada University, Yogyakarta. This research has received approval from the Research Ethics Committee of the Faculty of Medicine, Sebelas Maret University, with number 108/Un27.06.11/KEP/EC/2023.

Wistar rats used in this study were treated and raised in the Laboratory of the Center for Food and Nutrition Studies (PSPG), Gadjah Mada University, Yogyakarta. The sampling technique was purposive sampling with 30 samples, 8 weeks old, 150-200gram weight. Rats were adapted within 7 days with drinking water ad libitum and comfeed feed. After the rats were acclimated for 7 days, the rats were made obese, induced with HFHF diet for 14 days given 2 times (morning and evening) ad libitum<sup>9</sup>. In addition to being given HFD, obesity-induced rats are also given 10% Fructose by dissolving 20 ml of High Fructose Syrup 55% in 100 ml of distilled water until homogeneous<sup>10</sup>. After 14 days, the lee index was measured. Mice were classified as obese if the lee index exceeded 300. After reaching obesity, mice were induced with streptozotocin (STZ) as much as 45 mg/kgBW/day and nicotinamide (NA) as much as 110 mg/kg BW/day for 72 hours. STZ + NA induction is done through injection into the abdominal cavity because the abdominal cavity has many blood vessels that cause hyperglycemia. Rats are said to be hyperglycemia if their blood glucose levels exceed 250 mg/dl<sup>11</sup>. Experimental animals were divided into 6 groups, namely: KNo (standard control), KN (T2D obesity), KP (T2D obesity given metformin), P1, P2, and P3 (T2 D obesity given

ethanol extract of ant nest 150mg/KgBW/day, 300mg/KgBW/day, and 600mg/KgBW/day).

To prepare the Ethanol Extract of the Ant Nest, the first step is to peel the ant nest that has met the inclusion and exclusion criteria set. Then, the peeled ants' nests were thoroughly dried and not wet so that they became thin like crackers. After that, the anthill pieces were blended to make a coarse powder. The next step uses a maceration method that Ahmad & Lestari (2011) modified. A total of 300 g of finished anthill coarse powder was added with 70% ethanol in a ratio of 1:7. This mixture was placed in a tightly closed bottle container and then allowed to stand for 2 days with stirring once. After that, the resulting macerate will go through a distillation or evaporation process using soxhlet at a maximum temperature of 78oC. This is done so that the extract is not damaged or degraded<sup>12</sup>.

Blood sampling was carried out two times after the rats were induced with STZ-NA for 3 days, which was to measure the rats' blood sugar levels as a sign of diabetes after induction. At both times of blood sampling, rats were fasting for at least 8 hours. Blood samples were taken by first preparing the rats to be taken blood. The retro-orbital plexus method takes blood from the orbital sinus (eye vein). Second, prepare supporting equipment for taking blood samples (1mL syringe and Eppendorf). Third, the rat was held by the nape of the neck and massaged with fingers. Fourth, microhematocrit was scraped on the medial canthus. Blood was drawn as much as 1mL and collected in Eppendorf<sup>13</sup>.

Examination of total cholesterol, LDL and HDL using by enzymatic colorimetry CHOD-PAP using blood from orbital vein of rats<sup>14</sup>. Total Cholesterol Level Examination, Homogenize 1000 µl standard cholesterol reagent + 10 µl serum 10 minutes at room temperature. Then measured the absorbance with a 546nm spectrophotometer and then compared with the standard. LDL Level Examination, using the Fridewald and Fredicson formula, total cholesterol - HDL - triglycerides: 5. HDL Level Examination, working reagent was made by mixing between 1000 µl distilled water and 4 parts of 4000 µl cholesterol reagent placed in a bottle. The next step is to make a supernatant by homogenizing the sample which is added with 200 µl serum left for 10 minutes at 20-25 Degrees Celcius then centrifuged at 4000 rpm, 10 minutes. The

last step is to homogenize working reagent 1000 µl + serum 10 µl 10 minutes at room temperature. Then measured the absorbance with a 546nm spectrophotometer and then compared with the standard<sup>15</sup>. Statistical data analysis using SPSS 26, where the normality test uses paired t-test parametric test, and homogeneity test using Levene. The test used to determine group differences is continued using ANOVA (Analysis of Variance). The significance value used is = 0,05<sup>16</sup>.

## RESULTS

**Table 1. Cholesterol Levels in Mice.**

Group	Mean ± SD			P <sup>b</sup>
	Initial Cholesterol (mg/dl)	Final Cholesterol (mg/dl)	Δ Cholesterol (Difference) (mg/dl)	
KNo	82,64 ± 1,40	92,33 ± 1,92	9,69 ± 2,79	0,001
KN	168,06 ± 3,46	229,10 ± 4,26	61,05 ± 6,77	0,000
KP	162,93 ± 2,67	108,24 ± 2,90	54,69 ± 3,95	0,000
P1	167,91 ± 4,13	142,08 ± 47	25,83 ± 4,63	0,000
P2	169,96 ± 4,01	130,18 ± 2,18	39,78 ± 4,62	0,000
P3	165,42 ± 2,22	101,36 ± 1,49	64,06 ± 1,97	0,000
P <sup>a</sup>	0,00	0,00	0,00	

Description:

*Kno*: Group of normal/healthy experimental animals

*KN*: Type 2 Diabetic obesity trial group

*KP*: Type 2 Diabetic obesity trial group + metformin 9mg/200gBW

*P1*: Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 150mg/KgBW

*P2*: Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 300mg/KgBW

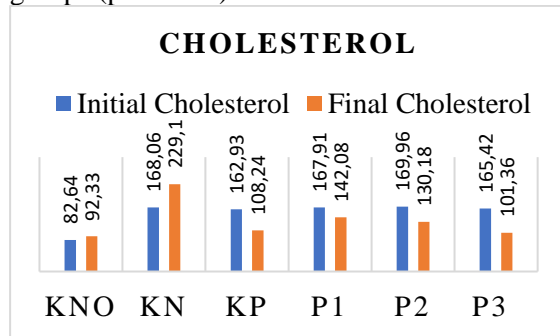
*P3*: Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 600mg/KgBW

**P<sup>a</sup>**: (p<0,05) Uji One Way Anova

**P<sup>b</sup>**: (p<0,05) Uji Paired T-test

Table 1 shows that there is a decrease in cholesterol in the P1 group by 25.83 ± 4.63 (p < 0.0001), P2 by 39.78 ± 4.62 (p < 0.0001), and in the P3 group by 64.06 ± 1.97 (p < 0.0001). In the KNo group, where the rats are in average condition (p = 0.001), there is no significant decrease in cholesterol levels in contrast to KN and KP rats in the negative control group (p < 0.0001), which shows there is a substantial decrease in cholesterol levels. Based on the ANOVA test, it was found that there was a significant difference between the treatment

groups ( $p < 0.0001$ ).



**Figure 1. Comparison graph of Cholesterol levels before and after treatment.**

Figure 1 shows that the comparison graph of Cholesterol levels before and after treatment in all groups with Ethanol Ants Nest Extract and metformin shows there was an decrease. In the KN and KNO group, the Cholesterol value has increased significantly. This is different in the KP, P1, P2, and P3 groups, which experienced a decrease in Cholesterol levels after treatment. If you look back at the highest decline, it is P3, namely in the group of obese T2D animals given EANE 600mg / KgBW.

### Results of Statistical Test of *Low-Density Lipoprotein (LDL) Levels*

Contains exposure to the results of related analysis based on statistical tests to determine the effect of EANE administration in lowering LDL levels in Table 2. It can be seen that there is a decrease in LDL in group P1 by  $31.98 \pm 1.79$  ( $p < 0.0001$ ), P2 by  $38.56 \pm 3.38$  ( $p < 0.0001$ ), and group P3 by  $44.56 \pm 2.22$  ( $p < 0.0001$ ). In the KN group, the rat negative control group ( $p=0.009$ ) showed no significant decrease in GDP levels. Then, in the KNo group where the rats were in normal condition ( $p < 0.0001$ ), it was also found that there was a significant difference. Based on the ANOVA test, it was found that there was a substantial difference between the treatment groups ( $p < 0.0001$ ).

**Table 2. Low-Density Lipoprotein (LDL) Levels in Mice**

Group	Mean $\pm$ SD			$P^b$
	Initial LDL (mg/dl)	Final LDL (mg/dl)	$\Delta$ LDL (Difference) (mg/dl)	
KNo	$21,27 \pm 1,55$	$22,68 \pm 1,75$	$1,40 \pm 0,28$	0,001
KN	$71,91 \pm$	$74,50 \pm$	$2,59 \pm$	0,009

	1,91	1,66	1,22	
KP	$74,90 \pm 3,22$	$32,44 \pm 1,64$	$42,46 \pm 1,74$	0,000
P1	$76,11 \pm 1,80$	$44,12 \pm 1,78$	$31,98 \pm 1,79$	0,000
P2	$74,16 \pm 2,37$	$35,60 \pm 2,85$	$38,56 \pm 3,38$	0,000
P3	$71,91 \pm 27,35$	$27,35 \pm 1,32$	$44,56 \pm 2,22$	0,000
$P^a$	0,00	0,00	0,00	

Description:

KNo : Group of normal/healthy experimental animals

KN : Type 2 Diabetic obesity trial group

KP : Type 2 Diabetic obesity trial group + metformin 9mg/200gBW

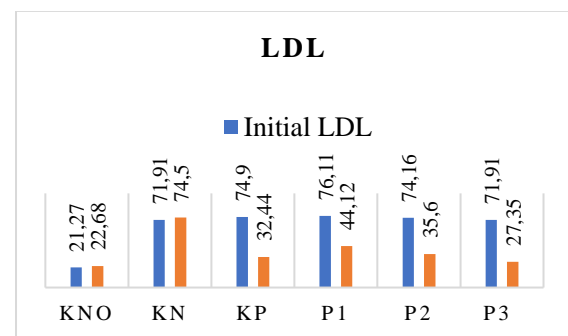
P1 : Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 150mg/KgBW

P2 : Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 300mg/KgBW

P3 : Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 600mg/KgBW

$P^a$  : ( $p < 0,05$ ) Uji One Way Anova

$P^b$  : ( $p < 0,05$ ) Uji Paired T-test



**Figure 2. Comparison Graph of LDL levels before and after treatment.**

Figure 2 shows that the comparison graph of LDL levels before and after treatment in all groups with Ethanol Ants Nest Extract and metformin shows there was an decrease. In the KN and KNO group, the Cholesterol value has increased significantly. If you look back at the highest decline, it is P3, namely in the group of obese T2D animals given EANE 600mg / KgBW.

### Results of Statistical Tests of *High-Density Lipoprotein (HDL) Levels*

Based on the results of statistical tests to determine the effect of EANE administration in reducing HDL levels in Table 3. It can be seen that there was a decrease in HDL in group P1 by  $20.83 \pm 3.71$  ( $p < 0.0001$ ), P2 by  $33.07 \pm 1.38$  ( $p < 0.0001$ ), and group P3 by  $45.33 \pm 2.56$  ( $p < 0.0001$ ), in the KNo group, where the rats were in normal condition ( $p=0.004$ ) and KN rats negative control group ( $p=0.002$ ) showed no significant decrease in HDL levels. Based

on the ANOVA test, it was found that there was a substantial difference between the treatment groups ( $p < 0.0001$ ).

**Table 3. High-Density Lipoprotein (HDL) Levels in Mice.**

Group	Mean $\pm$ SD			$P^b$
	Initial HDL (mg/dl)	Final HDL (mg/dl)	$\Delta$ HDL (Difference) (mg/dl)	
KNo	85,10 $\pm$ 1,53	84,23 $\pm$ 1,57	0,87 $\pm$ 0,33	0,004
KN	32,19 $\pm$ 0,90	29,13 $\pm$ 1,56	3,06 $\pm$ 0,96	0,002
KP	33,62 $\pm$ 1,30	71,55 $\pm$ 2,35	37,92 $\pm$ 2,19	0,000
P1	31,55 $\pm$ 1,92	51,62 $\pm$ 2,53	20,83 $\pm$ 3,71	0,000
P2	34,10 $\pm$ 2,84	67,17 $\pm$ 2,77	33,07 $\pm$ 1,38	0,000
P3	33,47 $\pm$ 1,26	78,79 $\pm$ 2,42	45,33 $\pm$ 2,56	0,000
$P^a$	0,00	0,00	0,00	

Description:

KNo : Group of normal/healthy experimental animals

KN : Type 2 Diabetic obesity trial group

KP : Type 2 Diabetic obesity trial group + metformin 9mg/200gBW

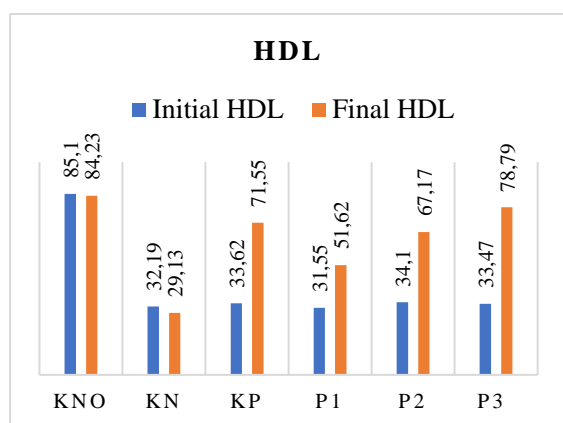
P1 : Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 150mg/KgBW

P2 : Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 300mg/KgBW

P3 : Type 2 Diabetic obesity trial group + Ethanol Ants Nest Extract 600mg/KgBW

$P^a$  : ( $p < 0,05$ ) Uji One Way Anova

$P^b$  : ( $p < 0,05$ ) Uji Paired T-test



**Figure 3. Comparison Graph of HDL levels before and after treatment.**

Figure 3 show that the comparison graph of HDL levels before and after treatment in all groups shows there was an increase. However, that there is slight change in KNO.

Meanwhile in the KN group there was a decrease. Looking back, the highest LDL levels is P3, namely in the group of obese T2D animals given EANE 600 mg/KgBW.

## DISCUSSION

### Differences in Changes in Cholesterol Levels in Rats

The flavonoid component contained in the Ant's Nest plant (*Myrmecodia pendans* Merr. & Perry) shows an antihyperlipidemia effect because it can reduce the amount of overall cholesterol, Low-Density Lipoprotein (LDL) and prevent the oxidation process of LDL<sup>17</sup>. Lowering cholesterol levels is thought to be related to inhibiting enzyme activity by the ethanol extract of an ant nest. In the flavonoid group, the effect of ant nest is believed to be strongly associated with the content of other active compounds such as tannins, tocopherols, multimineral (Ca, Na, K, P, Zn, Fe, Mg), and polysaccharides. Flavonoids are contained in ant nests by inhibiting cholesterol synthesis through inhibitors of hydroxymethylglutaryl coenzyme-A (HMG CoA) reductase, which is an essential enzyme for cholesterol production in the body. Saponins can form insoluble complex bonds in cholesterol so that cholesterol cannot be absorbed by the intestine and tannin chemicals work by inhibiting fat absorption<sup>3</sup>.

### Differences in Changes in Low-Density Lipoprotein (LDL) Levels in Rats

Flavonoids have antioxidant properties that protect cells from oxidative damage caused by free radicals. In obese mice with DM, excessive oxidation will lead to increased inflammation and impaired lipid metabolism. Flavonoids have protective properties against pancreatic  $\beta$ -cells and restore the sensitivity of insulin receptors on cells and can maximize insulin sensitivity<sup>18</sup>. Flavonoids can boost several enzymes involved in the breakdown of LDL in the liver. Ethanol Extract has a high flavonoid content and plays a role in preventing LDL oxidation. LDL oxidation is one of the early developments of atherosclerosis disease and increases the level of obesity in obese mice models with T2D. Prevention of LDL oxidation will help reduce further disease complications.

The effectiveness of ethanol extract of anthill stem (*Hydnophytum formicarum*) on LDL levels (diabetic rats (*Rattus norvegicus*) induced with alloxan has the effect of being able



to reduce LDL significantly with a dose of 0.54 gr/kgBW equivalent to the administration of glibenclamide 0.5 mg/KgBW. In the treatment group with ESS water extract at a dose of 200 mg/kg and 400 mg/kg, there was a significant decrease in plasma LDL levels. This shows that there is an effect of treatment with ESS has a substantial impact in reducing LDL levels in the blood circulation of rats. This is because dietary cholesterol can suppress cholesterol biosynthesis. However, dietary cholesterol can increase plasma concentrations slightly, which helps reduce LDL levels<sup>19</sup>.

### **Differences in Changes in High-Density Lipoprotein (HDL) Levels in Rats**

The condition of rats before being given EANE decreased HDL due to the presence of cholesterol that accumulates. Free radical activity follows this buildup, which causes oxidative damage to several tissues<sup>20</sup>. Ant nest plant extracts *Myrmecodia pendens* Merr. & Perry) has the potential for anhiperkolesterolemia (total cholesterol and HDL cholesterol) in white rats (*Rattus norvegicus*) male Wistar strain at a dose of 800 mg/KgBW<sup>17</sup>. This is also in line with other studies which state that there is an effect after the administration of the first dose of ant nest plant 100mg/KgBW body weight of rats, which shows an increase in HDL concentration balanced with a decrease in LDL cholesterol<sup>3</sup>.

The limitations of this research are the parameters measured in this study are limited to cholesterol, LDL and HDL only so that other parameters such as HbA1c, GLUT-2, GLUT-4 or MDA levels need to be studied to further determine the antidiabetic activity of the ethanol ant nest extract. Then, the phytochemical test on ethanol ant nest extract was not conducted. In addition, there is limited literature related to ethanol ant nest extract or those associated with obesity with Diabetes Mellitus.

### **CONCLUSION**

Ethanol Ants Nest Extract can reduce LDL and cholesterol Nest levels and increase HDL levels. Dose 3 is the most effective dose using ethanol extract at 600mg/KgBW/day. Dose 3 can reduce LDL and cholesterol levels and increase HDL levels compared to the positive group (metformin). The results showed that the use of Ethanol Ants Nest Extract can be

considered as antidiabetic therapy and has an effect on cholesterol, LDL and HDL values but still needs further research such as acute cytotoxicity tests, chronic cytotoxicity tests. Ethanol Ants Nest Extract is still not recommended if used in humans because it still needs further research.

### **CONFLICTS OF INTEREST**

The authors declare no conflict of interest.

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## Management Analysis of Early Initiation of Breastfeeding in The New Habit Era

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### ABSTRACT

There are still a number of Independent Midwives who have not implemented the early initiation of breastfeeding management in the New Normal Era. As early as 2020, newborns should be separated from their Covid-19 infected mothers. This study aims to analyze the management of the early initiation of breastfeeding in the New Normal Era from the point of view of the midwives' knowledge and the relationship between Midwives' knowledge and the implementation of the early initiation of breastfeeding in the New Normal Era. The research method used is quantitative analysis with a cross-sectional design. The design of this study is quantitative analytic with a cross-sectional research design. The population was all Operative Independent Midwives in East Tanjungkarang District of Bandar Lampung City, which amounted to 42 people, and the entire population was sampled. Data analysis used frequency distribution and bivariate analysis using chi-square. Based on the research results from 42 respondents, most had good knowledge about the early initiation of breastfeeding in the new habit era of 29 people (69%), and most midwives had implemented the early initiation of breastfeeding by complying with the Covid-19 protocol, of which 28 people (66.7%). The results of the chi-square analysis obtained a p-value of 0.015, which shows a relationship between midwives' knowledge of the suitability of the early initiation of breastfeeding implementation and the Covid-19 protocol in the New Habit Era of 2022. It is expected that midwives can consistently increase their knowledge and follow the overall developments as the health workers who play a role in the implementation of the early initiation of breastfeeding so that they can implement the early initiation of breastfeeding following the management of newborns babies in Indonesia as a first step to succeeding in exclusive breastfeeding.

**Keywords:** Midwives, Covid-19 Protocol, New Born Baby

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### INTRODUCTION

Human Resource Development is inseparable from health efforts, including maternal and child health efforts. Therefore, the development of human resources must begin from infancy in the womb. One of the efforts to improve human resources' health is exclusive breastfeeding. There is nothing more valuable in a child's life than getting quality nutrition from the beginning of his life, namely breast milk. Exclusive breastfeeding is breastfeeding a baby with only breast milk during the initial six

months of life without giving additional food and drinks except for drugs and vitamins and continuing to give the milk for up to 2 years<sup>1</sup>. Exclusive breast milk is vital because it is the leading food and the first to contain complete nutrients needed for the growth and development of the baby. Breast milk provides immune benefits for the baby. Breast milk is an ideal nutrient to optimally support the baby's health, growth, and development<sup>2</sup>. For mothers, exclusive breastfeeding will accelerate uterine involution, prevent postpartum bleeding, reduce postpartum pain and mortality, reduce the risk

of ovarian cancer, and reduce the risk of breast cancer<sup>3</sup>.

Since the Covid-19 pandemic, there have been many changes in all sectors, including health services. In early 2020, the newborns were separated from their mothers, who were infected with Covid-19<sup>4</sup>. Even at the outset of the pandemic, the American Academy of Pediatrics and the CDC recommended that hospitals separate Covid-19-confirmed mothers from their babies due to the possible risk of neonatal infections<sup>5</sup>. However, the WHO 2020 recommendations state that close contact, the early initiation of breastfeeding, and exclusive breastfeeding help babies to develop<sup>6</sup>. Women with Covid-19 should be encouraged to breastfeed safely, hold the baby in skin contact, and be treated together. In managing newborns in Indonesia, Early Initiation of Breastfeeding is still carried out for mothers who are not suspect, probable, or confirmed to be Covid-19, but prioritizes the prevention of the SARS-CoV-2 virus through droplets or air<sup>7</sup>. It is reinforced by the American College of Obstetricians and Gynecologists (2022), which explains that Covid-19 does not transfer into breast milk and does not cause infections in infants. Most information suggests that it is safe to breastfeed a baby even when a mother has Covid-19<sup>8</sup>.

In implementing the early initiation of breastfeeding, the baby and mother make skin-to-skin contact immediately after the baby is born, and the baby breastfeeds alone within the first hour of life. This has many benefits, including reducing the risk of hypothermia, making the baby's breathing and heartbeat more stable, increasing the baby's ability to fight bacteria, strengthening the bond of affection (bonding) between mother and baby, helping to sustain exclusive breastfeeding and extended breastfeeding, stimulating the release of the hormone oxytocin and prolactin so that it allows the process of removing the placenta, reduces bleeding, makes the mother relax so that she loves her baby more, and increases the flow of milk from the breast<sup>3</sup>. Adapting to the Covid-19 outbreak, the 2020 Ministry of Health issued Guidelines for Antenatal, Childbirth, Postpartum, and Newborn Services in the New Normal Era, which can be a reference for health workers, mothers, and families in providing and obtaining health services according to procedures, and still protected from Covid-19, including in implementing the early initiation of breastfeeding in the Era of Adaptation to New

Habits<sup>7</sup>.

The principle of helping newborns in the Adaptation Era of New Habits prioritizes preventing the transmission of the Covid-19 virus through droplets or air, where newborns from mothers who are not suspected, probable, or confirmed with Covid-19 still receive essential neonatal services at birth, including the early initiation of breastfeeding, of course by implementing Covid-19 prevention procedures such as Implementation of the early initiation of breastfeeding is based on a decision with parents, provided that parents have received counseling about the dangers and risks of transmission of Covid-19 from mother to baby, counseling about the benefits of the early initiation of breastfeeding, during the early initiation of breastfeeding implementation mothers are required to wear masks, washing hands, and cleaning breasts before breastfeeding<sup>7</sup>.

For this reason, as implementers at the forefront of providing health services to pregnant and maternity women, midwives must understand and carry out health services according to service guidelines issued by the Indonesian Ministry of Health.

Based on Fiantika et al. (2021) research in the Implementation of Early Initiation of Breastfeeding, it is hoped that midwives can realize the importance of complying with the early initiation of breastfeeding protocols as work instructions in implementing the early initiation of breastfeeding. Midwives are expected to improve the early initiation of breastfeeding services following the protocol and increase intents and motivations from within themselves to be more responsible in their duties<sup>9</sup>. The results of the presurvey conducted at 10 midwifery independent practice in Bandar Lampung, all midwifery independent practice's continue to implement the early initiation of breastfeeding as usual, but some midwifery independent practice's have not prioritized the prevention of Covid-19 virus transmission. In the results of the pre-survey, 30% of midwifery independent practice's did not counsel first about the dangers and transmission of Covid-19 from mother to baby, before doing the early initiation of breastfeeding, 50% of mothers did not use masks when doing the early initiation of breastfeeding, 30% of mothers did not wash their hands before doing the early initiation of breastfeeding, and 20% of mothers did not clean

their breasts before doing the early initiation of breastfeeding. Based on the survey results, several independent midwifery practices have not implemented the early initiation of breastfeeding management in the New Normal Era. For this reason, researchers want to know how to manage Early Breastfeeding Initiation in the Era of Adaptation to New Habits from the midwife's side based on the midwife's knowledge and whether there is a relationship between the midwife's knowledge and the implementation of the early initiation of breastfeeding in the Era of New Habits?

## METHOD

This research is quantitative research that is analytic with a cross-sectional design. The independent variable in this study is Midwives' Knowledge, while the dependent variable is the early initiation of breastfeeding management in the New Habit Adaptation Era.

The location of this research is throughout midwifery independent practice in East Tanjungkarang District, Bandar Lampung City. The research was conducted in 2022. The population in this study was all operative midwives in midwifery independent practice throughout East Tanjungkarang District of Bandar Lampung City, which amounted to 42 people, and because the total population in this study was less than 100, the sampling technique in this study used total sampling.

In the midwife's knowledge variable, data collection was carried out by filling out a questionnaire before implementing the early initiation of breastfeeding, whereas observing the implementation of the early initiation of breastfeeding in the New Normal Era was carried out using direct observation techniques the early initiation of breastfeeding was being implemented with the approval of the midwife and patient. A questionnaire served as the instrument for this study to measure midwives' knowledge and an observation sheet to see the management of the early initiation of breastfeeding in the New Habit Adaptation Era. Data processing uses frequency distribution and bivariate analysis with the Chi-Square Test to see whether there is a relationship between midwives' knowledge of the suitability of the early initiation of breastfeeding implementation and the Covid-19 Protocol in the New Normal Era of 2022.

This research has received ethical

exemption from the Health Research Ethics Committee of the Tanjung Karang Health Polytechnic with number 012/KEPK-TJK/X/2022.

## RESULTS

**Table 1. Characteristics of Respondents**

Characteristics	Frequency	Percentage
Age		
≤ 35 years old	33	78.6
>35 years old	9	21.4
Education		
Diploma of Midwifery	34	81
Str Midwifery	8	19

Table 1 shows that most respondents are 35 years and under, as many as 33 people (78.6%), while those over 35 years are 9 people (21.4%). The most common education was D3 Midwifery, with 34 people (81%), while the remaining 8 (19%) were Str Midwifery.

**Table 2. Respondents' Knowledge of The Early Initiation of Breastfeeding Implementation in the New Habit Era**

Respondent Knowledge	Frequency	Percentage
Less Good	13	31
Good	29	69

Table 2 shows that most respondents have good knowledge about the early initiation of breastfeeding in the New Habit Era, as many as 29 people (69%), and 13 people (31%) have less good knowledge.

For the early initiation of breastfeeding implementation, all operative midwives in East Tanjungkarang District have done the early initiation of breastfeeding, but the suitability of the early initiation of breastfeeding implementation with the Covid-19 protocol in the new habit era can be seen in the table below:

**Table 3. Suitability of The Early Initiation of Breastfeeding Implementation with Covid-19 Protocol in the New Habit Era**

The Early Initiation of Breastfeeding Implementation	Frequency	Percentage
Unsuitable	14	33.3
Suitable	28	66.7

Based on table 3, it can be seen that most midwives have implemented the early initiation of breastfeeding by complying with

the Covid-19 protocol, which is as many as 28 people (66.7%), but there are still midwives whose implementation of the early initiation of

breastfeeding in the new habit era is not following the Covid-19 protocol, which is as many as 14 people (33.3%).

**Table 4. The Relationship of Knowledge with the Suitability of The Early Initiation of Breastfeeding Implementation with the Covid-19 Protocol in the New Habit Era**

Knowledge Respondent		p-Value				
		Less Good		Good		
		n	%	n	%	
The Early Initiation of Breastfeeding Suitability	Unsuitable	8	61.5	6	20.7	0.015
	Suitable	5	38.5	23	79.3	
Total		13	100	29	100	

Based on table 4, p-value=0,015 means  $p < 0.005$ , shows a relationship between midwives' knowledge of the suitability of the early initiation of breastfeeding implementation and the Covid-19 protocol in the New Habit Era of 2022.

## DISCUSSION

### Midwives' Knowledge of The Early Initiation of Breastfeeding Implementation in the New Habit Era

Based on the study results, it is known that most respondents have good knowledge about the early initiation of breastfeeding in the new habit era, as many as 29 people (69%). According to Warner et al. (2022), as frontline service providers, nurses and midwives play an essential role in providing support and education about the risks and benefits of breastfeeding for individuals with Covid-19<sup>4</sup>. Brown & Shenker (2021) also said that more than 70% of mothers who stopped breastfeeding occurred due to a lack of support during the pandemic, both from health workers and families<sup>10</sup>. Many assumptions circulating in the community about the spread of Covid-19 make most mothers afraid to breastfeed their babies, including the fear of mothers and families implementing the early initiation of breastfeeding. Therefore, midwives should be able to provide relevant information to families about the risk of Covid-19 and the benefits of breastfeeding. By providing relevant information, the midwives can explain the steps of the Covid-19 protocol that can prevent the transmission of the Covid-19 virus from mother to baby in carrying out the early initiation of breastfeeding and while breastfeeding the baby. Thus, midwives can support mothers to continue to give their milk, even to mothers

infected with Covid-19. It follows the WHO statement, which states that even women with Covid-19 should be encouraged to breastfeed safely, hold their babies in skin contact, and be treated together<sup>11</sup>.

To provide such education and support, a midwife or health worker must know about implementing the early initiation of breastfeeding in the New Habit Era. With good knowledge, midwives or health workers can provide health education to families about the benefits and risks of breastfeeding in the New Habit Era. Health education provided by midwives or health workers must be able to provide information about preventive measures such as wearing masks, washing hands before and after breastfeeding and maintaining distance from newborns after breastfeeding. Thus, midwives or health workers are expected to be able to convince and encourage mothers to continue to do the early initiation of breastfeeding with the Covid-19 protocol.

Based on the study results, 31% of respondents still have poor knowledge of implementing the early initiation of breastfeeding in the New Habit Era. It is possible because some levels of midwives' education with less good knowledge are Diploma of Midwifery, which is as much as 85%. For this reason, it is expected that midwives, as frontline service providers, can increase their knowledge through formal and informal education. Midwives and other health workers must realize that mothers and families need support, education, and safety in breastfeeding their babies. To provide the best to clients, midwives and other health workers must be aware of rapidly changing information, follow it, and have good knowledge to provide appropriate and evidence-based information to mothers and families.

### **Suitability of The Early Initiation of Breastfeeding Implementation with Covid-19 Protocol in the New Habit Era**

In 2018, WHO stated that breastfeeding improves the health of mothers and babies and has a positive impact on the family's socio-economy<sup>11</sup>. However, fears of Covid-19 virus transmission from mother to baby have resulted in the separation of newborns from their mothers, making formula often an option for breastfeeding<sup>10</sup>. A survey of hospital practices conducted by the CDC in 2020 showed that 32.8% of hospitals did not provide support in the breastfeeding process<sup>5</sup>. It occurred because of doubts from health workers, mothers, and families<sup>5</sup>. The researchers reported that separating the newborn from the mother impacts the baby and the mother<sup>12</sup>. Even Wang et al. (2020) stated that the separation of newborns for 35 days from mothers diagnosed with Covid-19 had caused communication disorders, gross motor, and personal and social development skills in newborns, while there was no evidence of transmission during breastfeeding, in terms of economics<sup>13</sup>. Mialon et al. (2021) stated that there is an increased cost for purchasing formula milk as a consideration factor for mothers to continue breastfeeding their babies even though the mother is infected with Covid-19<sup>14</sup>.

The WHO recommendations (2020) stated that close contact, the early initiation of breastfeeding, and exclusive breastfeeding help babies to develop<sup>15</sup>. Covid-19 mothers should be encouraged to breastfeed safely, have skin-to-skin contact with their infants, and get treatment. Following the WHO directive in 2020, the Ministry of Health of the Republic of Indonesia implemented clinical procedures for the implementation of the early initiation of breastfeeding in the New Habit Era, which includes: counseling or health education regarding the risk of Covid-19 transmission and the benefits of the early initiation of breastfeeding and breastfeeding, implementation is carried out based on mutual agreement with parents, and implementing Covid-19 infection prevention procedures (protocols) such as using masks during the early initiation of breastfeeding, washing hands and cleaning breasts before breastfeeding. All of these procedures must be done to minimize the transmission of Covid-19 from mother to baby<sup>7</sup>.

According to the study's findings, it is known that most midwives have implemented

the early initiation of breastfeeding by complying with the Covid-19 protocol, which is as many as 28 people (66.7%), but there are still midwives whose implementation of the early initiation of breastfeeding in the new habit era is not following the Covid-19 protocol, which is as many as 14 people (33.3%). The results of the study by Sullivan & Thompson (2020) stated that to minimize the transmission of Covid-19 infection from mothers to neonates, nursing mothers should apply infection control measures, including hand washing, breast washing, and wearing masks<sup>16</sup>. Similarly, according to the findings of Jiménez et al. (2021), among the 403 respondents who commenced early breastfeeding, there was no verified mother-to-child transmission of Covid-19<sup>17</sup>. Even Fox et al. (2020) reported that the breast milk of mothers diagnosed with Covid-19 contained IgA and IgM antibodies and the neutralizing qualities of Covid-19 infection<sup>18</sup>.

The pandemic conditions since the end of 2019 have led to the incorporation of breastfeeding promotion with fairly reasonable infection control measures such as washing hands, using masks during breastfeeding, and cleaning the breasts before breastfeeding. These measures are expected to prevent transmission from mother to baby during periods of the early initiation of breastfeeding and breastfeeding. Therefore, midwives as health operative personnel should always comply with the Covid-19 infection prevention protocol measures in providing services to the community, including in the implementation of the early initiation of breastfeeding. Therefore, early breastfeeding initiation can be carried out well as one of the first steps to succeeding in exclusive breast milk, and Covid-19 transmission from mother to baby can be prevented.

### **The Relationship of Knowledge with the Conformity of The Early Initiation of Breastfeeding Implementation with the Covid-19 Protocol in the New Habit Era**

The results of the chi-square analysis obtained a p-value of 0.015, which shows a relationship between midwives' knowledge of the suitability of the early initiation of breastfeeding implementation and the Covid-19 protocol in the New Habit Era of 2022. The research of Syukaisih et al. (2018) shows a significant relationship between knowledge and the role of midwives in implementing the early

initiation of breastfeeding<sup>19</sup>. Human perceiving or awareness of items through the senses produces knowledge<sup>20</sup>. Knowledge is a critical domain in the formation of one's behavior. In this study of 29 respondents with good knowledge, most (29.3%) implemented the early initiation of breastfeeding following the covid-19 infection control protocol. It follows the research of Warner et al. (2022), which states that in line with the development of knowledge about the Covid-19 protocol, the practice has changed, and a protocol that is not too rigid can be implemented. Combining the promotion of following with Covid-19 infection prevention measures is the best alternative in the Covid-19 pandemic situation<sup>4</sup>. It follows the American Academy of Pediatrics (2021) statement that the early initiation of breastfeeding practices can continue to be implemented, and mothers must wear masks when carrying or breastfeeding their babies<sup>21</sup>.

For this reason, midwives, as health care workers, must be able to realize and follow information or knowledge that is constantly changing rapidly. By consistently following changes in knowledge, midwives can provide evidence-based information and services to mothers and families. Included in the provision of the early initiation of breastfeeding services, by following changes in knowledge, midwives can provide the best direction for mothers and families in implementing the early initiation of breastfeeding as a first step to succeeding in exclusive breastfeeding while still minimizing the risk of spreading Covid-19 from mother to baby.

Based on the above research results, there are still midwives who have poor knowledge, and their early initiation of breastfeeding implementation is not following the Covid-19 control protocol. After further study, three midwives had poor knowledge that the management of Covid-19 was not based on decisions with parents. According to Syukaisih (2018), the practice of the early initiation of breastfeeding will be achieved if there is support from recipients of health services and health service providers, namely midwives<sup>19</sup>. In a newborn clinic procedure without symptoms, Indonesia's Ministry of Health (2020) explained that a joint decision of parents implements the early initiation of breastfeeding<sup>7</sup>. It is also under the results of Salvatore et al. (2020) state that in the implementation of the early initiation of breastfeeding and breastfeeding, the risks and

benefits have been discussed with the mother, and finally, the mother makes the decision to breastfeed her baby<sup>22</sup>. This means that the early initiation of breastfeeding is carried out based on health workers' wishes and the government's procedures. For this reason, as health workers, midwives must have a lot of time to interact with maternity patients. Midwives must also realize that during the Covid-19 pandemic, there is a risk of transmission of the spread of the Covid-19 virus from mother to baby during the implementation of the early initiation of breastfeeding, so counseling is needed for mothers and families regarding the dangers and risks of transmission of Covid-19 from mother to babies about the benefits of the early initiation of breastfeeding, and the benefits of breastfeeding for mothers and babies. After the mother and family understand it, early breastfeeding initiation can be implemented if the parents agree by considering that the benefits outweigh the possible risks. The consent of the parents must be contained in the informed consent.

In the results of the study above, some midwives have poor knowledge and allow mothers to do the early initiation of breastfeeding without wearing a mask (6 respondents), do not wash their hands before the early initiation of breastfeeding (2 respondents), and do not wash their breasts before the early initiation of breastfeeding (2 respondents). Apart from knowledge and understanding of the importance of the early initiation of breastfeeding, midwives should apply the early initiation of breastfeeding every time they assist with childbirth and provide support to mothers in labor to carry out the early initiation of breastfeeding because, in general, mothers will obey what the midwife says. This is also by Dennis et al. (2012), who stated that midwife support during childbirth and breastfeeding is necessary for mothers to increase positive behavior in early breastfeeding initiation<sup>23</sup>. The Ministry of Health (2020) has stated that one of the procedures of the Covid-19 protocol in the implementation of the early initiation of breastfeeding is the use of masks by mothers during the early initiation of breastfeeding and breastfeeding, hand washing, and breast cleaning before breastfeeding<sup>7</sup>. It also follows the research of Dumitriu et al. (2021), which states that in mothers diagnosed with Covid-19, applying a mask during breastfeeding, washing their hands, and washing their breasts before

breastfeeding does not transmit the virus to their babies<sup>24</sup>. Even Dumitriu et al. (2021) specifically reported that one of the newborns was declared Covid-19 positive because the mother removed the mask while breastfeeding her baby. We know that the method of transmission of Covid-19 is droplets (can be spread through tiny droplets) from the mouth or nose when sneezing<sup>24</sup>. Therefore, in implementing the early initiation of breastfeeding, the midwives must follow the directions that the Ministry of Health has set, where mothers must use masks during breastfeeding, wash their hands, and wash (clean) their breasts before breastfeeding. Midwives must understand the importance of the Covid-19 protocol in implementing the early initiation of breastfeeding. They must be able to emphasize the importance of complying with the Covid-19 protocol in implementing the early initiation of breastfeeding and breastfeeding to mothers and families to prevent transmission of the virus from mother to baby.

Of 13 respondents with poor knowledge, 85% had a Diploma education. It is in line with Mubarak (2011), which states that seven factors affect one's knowledge, one of which is education, where the higher one's education, the easier one will receive information, and in the end, the more knowledge one will have<sup>12</sup>. Besides that, the limited information during the pandemic made some Midwives not keep abreast of health developments in an updated manner. By consistently following the story news, midwives as health practitioners will have adequate knowledge to provide health education according to updated evidence-based heads of mothers and families. They can also initiate early breastfeeding by complying with the Covid-19 infection prevention protocol.

## CONCLUSION

There is a relationship between midwives' knowledge of the suitability of the early initiation of breastfeeding implementation and the Covid-19 protocol in the New Habit Era in 2022. The existence of a pandemic has contained changes in the implementation of the early initiation of breastfeeding, where the early initiation of breastfeeding is implemented based on a joint decision of parents, and mothers must use masks during breastfeeding, wash their

hands, and wash (clean) their breasts before breastfeeding. All of them are conducted to continue to succeed in exclusive breastfeeding milk while minimizing the spread of Covid-19 from mother to baby. For this reason, midwives as health workers must always follow changes in knowledge and implement health services following the directives of Indonesia's Ministry of Health or the appropriate governance in Indonesia. This study's limitation lies in the narrowness of the research area taken, but it does not reduce the meaning of this study's results.

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Original Article

## **Healthy Food Education Affects Underweight Adolescent's Knowledge and Intakes of Energy, Macro and Micro Nutrients**

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### **ABSTRACT**

*One of the causes of underweight is an imbalance between nutritional intake and needs. The condition often occurs in teenagers and in Indonesia there are 8.1%. This study aims to investigate the impact of healthy diet education delivered by peers on the level of knowledge; energy, macro and micro nutrients intake among underweight adolescents at state Senior High School 1 in Singosari, Malang Regency. This study conducted on 33 undeweight adolescent's girls selected based on inclusion criteria. Data collection was carried out before and after the intervention. Adolescents' nutritional knowledge was collected by asking questions using Google forms and food consumption data collection was carried out by direct interviews using a 24-hour food recall form. The intervention took the form of education and guidance from peer tutors when the subjects consumed snacks and lunch at school, which was carried out 14 times, 2 times a week during 8 weeks. The effect of providing education on the level of knowledge; Energy, carbohydrate, protein, fat and zinc intake were analyzed using the paired sample t test, while vitamin C and iron intake used the Wilcoxon test (95% CI;  $\alpha = 0.05$ ). The results showed significant improvements in the level of knowledge intake of Energy, Protein, Fat, Carbohydrates as well as Iron and Zinc ( $p$ -value  $<0.05$ ), while the increase in vitamin C intake was not significantly different ( $p$ -value  $>0.05$ ). These findings demonstrated the potential of providing healthy diet education by peers to increase knowledge, energy, macro and micro nutrient intake among underweight adolescent girls.*

**Keywords:** Education, Healthy Diet, Nutrients Intake, Peer Tutor

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### **INTRODUCTION**

According to the World Health Organization, adolescence occurs between the ages of 10 and 19 years<sup>1</sup>. Several nutritional problems in adolescents arise due to an imbalance between energy and nutrient intake with adequacy recommended nutrient<sup>2</sup>.

The problems of nutritions in Indonesia generally caused by several factor among them in sufficient food availability, low levels public knowledge about nutritions, and imbalance eating patterns<sup>3</sup>. Underweight is condition caused by imbalance between food

intake and nutritional needs. According to data from the Ministry of Health in (2018) there were 8,7% teenagers aged 13-15 years and 8,1% teenagers aged 16-18 years with condition thin and very skinny. Malnutrition can increase susceptibility to diseases caused by a poor immune system, and has an impact on the risk of stunting at a young age<sup>1</sup>. If this problem continues into adulthood until marriage, there will be a risk of affecting the health of the fetus during pregnancy<sup>4</sup>. Lack of food consumption will cause disease. Adolescents' food consumption will determine the amount of nutrients they obtain for their growth and development. If this intake is insufficient or excessive, it will have an impact on their growth and development as well as their achievements Arisman M., (2010), states that one of the causes of nutritional problems is a lack of knowledge about nutrition which can later lead to mistakes in choosing food<sup>5</sup>. Nurcahyani, (2020) states that nutritional education among adolescents can change attitudes and actions toward awareness of being able to meet nutritional needs. Good knowledge will create a good attitude so that good behavior will emerge<sup>6</sup>. This is proven by Asmarudin's research, (2018) that there is an influence of providing nutrition education on the energy and nutrient intake of research subjects. Education uses the peer tutoring method which is provided in the form of a peer group, as an effort to change health behavior<sup>7</sup>. This is supported by research conducted by Nuryani, et al (2018), namely that there was a significant increase in knowledge, attitude and behavior scores after nutrition education interventions were carried out<sup>8</sup>.

This study aims to investigate the impact of healthy diet education delivered by peers on the level of knowledge; energy, macro and micro nutrients intake among underweight adolescents at state Senior High School 1 in Singosari, Malang Regency.

## **METHOD**

This type of study is quantitative with pre-experiment methods with used a pre and post test one group design. The research target was 33 female students who met the inclusion criteria (female students with a BMI and/or upper arm circumference less than normal and willing to participate in research activities from

start until finish and 16-18 years old) . The research was carried out in May-June 2023 underweight adolescents at state Senior High School 1 in Singosari, Malang Regency. Data collection on nutritional knowledge and food consumption was carried out before and after the intervention. Nutritional knowledge was collected by asking 30 questions using a Google form, while food consumption data was collected by direct interviews using a 24-hour food recall form. There are 30 questions given with a score of 3 for the correct answer and 0 for the wrong answer. The intervention carried out was in the form of education and guidance from peer tutors when the subject's consumed snacks and lunch at school which was carried out 14 times, 2 times a week for 8 weeks. The intervention provided is in the form of educational material on healthy diet for adolescents which is given for approximately 45 minutes.

Knowledge score data is categorized into insufficient (score < 56), sufficient (score 56-75) and good (score 76-100) categories. Food consumption data was analyzed using nutrisurvey to obtain Energy and nutrient intakes are then compared with requirements to obtain levels of energy consumption, macronutrients and micronutrients.

Data were analyzed using SPSS 25. Subject characteristics data were presented in the form of descriptive frequency tables and descriptive analysis was carried out. while data on knowledge levels and energy and nutritional intake were carried out. Descriptive analysis and continued with statistical analysis. The effect of education on data normally distributed using the Paired Sample T-Test (knowledge, energy intake, Carbohydrates, Protein, Fat and Zinc) while data that is not normally distributed (Vitamin C and iron) uses the Wilcoxon Test. The confidence level used is 95% or  $\alpha = 0.05$ . This research was carried out after receiving ethical approval from the Health Research Ethics Commission of the Health Polytechnic, Ministry of Health, Malang with No. Reg. 80/V/KEPK POLKESMA/2023 which was published on 24 May 2023.

## **RESULTS**

The characteristics of the research subjects include age and nutritional status. The distribution of research subjects based on

characteristics can be seen in the following table:

**Table 1. Distribution of research subjects based on characteristics**

Characteristics of research subjects	Category	n	%
Age	16 years old	33	100
	Very thin BMI, skinny and LiLA not enough	25	75.8
Nutritional Status	BMI is thin and very thin	2	6,1
	LiLA not enough	6	18,2
	Amount	33	100

Source : Primary data, 2023

Table 1 shows that all research subjects were 16 years old and the majority (75.8%) were in the BMI categories of thin, very thin and insufficient Middle Upper Arm Circumference (MUAC).

**Table 2. Distribution of Research Subjects Based on Knowledge Level Categories Before and After Healthy Diet Education**

Category	Before		After	
	n	%	n	%
Good	3	9	14	42.4
Sufficient	18	54.5	17	51.5
Insufficient	12	36.5	2	6.1
Amount	33	100	33	100

Source : Primary data, 2023

Table 2 shows that before being given education, the majority (54.5%) of research subjects had a level of knowledge in the sufficient (enough) category, and there were still 36.5% of subjects with a level of knowledge in the insufficient (not enough) category. After being given education, research subjects who were in the sufficient level of knowledge category became 51.5% and those in the good category became 42.4%. Research subjects with a low level (not enough) of knowledge category remaining 6.1%.

**Table 3. Average Knowledge Score of Research Subjects Before and After education**

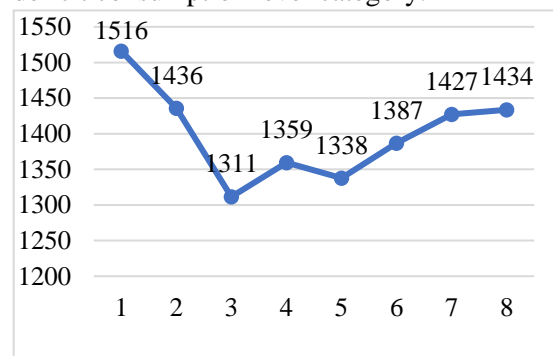
Variable	N	Mean±SD	p- value
Before	33	55.94±10.994	0.000
After		67.45±9.223	

Source : Primary data, 2023

Table 3 shows that the average knowledge score of research subjects before being given

education was 55.94, and afterwards it increased to 67.5. The increase in knowledge scores is significantly different (p-value <0.05)

Providing education, which had an impact on increasing the knowledge of research subjects, also turned out to have an influence on increasing the average energy and nutrient intake. Providing education, apart from increasing the knowledge of research subjects, also has an influence on increasing the average intake of energy and nutrients. The average energy intake of respondents while attending education can be seen in Figure 1. In this figure, respondents' intake decreased in the second, third, and fourth weeks, but on average increased. Even though it has increased several times, energy intake still does not meet the needs of adolescent girls aged 16-18 years based on the RDA 2019 and is still in the severe deficit consumption level category.



**Figure 1. Average Energy Intake of Research Subjects During Education**

**Table 4. Energy Intake of Research Subjects Before and After Providing Education**

Variable	N	Mean±SD	p-value
intake Energy Before Education (g)	33	1282.1752±3	0.005
intake Energy After Education (g)		1533.2258±3	

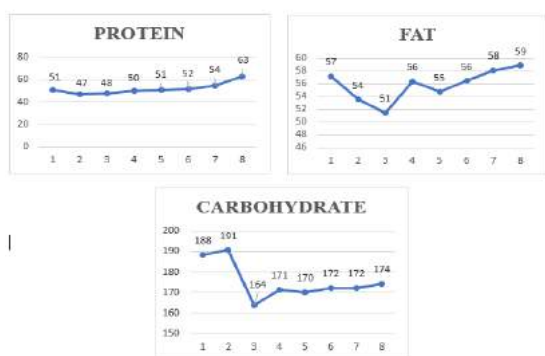
Source : Primary data, 2023

Table 4 shows the energy intake of research subjects before being given healthy diet education was 1282 kcal. After being given education, it increased by 251 kcal to 1533 kcal. This increase in energy intake is significant (p-value <0.05).

**Average Macronutrient Intake of Research Subjects (Protein, Fat and Carbohydrates) During Education.**

Figure 2 shows that the average protein intake increased during the education. While fat intake decreased in the second and third weeks,

in the fourth week protein, fat and carbohydrate intake increased by 2 grams, 5 grams and 7 grams respectively. Then in the fifth week only protein intake increased, while fat and carbohydrates decreased, although only by 1 gram. However, in the following week, Protein, Fat and Carbohydrate intake increased until the last week. Even though the research subjects' intake has increased, it is still below the nutritional requirements according to the RDA 2019 and still in the severe deficit consumption level category.



**Figure 2. Average Macronutrients Intake of Research Subjects During Education**

Research subjects' macronutrient intake before and after healthy food education is proven by the normality test and the data results are normally distributed. The results of the analysis can be seen in the table below.

**Table 5. Macronutrient Intake of Research Subjects Before and After Providing Education**

Variable	N	Mean±SD	p-Value
Intake Protein Before Education		48.3788±1	
Intake Protein After Education		57.9279±2	0.009
Intake Fat Before Education		43.08±18.9	
Intake Fat After Education	33	53.92±2.63	0.023
Intake Carbohydrate Before Education		167.5879±52.85	
Intake Carbohydrates After Education		203.35±61.3685	0.009

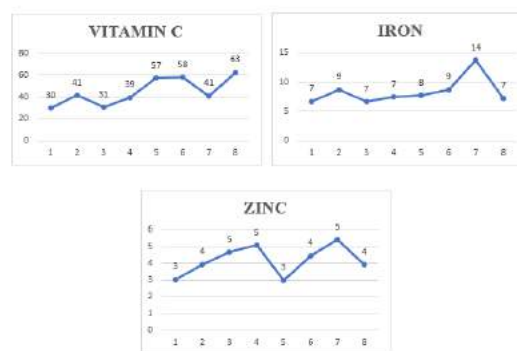
Source. Primary Data (2023)

Table 5 shows that the macronutrient intake of research subjects before and after being given education increased. Protein intake increased by 9.55 grams; Fat 10.4 grams and carbohydrates 35.77 grams. This shows that

providing education can increase macronutrient intake.

**Average Intake of Micronutrients (Vitamin C, Iron, Zinc) of Research Subjects During Education**

The average micronutrient intake of research subjects during education tends to be unstable. There are ups and downs every week. In the second week, intake increases. However, in the third week Vitamin C and Iron decreased simultaneously, while Zinc intake increased. Even though there have been several increases, the intake of vitamin C, iron and zinc is still below the 2019 AKG figure. The results of the average intake of micronutrients can be seen in Figure 3 below.



**Figure 3. Average Micronutrient Intake of Research Subjects During Education**

Research subjects' macronutrient intake before and after healthy food education is proven by the normality test and the data results are normally distributed. The results of the analysis can be seen in the Table 6.

**Table 6. Average Vitamin C and Iron Intake of Research Subjects Before and After Providing Education**

Variable	n	Means	Sum of Rank	p-value
Pre test Vit C	(-) ranks 8 <sup>a</sup>	12.59	101.50	0.21
Post test Vit C	(+) ranks 20 <sup>b</sup>	15.23	304.50	
	Ties 5 <sup>c</sup>			
	Total 33			
Pre test substance iron	(-) ranks 9 <sup>a</sup>	13.50	121.50	0.038
Post test substance iron	(+) ranks 20 <sup>b</sup>	15.68	313.50	
	Ties 4 <sup>c</sup>			
	Total 33			

Source : Primary data, 2023

Table 6. There is an increase in vitamin C and iron intake. Vitamin C intake increased from 12.59 grams to 15.23 grams. Likewise, iron intake increased from 13.50 grams to 15.68 grams. This shows that providing education can increase intake of vitamin C and iron.

**Table 7. Zinc Intake of Research Subjects Before and After Providing Education**

Variable	n	Mean±SD	p-value
Iron intake before providing education	33	3.5518±2.127	0.004
Iron intake after providing education		4.8721 ± 2.590	

Source: Primary data, 2023

The table above shows the average Zinc intake of research subjects before and after providing education. It is known that there has been an increase in zinc intake, from 3.55 grams to 4.87 grams. This shows that education can increase zinc intake.

## DISCUSSION

### The Effect of Healthy Diet Education on The Level of Knowledge among Underweight Adolescents

Providing education has been proven to increase the knowledge of research subjects (table 2). Only 6.1% of research subjects were categorized as low level of knowledge (insufficient). The average knowledge score of research subjects before being given education was 55.4, increasing to 67.5 (table 3). The increase in knowledge scores is significantly different (p-value <0.05). Education is a form of effort that can influence a person's knowledge, attitudes, and behavior as a result of learning or knowledge that has been obtained<sup>7</sup>.

The research subjects were general students who had never received nutritional information about healthy eating patterns for teenagers, and this information was delivered by peer tutors. This makes students less reluctant to express the conditions they feel and are free to ask questions. So that they can receive the explanation well. Studying together with peer tutor is competency-based learning, because students will become more active with interaction and communication. This can be

seen from the increasing participation of students with their peers. This is also in accordance with Nuryani (2018), sometimes students/adolescents find it easier to accept information provided by their peers and do not feel reluctant to ask questions<sup>8</sup>. The increase in knowledge after being given education is in line with research by Asmarudin (2018)<sup>7</sup> which states that there is an influence of education on the level of knowledge of research subjects<sup>7</sup>. The results of the research that has been carried out prove that healthy diet education can significantly increase (p-value <0.005) the knowledge of underweight female students.

### The Effect of Healthy Diet Education on The Level of Energy Consumption Among Underweight Adolescents

The results showed that the average weekly energy intake of research subjects continued to increase. Even though there appears to be an increase, the consumption level of research subjects is still below the 2019 adequate (RDA). Based on the 2019 RDA, teenage girls aged 16-18 years need 2100 kcal of energy. An increase occurred in the research subjects' energy intake (figure 1), although the research subjects' energy intake still did not meet the recommended adequacy figures. Research subjects rarely consumed high-energy foods such as staple foods. This data was obtained from the results of a 24-hour food recall carried out. This shows that the research subjects still have not implemented the balanced nutrition message conveyed during education so they have not been able to change their eating behavior. Education still needs to be carried out so that the subject's energy sufficiency can be achieved. Even though they understood the education that had been provided, the students still could not accept the change in their eating patterns, especially in the third week there was a drastic decrease because the average frequency of eating for research subjects was 2 times a day. as well as the lack of food variety in research subjects, such as rarely consuming snacks, vegetables and fruit. Female students admit that they rarely eat breakfast because they are afraid of being late for school. Anna (2012) said that someone with a high level of knowledge may not necessarily be able to eat breakfast every day<sup>10</sup>.

Another factor is that they lose motivation to change their eating behavior. This

assumption was proven in the following weeks, there was an increase in energy intake after being given education and motivation again by the peer tutor on duty. Rotua (2017) states that health education provides a person's motivation to receive information in order to understand better<sup>11</sup>.

The results of research that have been conducted prove that healthy food education can significantly increase the energy intake of underweight female students (*p-value* <0.05). The increase in energy intake after being given education is in line with research by Asmarudin (2018) which states that there is an influence of education on the energy intake of research subjects<sup>7</sup>.

### **The Effect of Healthy Diet Education on The Level of Macronutrients Consumption Among Underweight Adolescents**

The average intake of macronutrients during education tends to increase, although it still has not reached the recommended adequacy figure according to the RDA 2019 (figure 2). The results of the 24-hour food recall showed that the research subjects consumed less varied foods and lacked motivation in weeks 2 and 3, and it appeared that their intake of Fat and Carbohydrates decreased. The research subjects admitted to skipping breakfast several times for the same reason, namely because they were afraid of being late for school and this often happens to students<sup>10</sup>.

Adolescent who needs high concentration in their studies and for good physical growth really need adequate protein intake. Angramseani (2018) stated that one of the causes of skinny teenagers is that they rarely consume foods that contain high protein such as meat, fish and nuts, thus resulting in less protein intake in the body<sup>12</sup>. According to Supriasa (2016), protein intake is recommended from food sources of protein with high biological value<sup>13</sup>. If protein intake does not meet needs, it will result in weight loss, delayed sexual maturity, and decreased accumulation of lean body mass<sup>14</sup>. The results of statistical analysis (table 5) show that there was an increase in the average intake of Protein, Fat and Carbohydrates in research subjects after being given education. This is the same as Asmarudin's research (2018) which states that there is an influence of education on the protein intake of research subjects<sup>7</sup>. Adequate intake of

Protein, Carbohydrates and Fat during adolescence is very necessary, to avoid the emergence of several problems in adolescents. This is supported by Sirajuddin, (2012) who said that lack of fat consumption can also have an impact on health such as physical disorders, increased risk of chronic disease, physiological dysfunction<sup>15</sup>. Intake of these macronutrients increased significantly (*p-value* <0.05), which means providing education about healthy diet for underweight adolescents can increase protein, fat and carbohydrate intake.

### **The Effect of Healthy Food Education on The Level of Micronutrients Consumption Among Underweight Adolescents.**

Based on the research results, there was an increase in intake of vitamin C and iron. Vitamin C intake increased from 12.59 grams to 15.23 grams. Likewise, iron intake increased from 13.50 grams to 15.68 grams. This shows that providing education can increase intake of vitamin C and iron. It can be seen that the average intake of Vitamin C from the first week to the last week has increased and decreased, and no one has met the requirements according to the RDA 2019, that is 75 mg. It is known from the results of 24-hour food records that the research subjects rarely consumed vegetables and fruit so they were unable to increase their Vitamin C intake according to the RDA 2019. Vitamin C and iron intake is very important for young women, these two nutrients are always related, if at all. With vitamin C, the absorption of iron in non-heme form increases fourfold. The role of Vitamin C is to move iron from transferrin in plasma to liver ferritin. Therefore, iron which plays a role in the formation of hemoglobin also requires the role of Vitamin C, so that young women will avoid anemia<sup>16</sup>.

Likewise for iron, the results of the study showed that the average iron intake of the research subjects had increased and decreased. Even though there has been a significant increase, it is still below the recommended nutritional adequacy rate (RDA 2019). This is because research subjects rarely consume vegetable food, so it can be concluded that research subjects do not apply the knowledge gained from previous education. Another factor that might occur is that the research subjects did not convey the nutritional knowledge they had acquired to their parents so that it could not be applied at home. This is in line with research by



Fitriyani and Sefrina (2022) which states that nutrition education is considered less effective in changing fruit and vegetable consumption behavior in children and adolescents<sup>17</sup>. Regarding zinc intake, the research results showed that the average zinc intake of study subjects increased and decreased over time. This shows that the research subjects were not ready to change their eating habits, so the research subjects' zinc consumption did not meet or was below the 2019 RDA, that is 9 mg. The best sources of zinc are animal protein sources, especially meat, liver, shellfish and eggs. Cereals and legumes are also good but have low biological value<sup>18</sup>. Meanwhile, zinc intake is also needed by adolescents as they grow. This is supported by Ilmi (2021) which shows that zinc levels in thin female students are lower but the values are relatively the same as female students with normal nutritional status. Even so, this could be an early indicator that underweight research subjects experience growth disorders<sup>19</sup>.

The results of the p-value analysis for iron and zinc were <0.05, which means that there was a significant effect of healthy food education on iron and zinc, while increasing Vitamin C intake had no significant effect (p-value > 0.05). This research is in line with research conducted by Nento (2022), namely that nutrition education via WhatsApp media cannot increase intake of iron, protein and Vitamin C<sup>20</sup>.

## CONCLUSION

The research conclusion proves that providing healthy diet education to underweight adolescent girls can significantly increase knowledge, energy intake and macronutrients (protein, fat and carbohydrates) and micronutrients (iron and zinc) in underweight adolescent girls at state Senior High School 1 Singosari. However, there was an increase in Vitamin C but there was no significant effect.

Healthy food education using peer tutors can be used as an alternative to increase knowledge and consumption in adolescents with underweight.

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Original Article

***Differences in Prostaglandin  $f2\alpha$  Level in Adolescent Girls Experienced and Not Experienced Premenstrual Syndrome: A Cross-Sectional Study***

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**ABSTRACT**

*This study aims to determine the differences in Prostaglandin  $f2\alpha$  concentration in female adolescents who experienced and did not experience Pre-Menstrual Syndrome (PMS). Cross-sectional study conducted at a single institution. The sample for this study was female adolescents at the Darul Arqam Islamic Boarding School in Makassar, consisting of 50 adolescents who experienced PMS and those who did not experience PMS in a ratio of 1:1. Prostaglandin  $f2\alpha$  levels were measured using an ELISA kit. The sample used was 5 cc blood from the median cubital vein by laboratory staff 5 days before menstruation. Data were analyzed descriptively and statistically. The results showed that the average Prostaglandin  $f2\alpha$  in the group that experienced PMS (379.07) was higher compared to the group that did not experience PMS (101.23) with a p-value < 0.05, significantly. Furthermore, the group that experienced mild PMS had an average Prostaglandin  $f2\alpha$  value of 283.32, while the group that experienced severe PMS had an average Prostaglandin  $f2\alpha$  value of 454.31. The average Prostaglandin  $f2\alpha$  level in the group who did not experience PMS, mild PMS, and severe PMS had a p-value < 0.05. This study concludes that there is a significant difference in the Prostaglandin  $f2\alpha$  Level in adolescents who experience PMS and those who do not experience it and there are differences based on the severity of PMS.*

**Keywords:** Premenstrual Syndrome (PMS), Prostaglandin  $f2\alpha$ , Female Adolescents.

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**INTRODUCTION**

Premenstrual syndrome (PMS) is a group of symptoms that usually appear one to three days before the start of the menstrual cycle, disappear once the menstrual cycle begins, or persist until the menstrual cycle is finished<sup>1</sup>. Based on the WHO (World Health Organization) report, PMS has a higher prevalence in Asian countries compared to Western countries<sup>2</sup>. Research shows that around 90% of women of childbearing age are affected by mild to acute premenstrual symptoms. Among them, about 20% to 40%

experience PMS<sup>1</sup>. The prevalence of premenstrual syndrome in Ethiopia was found to be 53%<sup>3</sup>. In Palestine, of the 398 participants (100%) suffered from some kind of PMS symptoms, 398 (100%) had physical symptoms, 397 (99.7%) had psychological symptoms, and 339 (85.2%) had behavioral PMS symptoms<sup>4</sup>. In Indonesia, Four hundred and sixty women aged between 20 and 49 years with regular menstrual cycles, as many as 95% of these women were found to have at least premenstrual symptoms. Severe to moderate premenstrual symptoms and premenstrual dysphoric disorder were suffered by 5% of women and mostly

affected 20-29 year old women <sup>5</sup>.

Premenstrual syndrome can cause depression which can lead to suicidal feelings, even the desire to commit violence against oneself or others <sup>6</sup>. Apart from that, other illnesses that are often experienced are feelings of anger, anxiety, and sadness <sup>7</sup>. This is in line with research by Surbhi and team which explains that more than half (53.8%) of female participants said that PMS made it difficult for them to focus, work well, create results, and engage in social activities <sup>8</sup>. As age increases, there is a statistically significant increase in the likelihood of forgetfulness, low libido, sleep problems, gastrointestinal symptoms, weight gain, headaches, sweating or hot flashes, fatigue, hair changes, rashes, and swelling <sup>9</sup>. PMS is also associated with the risk of postpartum depression <sup>10</sup>.

According to a study, prostaglandin hormone levels may have an impact on premenstrual symptoms <sup>11</sup>. Prostaglandins are hormone-like substances that mediate several physiological reactions, including inflammation, muscle contraction, blood vessel dilation, and platelet aggregation <sup>12</sup>. Ni Made et al (2021) researched endometrial preparations in women suffering from menstrual pain who were not undergoing treatment. On the first day of menstruation, PGF2 levels were four times higher than women who did not experience menstrual pain <sup>13</sup>.

Understanding the differences in Prostaglandin f2 $\alpha$  levels can help manage premenstrual syndrome, especially in mild, moderate, or severe cases. Based on previous research, not many studies have discussed the differences in prostaglandin f2 $\alpha$  levels in adolescent girls who experience and do not experience premenstrual syndrome and the differences regarding the severity. Therefore, this study aims to determine the differences in Prostaglandin f2 $\alpha$  concentration in female adolescents who experienced and did not experience premenstrual syndrome.

## METHOD

This research was conducted at the Darul Arqam Makassar Islamic Boarding School from March to May 2017 after obtaining the Ethical approval recommendation issued by the Postgraduate Faculty of Hasanuddin University Makassar number: 255/H4.8.4.5.31/

PP36-KOMETIK/ 2017. Before conducting the research, respondents were given information about the research being conducted and then signed informed consent. Researchers keep research data confidential by not using respondents' identities in reporting data.

This study used a cross-sectional study. The population in this study were all female students at the Darul Arqam Makassar Islamic Boarding School. The population in this study was all 50 young women who were studying at school. The sample used in this research was all students, 25 people who experienced PMS and 25 people who did not experience PMS.

The inclusion criteria for this study were middle-class students aged 15 to 17 years, who have had regular menstrual cycles (28 to 32-day cycle) for the previous three months, and who were willing to refrain from using drugs, including pharmacological treatments like anti-pain medications and non-pharmacological treatments like herbs and other herbal medicines throughout the study, and who were willing to be respondents. While the exclusion criteria were female students who suffered from gynecological diseases, such as polimenerhoea, vaginitis, oligomenorhea, hypomenorrhoea, leukorrhoea, endometritis, dysmenorrhoea, pelvic inflammation, uterine cysts, and who experienced mental disorders. Exclusion criteria are proven by examination results from hospitals or health facilities.

The instrument used in this research is a diary sheet (LCH), namely a data collection questionnaire that contains the identity and symptoms or complaints of premenstrual syndrome. The unit of analysis is prostaglandin F2 levels. Prostaglandin Enzyme Linked Immuno Sorbent Assay (ELISA) kit was used for prostaglandin analysis. The unit of prostaglandin examination results is pg/ml. The sample used was a 5 cc blood sample from the median cubital vein by laboratory staff 5 days before menstruation.

The collected data was then processed using a computer and the Excel and SPSS version 21 programs. The data was analyzed descriptively and statistically. The t-test was used to analyze differences in prostaglandin levels in adolescents suffering from PMS and those not suffering from PMS. If the data is not normally distributed, the data is analyzed using the Mann-Whitney Test. The difference is concluded to be significant if the p-value <0.05.

## RESULTS

A summary of the respondent's data was provided in the study's results. Based on Table 1, respondents who experienced PMS and did not experience PMS were dominated by the 17-year age group and the lowest were in the 15-year age group. More than half of the total respondents had menarche at the age of 11 years in the PMS group. Among respondents who did not experience PMS, more than half of the total respondents had menarche at the age of 13 years. Based on body mass index, more than half of the total respondents experiencing PMS were overweight and 1 person (4%) had an obesity. There were no respondents who were obese in the group of respondents who did not experience PMS.

The length of the menstrual cycle varies. Almost half of the total respondents who experience PMS have a menstrual cycle of 28 days. 2 people experienced a 31-day menstrual cycle. Nearly half of the total respondents who do not experience PMS have a menstrual cycle of 29 days. 2 people also experience a 31-day menstrual cycle. In the group of respondents who experienced PMS, more than half of the total respondents had menstrual periods of 3-7 days. In the group of respondents who did not experience PMS, more than half of the respondents had menstrual periods of 3-7 days. Almost all of the total respondents who experienced PMS had menstrual blood from 3-5 pads, as did the group who did not experience PMS. The results of the respondent characteristics are in Table 1.

**Table 1. Distribution of Respondents**

Respondents Characteristics	Group				Total	
	PMS		Non-PMS		n	%
	n	%	n	%		
<b>Age</b>						
15 years old	1	4.0	1	4.0	2	4.0
16 years old	5	20.0	1	4.0	6	12.0
17 years old	19	76.0	23	92.0	42	84.0
<b>Menarche Age</b>						
12 years old	2	8.0	2	8.0	4	8.0
13 years old	15	60.0	14	56.0	29	58.0
14 years old	3	12.0	7	28.0	10	20.0
15 years old	5	20.0	2	8.0	7	14.0
<b>IMT</b>						
Thin	1	4.0	1	4.0	2	4.0
Normal	9	36.0	14	56.0	23	46.0
Overweight	14	56.0	10	40.0	24	48.0
Obesity	1	4.0	0	0	1	2.0
<b>Menstrual cycle length</b>						
28 days	8	32.0	4	16.0	12	24.0
29 days	5	20.0	7	28.0	12	24.0
30 days	5	20.0	6	24.0	11	22.0
31 days	2	8.0	2	8.0	4	8.0
32 days	5	20.0	6	24.0	11	22.0
<b>Menstruation duration</b>						
3 – 7 days	14	56.0	10	40.0	24	48.0
> 7 days	11	44.0	15	60.0	26	52.0
<b>Menstrual blood pads</b>						
<3 x / days	0	0	0	0	0	0
3-5 x / days	23	92.0	23	92.0	46	92.0
> 5 x / days	2	8.0	2	8.0	4	8.0
<b>Total</b>	<b>25</b>	<b>100.0</b>	<b>25</b>	<b>100.0</b>	<b>50</b>	<b>100.0</b>

Table 2, the complaints experienced by respondents varied. More than half of the respondents experienced waist pain, wasting

time, and difficulty concentrating. The most common complaint is difficulty concentrating.

**Table 2. Distribution of Respondents Based on PMS Symptoms**

Symptoms	No		Yes		Total	
	n	%	n	%	n	%
Headache	22	88.0	3	12.0	25	100.0
Pimple	15	60.0	10	40.0	25	100.0
Painful or Swollen Breasts	14	56.0	11	44.0	25	100.0
Waist Pain	11	44.0	14	56.0	25	100.0
Bloated	23	92.0	2	8.0	25	100.0
Joint and Muscle Pain	21	84.0	4	16.0	25	100.0
Eat a lot	24	96.0	1	4.0	25	100.0
Weight Gain	24	96.0	1	4.0	25	100.0
Increased appetite	20	80.0	5	20.0	25	100.0
Decreased appetite	25	100.0	0	0.0	25	100.0
Feeling useless	23	92.0	2	8.0	25	100.0
Sad and Desperate	22	88.0	3	12.0	25	100.0
Anxious and Tense	19	76.0	6	24.0	25	100.0
Feeling Restless	21	84.0	4	16.0	25	100.0
Sad and Crying	18	72.0	7	28.0	25	100.0
Easily offended	11	44.0	14	56.0	25	100.0
Lots of Anger and Annoyance	14	56.0	11	44.0	25	100.0
Lazy	13	52.0	12	48.0	25	100.0
Difficult to Concentrate	8	32.0	17	68.0	25	100.0
Easily Tired	16	64.0	9	36.0	25	100.0
Sleep a lot	23	92.0	2	8.0	25	100.0
Feels like Shouting	24	96.0	1	4.0	25	100.0
Want to Slam Things around	22	88.0	3	12.0	25	100.0

Table 3, the average Prostaglandin f2 $\alpha$  in the group that experienced PMS (379.07) was higher compared to the group that did not experience PMS (101.23) with p-value < 0.05.

This means that there was a significant difference in the increase in Pgf2 $\alpha$  for respondents who experienced PMS and those who did not experience PMS.

**Table 3. Analysis of Differences in Average Levels of Prostaglandin F2 $\alpha$  Hormone**

Adolescents Group	Prostaglandin F2 $\alpha$ Hormone Concentration		p-value (uji t)
	Mean	Std.Deviation	
PMS	379.07	138.73	0,000
Non-PMS	101.23	17,84	

Table 4 shows the group that experienced mild PMS had an average Prostaglandin f2 $\alpha$  value of 283.32, while the group that experienced severe PMS had an

average Prostaglandin f2 $\alpha$  value of 454.31. The average Prostaglandin f2 $\alpha$  level in the group who did not experience PMS, mild PMS, and severe PMS had a p-value < 0.05.

**Table 4. Analysis of Differences in Average Levels of Prostaglandin F2 $\alpha$  Hormone**

Adolescents Group	Prostaglandin F2 $\alpha$ Hormone Concentration		p-value (uji t)
	Mean	Std.Deviation	
Non-PMS	101.23	17.84	0,00
Mild PMS	283.32	106.52	
Severe PMS	454.31	113.78	

## DISCUSSION

This research emphasizes that there is a significant difference in the Prostaglandin f2 $\alpha$  Level in adolescents who experience PMS and those who do not experience it and there are differences based on the severity of PMS. According to a study, different prostaglandin levels in the female reproductive system have an impact on the endometrial sloughing and regression of the corpus luteum. LH's ovulation-related effects are similarly impacted by prostaglandins<sup>14</sup>. It was discovered that there was an association between complaints of menstrual pain and the uterine smooth muscle contraction-stimulating properties of menstrual blood, as well as the generation of prostaglandins. PGF2 and PGE2 are present in these substances, and females who have primary menstrual pain have greater PGF2/PGE2 ratios in their endometrium and menstrual blood<sup>15</sup>.

The definition of severe PMS varies among RCTs, but in recent studies, standardized criteria have been used to diagnose one variant of severe PMS-premenstrual dysphoric disorder (PMDD). The criteria are based on at least five symptoms, including one of four core psychological symptoms (from a list of 17 physical and psychological symptoms) and being severe before menstruation starts and mild or absent after menstruation. The 17 symptoms are depression, feeling hopeless or guilty, anxiety/tension, mood swings, irritability/persistent anger, decreased interest, poor concentration, fatigue, food craving or increased appetite, sleep disturbance, feeling out of control or overwhelmed, poor coordination, headache, aches, swelling/bloating/weight gain, cramps, and breast tenderness<sup>16</sup>.

Due to the misconception that premenstrual discomfort is normal and would go away on its own, premenstrual syndrome is a symptom that affects adolescents whose management is still insufficient. Even though PMS does not cause death, PMS is a disorder that, if not handled properly, can disrupt learning, achievement, productivity, and social relationships.

The results of this study illustrate that the respondent dominated with adolescents aged 17 years. This indicates that the age of 17 years is a childbearing age that is prone to PMS. It will affect their reproductive health in

obtaining offspring in the future. Senja et al (2021) estimated that the prevalence of PMS was 20-40% of all females of reproductive age. The demographic range was between 14-51 years<sup>17</sup>. Wahyu et al. (2021) stated that the age of adolescents who experience PMS in Indonesia was between 25-35 years, with a tendency to increase the incidence in older age groups<sup>18</sup>. Herwandha & Prastuti, (2020) stated that in adulthood emotional development has been mature<sup>19</sup>. Emotional development will greatly influence a person's responses and actions towards health status<sup>19</sup>. Several adolescents claim to have PMS symptoms early, and research shows that some adolescents have PMS symptoms that are just as severe as those reported by older women.

Based on the results of research on menarche age characteristics, the average number of respondents who experienced PMS was 11 years old. Menarche is a period of hormonal and physical development that is mature enough to start the menstrual cycle. In studies of growth and development, the age at menarche, or the age at which young females experience their first menstrual period, is a measurement used to gauge the rate of reproductive maturity in individuals. Currently, female adolescents get menstruation faster, namely menarche at the age of 10-12 years<sup>20</sup>. This is in line with research which showed that PMS was more common in the group of female students with menarche age <12 years (rapid), namely 47.17% compared to those with menarche age  $\geq$ 12 years, namely 19.82%<sup>21</sup>.

According to the findings of the study on BMI characteristics, more than half of the respondents who had PMS had an excessive BMI. This supports the theory that PMS is caused by an imbalance in the hormones estrogen and progesterone, which is caused by obesity because PMS is also caused by excess fat<sup>22</sup>. According to research, obese female adolescents at Islamic Senior High School 1 East Lampung Metro experienced PMS at a rate of 55.6% as opposed to female adolescents who were not obese and experienced PMS, who had a rate of 27.4%<sup>23</sup>. The results of this study were in line with the results of research on Midwifery Academy Students in the Kudus Regency Government, which showed that there was a significant relationship between obesity in young females and PMS<sup>24</sup>.

The results of the study were obtained, difficulty concentrating is the main problem.

This was in line with the theory that the common symptoms found in PMS, such as cognitive impairment, can be concentration imbalances and confusion. Mastalgia (breast discomfort), bloating, migraines, exhaustion, and sleeplessness are examples of somatic illnesses. Social behavior disorders include carbohydrate abuse<sup>25</sup>.

## CONCLUSION

There was an increase in prostaglandin  $f2\alpha$  levels in adolescent girls who experienced PMS. Apart from that, there are significant differences in prostaglandin  $f2\alpha$  levels in adolescents who experience PMS and those who do not experience PMS and there are differences based on the severity of PMS. It is important to understand premenstrual syndrome

in female adolescents, especially the impact of the Prostaglandin  $f2\alpha$  hormone so that they can manage and understand their condition to avoid depression or psychological disorders. Health workers, especially midwives at the community health center level, as midwives in the community, are expected to be able to provide education regarding premenstrual syndrome in adolescents.

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## CONFLICTS OF INTEREST

There is no conflict of interest.

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Original Article

***The Role of Stress and Job Satisfaction Among Frontline Nurses in the National Health Insurance Era: The Mediating Role of Self-Efficacy***

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**ABSTRACT**

*The study aimed to analyze the effect of role stress (role ambiguity and role conflict) on the self-efficacy and job satisfaction of nurses implementing the National Health Insurance (JKN) era at Panembahan Senopati Hospital, Bantul. The research design used was an analytic survey design using a cross-sectional study approach. The population of this study was all nurses at the Panembahan Senopati Hospital, Bantul, with a sample size of 105 executive nurses. Data analysis used Spearman correlation analysis to see the effect of the independent variables on the dependent variable with a significance limit ( $\alpha$ ) of 5%. The results indicated no effect of role ambiguity on nurses' self-efficacy in the JKN era at Panembahan Senopati Hospital, Bantul ( $p=0.236$ ). Further, there was an effect of role conflict on the self-efficacy of nurses in the JKN era at Panembahan Senopati Hospital, Bantul ( $p=0.000$ ). There is an effect of self-efficacy on the job satisfaction of nurses in the JKN era at Panembahan Senopati Hospital, Bantul ( $p=0.000$ ). It can be concluded that there is a complex relationship between role ambiguity, role conflict, self-efficacy, and nurse job satisfaction. Although not all relationships have a significant effect, this study provides an initial understanding of the factors that influence the self-efficacy and job satisfaction of nurses at Panembahan Senopati Hospital, Bantul, in the JKN era.*

**Keywords:** Role Ambiguity, Role Conflict, Self Efficacy, Job Satisfaction, Nurse, National Health Insurance.

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**INTRODUCTION**

In the hospital environment, nurses play a central role in providing quality health services to patients <sup>1</sup>. The implementation of the National Health Insurance (JKN) which was implemented in January 2014 had a change impact felt by nurses due to the limited information provided, both to the public and health service providers including nurses <sup>2</sup>, so that in this JKN area, the demands on nurses are increasingly complex and varied <sup>3</sup>, which places them in situations that require high adaptation skills <sup>4</sup>.

In order to deal with these demands and challenges, the psychological and motivational

factors of nurses play a very important role <sup>5</sup>. One aspect that is the focus of attention is self-efficacy, namely the individual's belief in their ability to carry out certain tasks. High self-efficacy is believed to encourage individuals to play an active role, be confident, and perform better. The level of self-efficacy can determine how much the nurse believes in her abilities so that this belief will determine the quality of performance <sup>6</sup>. On the other hand, nurses can also experience role conflict and ambiguity, namely situations where different demands or expectations collide, or the tasks assigned are unclear. This role conflict and role ambiguity can have a negative impact on the self-efficacy and quality of nurse work <sup>7</sup>. Therefore, an in-

depth understanding of how role conflict and role ambiguity interact with self-efficacy and their impact on job satisfaction is very important.

Dealing with the results of interviews with nurses at Panembahan Senopati Bantul Hospital, information was obtained "Our workload tends to be higher since the implementation of JKN because apart from having to carry out our duties and functions as nurses, we are required to provide socialization to patients and their families regarding BPJS provisions or policies. On the other hand, nurses also have to face more complaints directed at us if the services provided are not covered by BPJS" (MR, S). As explained in this information, it is known that nurses feel that there is a lack of clarity about their role since the JKN era. Nurses are required to do work outside their duties and functions while this work can cause role conflict.

The aim of the study was to analyze the effect of role stress (role ambiguity and role conflict) on the self-efficacy and job satisfaction of nurses implementing the JKN era at Panembahan Senopati Hospital, Bantul.

## METHOD

The research design was an analytic survey design, using a cross sectional study approach. This research used a Quantitative Research with a correlation study (connecting two or more variables in a group), namely analyzing the effect of role stress on self-efficacy and the effect of self-efficacy on nurse job satisfaction and a comparative study with (comparing two or more groups on certain variables) , namely by comparing the variable role stress (role ambiguity, role conflict), self-efficacy and job satisfaction variables in the hospital.

The population of this study were all nurses at the Panembahan Senopati Hospital, Bantul. Sampling in this study using simple random sampling technique, namely simple random sampling. This technique consists of two ways, namely by drawing (lottery technique) and using a table of numbers or random numbers (random number). The technique used in this study is a lottery technique. The sample size for the Panembahan Senopati Hospital, Bantul, was 105 Executive Nurses.

Role ambiguity and role conflict variables are measured using instruments developed by Rizzo et al., (1970) <sup>8</sup>. The self-efficacy variable uses a modified instrument from Riggs et al., (1994)<sup>9</sup>. For job satisfaction variables using instruments by developing indicators from Irani et al., (2002)<sup>10</sup>. Statement from the role ambiguity and role conflict instruments from Rizzo et al., (1970) <sup>8</sup> and self-efficacy from Riggs et al., (1994)<sup>9</sup>. contains two stimulus characteristics, namely favorable and unfavorable. Favorable characteristics are in accordance with behavioral indicators or those that indicate the height of the attribute being measured, which is normatively considered good, desirable, or preferred. Positive responses to favorable and unfavorable stimuli are given different weights. Positive responses to favorable stimuli on the role ambiguity, role conflict and self-efficacy instruments are given high weight, and vice versa. The variable assessment criteria is based on a Likert scale with the following answer choices: 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree.

The data obtained were to be analyzed using SPSS. Data analysis used Spearman correlation analysis to see the effect of the independent variables on the dependent variable with a significance limit ( $\alpha$ ) used was 5%.

## RESULTS

**Table 1. Distribution of Respondent Characteristics at Panembahan Senopati Hospital, Bantul**

Characteristics	n	%
Gender		
Male	29	27.6
Female	76	72.4
Age Group		
Teenager (17-25)	14	13.3
Adult (26-45)	91	86.7
Education		
SPK	5	4.8
D3 in Nursing	54	51.4
S1 in Nursing	16	15.2
Nurse	30	28.6
Year of Service		
< 1 year	2	1.9
≥ 1 year	25	23.8
≥ 5 years	78	74.3

Table 1 shows that 27.6% of the respondents were male and 72.4% female, then

the age group of the respondents was mostly in the adult category, respectively 86.7% and 59.8%. The education level of the respondents is D3 nursing by 51.4%. The distribution of the frequency of respondents based on years of service, most of the respondents at Panembahan Senopati Hospital, Bantul, had a working period of  $\geq 5$  years, namely 74.3%.

Based on table 2 it is known that the results of statistical tests at the Panembahan Senopati Bantul Hospital showed a significant value of 0.236 ( $P > 0.05$ , which means that there was no effect of role ambiguity on the self-efficacy of nurses in the JKN era at Panembahan Senopati Hospital, Bantul in 2020. The test results for the effect of role conflict on self efficacy, it was concluded that there was an effect of role conflict on the self-efficacy of nurses in the JKN era, both at Panembahan Senopati Hospital, Bantul ( $p=0.000$ ) with an r value of -0.383 which indicates that both variables have a negative influence, which means the higher the respondent's role conflict then self-efficacy is getting lower, and vice versa. Then, there is an effect of self-efficacy on job satisfaction of nurses in the JKN era at Panembahan Senopati Hospital, Bantul in 2020 with a p value = 0.000 and an r value of 0.409 indicating that both variables have a positive effect, which means the higher self-efficacy respondents, job satisfaction is also higher, and vice versa.

**Table 2. Hypothesis Testing**

Hypothesis	Sig.	r Value	Description
Role ambiguity $\rightarrow$ self-efficacy of Nurse	.236	.117	The research hypothesis is rejected
Role conflict $\rightarrow$ self-efficacy of Nurse	.000	.383	The research hypothesis is accepted
Self efficacy $\rightarrow$ work satisfaction of Nurse	.000	.409	The research hypothesis is accepted

## DISCUSSION

### Role Ambiguity with Nurse Self-Efficacy

Role ambiguity is a condition in which the duties, responsibilities and expectations of an individual are unclear or ambiguous. Self-efficacy refers to an individual's belief in his ability to perform certain tasks. In the context of nurses at Panembahan Senopati Hospital, Bantul, statistical test results show that there is

no significant effect between role ambiguity and nurse self-efficacy in the JKN era. This can be interpreted that the level of role ambiguity experienced by nurses does not significantly affect their level of self-efficacy in carrying out their duties. Under these conditions, nurses may be able to overcome ambiguity while still maintaining their confidence in doing their jobs.

According to Kadir et al. (2017), it was found that there was an effect of role conflict and role ambiguity on job satisfaction, self-efficacy, and adaptability of nurses<sup>11</sup>. This study also identified differences in the level of role ambiguity in the inpatient unit, critical room, and emergency room. Then, referring to the results of research conducted by Dasgupta in 2012 showing that in order to promote better patient care, health care managers can try to reduce stressors such as role burden, role conflict, and role ambiguity, while also increasing the level of self-efficacy of nurses.<sup>12</sup> The quality of service in hospitals can be improved through evaluating the behavior of nurses towards the quality of service felt by patients. In addition, this study shows that increased discipline and commitment between doctors and nurses is needed to improve the quality of service in hospitals.

Originally, this research provides important value because nursing management in hospitals can use the results of this study as a basis for translating patient needs into specific plans to produce products and services that are in line with patient needs and the expected quality of service<sup>11</sup>.

### Role Conflict with Nurse Self-Efficacy

Role conflict is a situation in which individuals face conflicting demands or expectations from the various roles they have. Self-efficacy, as previously explained, is an individual's belief in his abilities. In the context of nurses at Panembahan Senopati Hospital, Bantul, the results of statistical tests show that there is a significant influence between role conflict and nurse self-efficacy in the JKN era. Based on hospital empirical, the condition of Panembahan Senopati Bantul General Hospital as a government hospital has a larger number of human resources including nurses so as to minimize the occurrence of role conflicts.

Role conflict has a negative effect on nurse self-efficacy. That is, the higher the level of role conflict experienced by nurses, the lower their confidence in carrying out their duties. If

there is a conflict between the demands or expectations of the various roles nurses have, this can undermine their confidence in their ability to carry out these tasks.

Research by Handiyani H, Kusumawati AS, Karmila R, Wagiono A, Silowati T, Lusiyana A, et al (2019) shows that the average nurse, both young and older, has positive feelings about their ability to complete tasks and can find a solution to solve the problem. Nurse self-efficacy is formed through a lifelong social learning process so that nurses can have a variety of experiences, both success and failure experiences. Self-efficacy depends on how individuals deal with the successes and failures they experience while working. The experience of success will increase self-efficacy, otherwise failure will reduce self-efficacy, but if the experience of failure is always faced by individuals by constantly trying to improve performance, self-efficacy will also increase<sup>13</sup>.

Research by Djony Harijanto (2013) suggests that role conflict in the management of human resources and workforce in an organization has several factors related to both internal and external factors. Internal factors include nurse performance conditions, organizational conditions, and managerial systems used by superiors or supervisors in the organization. External factors involve evaluations from other parties on the performance of nurses and recognition/awards from organizations based on the assessment of the surrounding community. These two factors are important things that are useful for expressing the condition of role conflict in an organization<sup>14</sup>.

### **Self-Efficacy with Nurse Job Satisfaction**

Self-efficacy, as a belief in individual abilities, can affect the level of job satisfaction. In the context of nurses at Panembahan Senopati Hospital, Bantul, statistical test results show that there is a significant effect between self-efficacy and job satisfaction of nurses in the JKN era. There are several factors that can affect job satisfaction put forward by experts, but researchers use a theory consisting of aspects of pay (salary), promotion (promotion), co-workers (co-workers), work it self (the job itself) and supervision (supervise)<sup>15</sup>.

The low level of patient satisfaction indicates the low quality of health services<sup>16</sup>. This certainly indicates that since the implementation of the JKN system the number

of patients has increased while the quality of service has decreased. The quality of health services in hospitals can be influenced by service provider factors, including provider satisfaction<sup>17</sup>. One important source of customer satisfaction is employee job satisfaction and an important component of patient satisfaction is job satisfaction of a nurse<sup>18</sup>. The level of nurse self-efficacy has a positive influence on the level of job satisfaction of nurses. The higher the self-confidence of nurses in carrying out their duties, the higher the level of job satisfaction they feel. This means that nurses who have high confidence in their abilities tend to be more satisfied with their jobs and feel able to overcome the challenges they face.

Research by Matthew Reid in 2013 shows that the correlation between job satisfaction and self-efficacy is proven to be statistically significant and clearly affects productivity and quality of work. Then, for nurses who have just entered work in the hospital, the presence of a caring mentor and self-efficacy is a predictor of job satisfaction and good performance and the preceptor must care, which contributes to increasing the self-efficacy of new nurses<sup>19</sup>. Managers should consider the benefits of increased staff training, support and better working conditions<sup>20</sup>.

The results of other studies show that self-efficacy has a positive and significant effect on organizational commitment and nurse performance<sup>21</sup>. In addition, work stress has a negative impact on organizational commitment and does not affect nurse performance<sup>22</sup>. The results of the study also found that organizational commitment has a negative impact on nurse performance<sup>22</sup>.

The results of the study show that job satisfaction has a correlation with professional self-concept and self-efficacy, professional self-concept is a factor that influences job satisfaction. Therefore, the strategy to improve the professional self-concept and the program of self-efficacy improvement must be developed to increase the work satisfaction<sup>23</sup>.

### **CONCLUSION**

The research results showed that there was a complex correlation between the role ambiguity, role conflict, self-efficacy, and work satisfaction of nurse. Even though not all correlation has a significant influence, this

research gave an initial understanding about the factors influencing self-efficacy and work satisfaction of nurse at Public Regional Hospital of Panembahan Senopati Bantul JKN era. Its implication is important for the hospital management and the nurse practitioner to consider these factors in the effort to improve the work quality and the nurse satisfaction.

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### CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Original Article

## ***Stress Factors and Macronutrient Intake to Total Cholesterol Levels and HDL Levels in Overweight Female Students***

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### **ABSTRACT**

*Being overweight is one of the many health problems that occur in modern times. Stress and macronutrient intake are factors that can affect the occurrence of increased cholesterol levels and decreased HDL in overweight. This study aimed to determine the relationship between stress factors and macronutrient intake on cholesterol and HDL levels. This research uses a cross-sectional design with a purposive sampling method, namely selecting subjects with certain criteria. The number of subjects was 50 Overweight female students based on the population proportion sample formula calculation. Stress data was measured using the Depression, Anxiety, and Stress Scale (DASS 42) questionnaire and macronutrient intake data using a 24-hour food recall form. Data analysis using the Chi-square test. The results obtained stated that 30% of respondents had high cholesterol levels, 2% of respondents had low HDL levels. As many as 22% of respondents experienced stress, the carbohydrate intake of 80% of respondents was inadequate, the protein intake of 96% of respondents was inadequate, the fat intake of 96% of respondents was inadequate. Analysis of the relationship between stress and total cholesterol ( $p=0.152$ ), carbohydrate intake ( $p=0.416$ ), protein ( $p=0.331$ ) fat ( $p=0.669$ ) with total cholesterol levels, carbohydrate intake ( $p=0.080$ ) protein ( $0.960$ ) fat ( $0.960$ ) with HDL levels. Stress factor with HDL levels ( $p=0.044$ ). It can be concluded that there is no relationship between stress factors, carbohydrate, protein and fat intake with total cholesterol levels. There is no relationship between carbohydrate, protein and fat intake with HDL levels. There is a significant relationship between stress factors and HDL levels in overweight female students.*

**Keywords:** HDL, Macronutrient Intake, Overweight, Stress Factor, Total Cholesterol

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## **INTRODUCTION**

The problem of excess nutrients, often called overweight, is a health problem that occurs in modern times because the prevalence is increasing yearly<sup>1</sup>. The results of the prevalence data showed that 11% of men and 15% of women were overweight<sup>2</sup>. Basic Health Research Data (RISKESDAS) in 2018 states that the prevalence of overweight in Indonesia

is 13.6%, with the proportion of excess body weight in the age group of >18 years. The prevalence of overweight for the >18 age group in East Java Province based on the 2018 Riskesdas is 13.75%<sup>3</sup>.

Total blood cholesterol levels tend to increase in people who are overweight and lack exercise<sup>4</sup>. High cholesterol levels of >240 mg/dl<sup>5</sup>. HDL cholesterol, which is often



referred to as good cholesterol, has more protein molecules than fat. The lower the cholesterol HDL levels, the greater the risk of being overweight<sup>6</sup>. HDL cholesterol is low if levels reach <40 mg/dl and HDL cholesterol is high if it comes to >60 mg/dl<sup>7</sup>. Stress can have an impact on the body in the form of an increased risk of overweight, obesity, hypertension, and other disorders due to hormonal changes during stress; hormones that are stimulated during stress are adrenaline and cortisol; these hormones have a metabolic effect on carbohydrates, lipids and proteins by increasing the mobilisation of the body's energy stores<sup>8</sup>.

This study aims to find out how stress and macronutrient intake affect total cholesterol and HDL levels in overweight college female students. The results of this study are expected to provide information about the relationship between stress factors, macronutrient intake, total cholesterol levels and HDL levels with the incidence of overweight in female students.

## METHOD

The study design used a cross-sectional method. The research location is at Darussalam Gontor University Female Campus, from November 25<sup>th</sup> to December 25<sup>th</sup> 2022. The population in this study was all female students in University of Darussalam female campus who were overweight and between of 18 and 25. This study, we will use purposive sampling, which is choosing subjects with certain criteria. Inclusion Criteria: Respondents must achieve BMI >25-27 and can be overweight, Respondents men >18-25 years. Exclusion Criteria: Female students are afraid of needles because in this study a blood collection will be held. Respondents are taking special drugs such as niacin drugs (Vitamin B3), arginine drugs and statin drugs, because taking these drugs can affect cholesterol levels in blood. This research was submitted and carried out by a predetermined procedure in the form of an approval letter from the ethical clearance section at the Health Research Ethics Committee (KEPK) Faculty of Semarang State University with the number: 553/KEPK/EC/2022. Dependent variable: Stress factors and macronutrient intake,

independent variable: Total cholesterol levels, HDL levels and Overweight. In this study using tools provided by the Widodo Medika laboratory with the hematology analyzer or device general care, this tool was used for checking cholesterol and HDL levels, cholesterol level examination reagents using the Wiener brand type, and HDL examination reagents using the Shimatzu brand type, stril test tubes (Vacutainer Tubes) for the placement of blood samples, for all tools and materials in this study, especially in checking cholesterol and HDL levels provided by Widodo Medika laboratory.

Anthropometric measurements include weighing using weight scales with the GEA medical EB 9360 brand type and height measurements using portable stadiometer brand microtoice; 24-hour food recall method which carried out 3 times a week to determine the intake of macronutrients consumed by respondents. Measurement of stress levels using the Depression Anxiety and Stress Scales (DASS). Anthropometric measurements were carried out by researchers at one time and then BMI calculations were carried out to determine the excess weight of research subjects. The data that had been collected was then processed manually in the editing, coding and entry processes. Bivariate data analysis using Chi Square test.

## RESULTS

Table 1 the relationship between stress factors and macronutrient intake with cholesterol levels in this study shows that there was no significant relationship between stress factors, carbohydrate, protein and fat intake with total cholesterol levels, corroborated by the results of p-value 0.152, p-value 0.416, p value 0.331, p value 0.669.

Table 2 the relationship between stress factors and HDL levels shows the p-value of 0,044 that p-value <0.05. Based on statistical tests there is a significant relationship between stress factors and HDL levels, but the results show that there is no significant relationship between carbohydrate, protein and fat intake with p-value 0,08, p-value 0,960, and p-value 0,960..

**Table 1. The Relationship of Stress Factors and Macronutrient Intake with Total Cholesterol Levels**

		Cholesterol				p-value
		Normal		High		
		n	%	n	%	
Stress Factors	Normal	34	87,2	5	12,8	0,152*
	Mild	4	57,1	3	42,9	
	Severe	3	75,0	1	25,0	
Carbohydrate	Adequate	9	90,0	1	10	0,416*
	Inadequate	32	80,0	8	20,0	
Protein	Adequate	1	50,0	1	50,0	0,331*
	Inadequate	40	83,3	8	16,7	
Fat	Adequate	2	100	0	0	0,669*
	Inadequate	39	81,2	9	18,8	

\*Chi-Square

**Table 2. The Relationship of Stress Factors and Macronutrient Intake with HDL Levels**

		HDL				p-value
		Normal		Low		
		n	%	n	%	
Stress Factors	Normal	39	100,0	0	0	0,044*
	Mild	6	85,7	1	14,3	
	Severe	4	100,0	0	0	
Carbohydrate	Adequate	10	100	0	0	0,08*
	Inadequate	39	97,5	1	2,5	
Protein	Adequate	2	100	0	0	0,960*
	Inadequate	47	97,9	1	2,1	
Fat	Adequate	2	100	0	0	0,960*
	Inadequate	47	97,9	1	2,1	

## DISCUSSION

According to research conducted by Kadir (2010), he explains hormonal changes that occur in stressful states and their effects on metabolism<sup>8</sup>. These metabolic changes will be influenced by changes in the hormones cortisol and epinephrine that increase in times of stress. The effects of cortisol and epinephrine will mobilize stores of fat and fatty acids in the blood<sup>9</sup>. These metabolic changes will be influenced by changes in the hormones cortisol and epinephrine that increase in times of stress. The effects of cortisol and epinephrine will mobilize stores of fat and fatty acids in the blood<sup>10</sup>. When the body is stressed, it will release the hormone cortisol, and a high cortisol level will make the brain arouse hunger<sup>11</sup>. In this study, respondents could not divide their time between academic activities and daily

activities, causing respondents to stress and often stay up late to do academic assignments, this factor caused respondents to consume food in the middle of the night. increase in the hormone cortisol during stress, food intake is not controlled, which it affects the increase in cholesterol and the decrease in HDL levels<sup>12</sup>.

The nonsignificant relationship between macronutrient intake and total cholesterol levels<sup>13-19</sup>. Respondents who have arranged to consume carbohydrate food sources unconsciously have regulated blood sugar and insulin to remain normal, these settings result in blood cholesterol levels in the body remaining normal so that there is no buildup or deposition in the arteries<sup>18</sup>. Other risk factors that affect body mass index and lipid profile levels cannot be changed such as age, genetic factors, or heredity<sup>20</sup>. Physical activity factors also affect

the formation of total cholesterol and an increase in HDL levels. The more physical activity a person does, the less total cholesterol and LDL, are formed and HDL levels<sup>10</sup>.

The results of the questionnaire on the food recall revealed that respondents frequently ate tofu and tempeh vegetable proteins. Tempeh is a food that has a lot of protein, and consists of amino acids that contain arginine, glycine and alanine<sup>15</sup>. The amino acid composition explains the ability of soy to regulate the ratio of insulin or glucagon levels, while the serum concentration of glucagon depends on the composition of the protein consumed. The benefits of arginine have the opposite properties to lysine and methionine in animal proteins which tend to increase cholesterol levels<sup>16</sup>. Based on the research conducted, and the results obtained, there is no significant relationship between fat intake and total cholesterol levels, it is influenced by the dietary intake of respondents who consume vegetable side dishes more often than animal side dishes.

Yulianti's (2015) research is in line with this study, which explains the significant relationship between carbohydrate, protein, and fat intake with HDL levels<sup>3</sup>. In the results of the food recall interview, respondents consumed as much non-refined carbohydrates as refined carbohydrates. Refined-type carbohydrates are carbohydrates that have undergone processing so that there are changes in structure, macronutrient content and fiber content, some are also processed with added sugar or salt<sup>3</sup>.

This study also explains the consequences of eating and drinking excessively. When someone consumes too much food, it will greatly affect the health of the body. Regarding consumption in an Islamic point of view, there is a concept of division of *haram* and *halal* in commodities consumed by humans, *israf* and *mubazir* as excessive consumption behavior and crossing the limit is a form of consumption behavior prohibited by Islam, the existence of this concept is evidence that Islam upholds the ethics of consumption<sup>21</sup>.

## CONCLUSION

There is no significant relationship between stress factors and cholesterol levels, a significant relationship between stress factors and HDL levels, and no significant relationship between macronutrient intake and total cholesterol levels and HDL levels.

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Original Article

***The Enhancing Women's Contraceptive Decision-Making: A Qualitative Study of IUD Adoption Among Women of Childbearing Age***

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**ABSTRACT**

*Family Planning (KB) initiatives seek to manage population growth by curbing childbirths among women aged 15-49. This qualitative research investigates the decision-making process of women of childbearing age (WUS) when choosing intrauterine device (IUD) contraception in Batuoge Village, Pedongga District, Pasangkayu Regency. Employing observation, in-depth interviews, and documentation, the study reveals that WUS possess limited knowledge of IUD contraception, primarily at the basic level. Furthermore, their attitude toward IUD contraception tends to be less favorable. In terms of action, WUS generally engage in consultations with their partners. This research highlights the need for improved knowledge and attitudes regarding family planning (KB) with intrauterine device (IUD) contraception among women of childbearing age in Batuoge Village. It emphasizes their inclination toward consultation with their partners.*

**Keywords:** Family Planning, Women of Childbearing Age, Intrauterine Devices

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**INTRODUCTION**

The decision factor for family planning acceptors to use the Long Term Contraceptive Method (MKJP) cannot be separated from the behavioral aspects of each individual <sup>1</sup>. If related to Lawrence Green's behavioral theory (2005), behavior is influenced by three factors. The first factor is the predisposing factor, which is a factor

that facilitates or predisposes a person's behavior to occur, which can be seen from age, education, knowledge, attitude, parity, and health history <sup>2</sup>. The second factor is enabling factors or enabling factors, namely factors that will allow or facilitate behavior or actions, and these factors include family planning services (room, equipment, and transportation). The third factor is a reinforcing factor that strengthens the behavior, in this case, the husband's support and the support of family planning service officers <sup>3</sup>.

The attitude of family planning acceptors in choosing modern contraception is a first step in whether they believe in using long-term family planning. When he agrees or has a good attitude towards the use of birth control, he will tend to behave in using contraception <sup>4,5</sup>. Action is a mechanism for observation that arises from perception so that there is a concrete response in the form of an action that influences life<sup>6</sup>.

The World Health Organization (WHO) states that contraceptive use has increased worldwide, especially in Asia and Latin America, and is lowest in Sub-Saharan Africa. Globally, modern contraceptive use has increased insignificantly from 54% in 1990 to 57.4% in 2014 <sup>7</sup>. Regionally, the proportion of couples aged 15-49 years reporting using modern contraceptive methods has increased for at least six years. In Africa, from 23.6% to 27.6%. In Asia, it has increased from 60.9% to 61.6%, while Latin America and the Caribbean have risen slightly from 66.7% to 67.0% <sup>8</sup>. An estimated 225 million women in developing countries want to delay or stop fertility but do not use any contraceptive method for the following reasons: limited choice of contraceptive methods and experience of side effects. The unmet need for contraception remains too high. Inequality is driven by population growth <sup>8</sup>.

The proportion of family planning use of the Long-Term Contraceptive Method (MKJP) in Indonesia in Basic Health Research (RISKESDAS) in 2013 (24%) and Riskesdas in 2018 (17.2%). In general, there was a decline over four years. In 2014-2018, MKJP achievement increased slightly (19.1%), but in 2015 the figure remained relatively constant, namely 23.5%. The use of MKJP in Indonesia is still far from the target <sup>9</sup>.

Data from representatives of the National Family Planning Agency for West Sulawesi in 2022, the number of active family planning participants was recorded at 98,676, with details of injectable family planning acceptors recorded at 47,417 (48.1%), pill birth control acceptors recorded at 26,272 (26.26%), condom birth control acceptors at 1,464 (1.5 %), birth control implant acceptors were 16,767 (17.0%), IUD birth control acceptors were recorded at 3,029 (3.1%), vasectomies were recorded at 270 (0.3%), tubectomies were recorded at 2,597 (2.6%) and

male birth control acceptors were recorded 92 (0.1%) <sup>10</sup>.

Data from the Population Control Service, Family Planning, Women's Empowerment and Child Protection, Pasangkayu Regency in 2022, the number of active family planning participants was recorded at 14,577, with details of injectable family planning acceptors recorded at 6,195 (42.50%), pill birth control acceptors recorded at 3,230 (22.16%), condom birth control acceptors. 170 (1.17%), birth control implant acceptors 3,609 (24.76%), IUD birth control acceptors recorded 33 (4.34%), vasectomies recorded 16 (0.01%), tubectomies recorded 597 (4.10%), and mal family planning acceptors were recorded at 17 (0.001%) <sup>11</sup>.

Reports from the Pedongga Community Health Center recorded the number of couples of childbearing age (PUS) at 1346, and the lowest IUD family planning participation in Batuoge Village was only one person out of 169 fertile women. There were 3 IUD acceptors in Malei Village, nine people in Padanda Village, seven in Martasari Village, seven in Martasari Kabuyu Village, and four in Martasari Mamuang Village<sup>12</sup>.

The same source report in Batuoge Village of 169 Women of Childbearing Age (WUS), there were 50 people receiving birth control injections (46%), 29 people accepting birth control pills (26.6%), 28 people receiving birth control implants (25.7%), MOW KB acceptors were two people (2%), while one person was an IUD KB acceptor (1%).

Even though the level of accuracy of IUD contraception is quite effective in regulating birth spacing, the results of initial observations of 10 women of childbearing age (WUS) in Batuoge Village, four people said that IUD contraception has a considerable health risk for those who use it, three other people said that IUD contraception is menstrual. Irregular and three other people said they did not choose IUD contraception as a contraceptive because they lacked information about IUD contraception and preferred contraception that was familiar to them, for example, contraceptive injections and pills.

These data show that the problem of IUD family planning participation nationally is almost the same as the problem of family planning participation coverage in Batuoge Village,

namely the lack of long-term use of family planning as outlined in a study of the behavior of women of childbearing age (WUS) choosing intrauterine device (IUD) contraception in the village. Batuoge, Pedongga District, Pasangkayu Regency.

Therefore, this study aims to determine the behavior of women of childbearing age (WUS) in choosing intrauterine device (IUD) contraception in Batuoge Village, Pedongga District, Pasangkayu Regency.

## METHOD

The research employs a qualitative descriptive approach to examine the behavior of women of childbearing age (WUS) in Batuoge Village when selecting intrauterine device (IUD) contraception. This study will be conducted through observations, in-depth interviews, and documentation. It is scheduled to take place in Batuoge Village, Pedongga District, Pasangkayu Regency, West Sulawesi Province, during March-April 2023. The methodology lacks detailed information on the study design, sample selection process, and data analysis methods, potentially introducing bias into the study.

## RESULTS

This research relies on the involvement of various informants to conduct interviews and gather data. Multiple informants, including both primary and secondary informants, are essential for examining the behaviors of women of childbearing age (WUS) when selecting intrauterine device (IUD) contraception. In this research, two key informants (KP) and four supporting informants were engaged.

**Table 1. Informant Information**

Initials	Type of Informant	Age/ Years	Address	Work	Educa-tion
KP	Key	40	Village Pedongga	PNS	Bachelor
BD	Key	38	Pedongga	PNS	D3
NV	Addition	25	Village Batuoge	PNS	Senior High School
NS	Addition	32	Village Batuoge	IRT	Junior High School

TA	Addition	22	Village Batuoge	IRT	Senior High School
AL	Addition	27	Village Batuoge	IR T	Junior High School

## Knowledge and Awareness of IUD Contraception

The research reveals a limited understanding of IUD contraception among women of childbearing age in Batuoge Village, Pedongga District, Pasangkayu Regency. The interviews with key informants (KP) and additional informants (AL, TA, NV, NS) highlighted the following findings:

*"There appears to be a lack of knowledge about contraception, and the efficacy of IUDs is not well comprehended."*

*"Many women of childbearing age are unaware of the high effectiveness of IUD contraception and tend to rely on more familiar contraceptive methods like injections and pills. The majority lack a clear understanding of IUDs."*

### Attitudes Toward IUD Contraception

*The research findings suggest that attitudes toward IUD contraception among women of childbearing age in Batuoge Village are generally less receptive. Key informants (KP and BD) noted:*

*"The response of fertile women to IUDs appears to be limited. While there has been an increase in participation, it remains modest."*

*"At times, the response is unfavorable. Some women decline invitations to use IUDs, expressing concerns about the absence of hormonal elements. Additionally, women using other forms of birth control with infrequent periods might hesitate."*

## Supporting informants shared similar perspectives:

*"IUD contraception is convenient and highly effective for long-term pregnancy prevention."*

*"Initially, I had only heard about IUD contraception, but I eventually considered switching to it after a thorough explanation"*

*from my mother. The surgical aspect of IUD insertion initially made me apprehensive."*

*- "Following discussions with my mother, I now believe that IUD contraception is an excellent choice. I plan to think it over and consult with my partner."*

### **Actions Taken to Promote IUD Contraception**

The research highlights specific actions undertaken to promote IUD contraception among women of childbearing age in Batuoge Village, Pedongga District, Pasangkayu Regency. Key informants (KP and BD) discussed these actions:

*"Our approach involves regular education about IUDs for WUS, in collaboration with family planning instructors to introduce IUD family planning to the community."*

*"Efforts to increase the adoption of IUDs include engaging counselors."*

### **Supporting informants reiterated:**

*"IUD contraception is highly effective, requiring minimal ongoing control."*

*"My awareness of IUD contraception was limited initially, but I have reconsidered it after my mother explained it to me. The surgical aspect of IUD insertion initially made me somewhat apprehensive."*

*"Upon understanding the details from my mother, I now believe it is an excellent option and plan to discuss it with my partner."*

## **DISCUSSION**

### **Knowledge of Women of Childbearing Age (WUS) choosing Intra Uterine Device (IUD) contraception in Batuoge Village**

Based on the results of research through interviews with informants regarding the knowledge of women of childbearing age (WUS) in choosing intrauterine device (IUD) contraception in Batuoge Village, it shows that, in principle, the people in the area only know from their closest family about IUDs.

Those who understand IUDs are women of childbearing age (WUS) who have used IUD contraception. At the level of society in general, it has not reached the stage of understanding. This

happens because the community or WUS in Batu Oge Village rarely receives counseling about IUD contraception. The increase in knowledge obtained by participants reflects those participants can accept the information received through health education.

A person's knowledge about something influences that person's decision-making regarding related matters<sup>13,14</sup>. This has been proven in family planning acceptors whose lack of knowledge will influence family planning acceptors in choosing IUD birth control. Knowledge factors greatly influence mothers' interest in using IUD contraception. Mothers' knowledge about IUD contraception is minimal, so only a few mothers choose to use it because they do not know the success of using it. Learning about family planning should be directed at PUS understanding about healthy ages for pregnancy and childbirth, how to regulate the number of children, and spacing of pregnancies so there are no risks and achieve a happy family.

To choose and use hormonal and non-hormonal contraceptive methods. By providing accurate and appropriate information and empathetic counseling, individuals and couples can consciously choose a contraceptive method. To use the form correctly and safely, women of childbearing age must know the possible side effects and complications.

The source of information influences the level of knowledge of women of childbearing age<sup>15,16</sup>. Information can be reported through outreach or leaflets, such as leaflets or communication media. With input from health workers, the level of knowledge of women of childbearing age is increasing, especially about contraception.

The level of knowledge of women of childbearing age about contraceptive methods obtained from providing accurate and unusual information influences the decision of women of childbearing age to choose IUD contraception as their contraceptive method.

The Family Planning (KB) program is essential in supporting the acceleration of achieving community welfare<sup>17,18</sup>. Therefore, cooperation between the government and the community is necessary to implement this program. The initial aim of the family planning program is to form a small family based on the



socio-economic strength of a family by regulating the birth of children to obtain a happy and prosperous family that can fulfill its life needs. The role of men/husbands in family planning participation is their responsibility and healthy and safe sexual behavior for themselves, their partners and their families. For the success of the family planning program, the participation of the wife and husband as couples of childbearing age (PUS) is essential. Family planning is not only for women/wives but also for men/husbands. The information source influences the knowledge level of women of childbearing age. Data can be provided through counseling, leaflets, or communication media about IUD contraception. With information from health workers, the level of knowledge of women of childbearing age about IUDs is also increasing. WUS are expected to be able to take part in family planning programs that are proven to be effective for family planning and good for reproductive health. Participation in the right family planning program for WUS will result in optimal reproductive health and the choice of IUD contraception.

Eisenberg et al. 2012 stated that knowledge is related to contraceptive choice<sup>19</sup>. To realize the rational use of contraception by family planning acceptors, it is necessary to increase the acceptor's knowledge and understanding of contraceptive methods through improved quantity and quality outreach. In this way, the acceptor knows the ins and outs of contraceptives properly and correctly. In line with this research, Gosavi et al. 2012 stated that those with high knowledge prefer the IUD family planning method<sup>20</sup>.

### **Attitudes of Women of Childbearing Age (WUS) in choosing Intra Uterine Device (IUD) contraception as a contraceptive tool in Batuoge Village**

Based on the research results through interviews with informants regarding the attitudes of women of childbearing age (WUS) in choosing intrauterine device (IUD) contraception in Batuoge Village, it shows that people in the area are less responsive to IUD contraception.

Attitude is a person's tendency to act, think, perceive, and feel an object, idea, situation, or value. This attitude determines whether someone agrees or disagrees with a thing.

Attitudes are relatively permanent. Attitudes arise from experience, have motivational and emotional aspects, and can be learned and contain a particular relationship to an object. A person's attitude is generally consistent, and people act according to their attitude. Meanwhile, the opinion of several acceptors about the IUD is that it aims to limit births, and every woman can use it.

The decision factor for family planning acceptors to use MKJP cannot be separated from the behavioral aspects of each individual. If related to Lawrence Green's behavioral theory (2005), behavior is influenced by three factors. The first factor is the predisposing factor, which is a factor that facilitates or predisposes a person's behavior to occur, which can be seen from age, education, knowledge, attitude, parity, and health history. The second factor is enabling factors or enabling factors, namely factors that will allow or facilitate behavior or actions, and these factors include family planning services (room, equipment, and transportation). The third factor is reinforcing factors that strengthen behavior, in this case, the husband's support and the support of family planning service officers<sup>2</sup>.

The IUD contraceptive device is a solid object that, if installed in the uterine cavity, can cause changes in the uterine endometrium, disrupting ovum implantation. IUDs containing copper (Cu) also inhibit the efficacy of anhydrase, carbon, and alkaline phosphatase, block the union of sperm and ovum, reduce the number of sperm reaching the fallopian tubes, and inactivate sperm. The IUD is effective because it only requires one installation and can be left in for years. It is safe because it can prevent pregnancy for a long time.

The low use of IUD contraceptives is caused by the many negative rumors about contraceptives, which influence the attitudes of potential acceptors in choosing contraceptives. Negative attitudes are caused by negative stories, including the opinion that the IUD is not reversible. It is feared that using an IUD will not result in getting pregnant again. It is also perceived that the IUD can cause pain during intercourse, which can lead to household disharmony. Another finding in this study that influences WUS's attitude towards using IUDs is that mothers of fertile women think that IUDs are installed through surgery, but in reality, the IUDs

are installed in the cervix and do not need surgery. The method for installing them is during menstruation because, at that time, the cervix is wide open.

This aligns with research by Rani Pratama Putri (2019), which states that a good mother's attitude has a greater possibility of using IUD contraception. This is to the theory, which states that attitudes can influence a person's behavior in choosing a contraceptive device, including the IUD<sup>21</sup>.

Information conveyed by word of mouth is one of the factors that women consider when using IUD contraception. Suppose information about the adverse effects and myths about IUDs circulates more frequently in society and is not comparable to education about the benefits of IUD contraception. In that case, this will make people increasingly distant and regard IUDs as inferior contraception.

A person's attitude is an essential component in their health behavior, and it is assumed that there is a direct relationship between a person's attitude and behavior<sup>22</sup>. Attitude is a reaction or response that is still closed from a person to a stimulus or object<sup>23</sup>. Other limitations include a person's attitude towards an object, whether a feeling of support or partiality (favorable) or a sense of not supporting or not taking sides (unfavorable) towards the thing. Attitude is a certain regularity in a person's feelings (affection), thinking (cognition), and predisposition to action (conation) towards an aspect of the surrounding environment<sup>24</sup>. From the limitations above, attitude is an assessment of the surrounding situation, shown by feelings. Attitude has three main components: 1. Belief (belief), ideas, and concepts towards an object. 2. Emotional life or emotional evaluation of an object. 3. The tendency to act (trend to behave).

In line with research by Rubin et al. 2011, it was stated that the average respondent's IUD family planning method was positive because the respondents' knowledge about IUD family planning was also good<sup>25</sup>.

### **Actions of Women of Childbearing Age (WUS) choosing Intra Uterine Device (IUD) contraception as a means of contraception in Batuoqe Village**

The research results show that the actions of women of middle age in choosing IUD contraception as a contraceptive method are only limited to hearing. Switching from pill contraception to IUD is quite tricky. The perception so far is that IUD installation is an operation.

One of the causes of the low use of IUD contraception is due to several factors, including the perception of IUDs in society. Perception is a person's experience of an event object obtained by deducing information and interpreting a message.

Apart from that, knowledge is a critical domain for the formation of one's actions<sup>26</sup>. Knowledge itself is the result of education, where the knowledge is obtained. However, it needs to be emphasized that it is not because someone with low education means they have common knowledge. This is because increasing knowledge is not obtained from formal education alone but can be obtained through non-formal education. Knowledge in the form of information that acceptors obtain regarding various types of contraceptives, whether the information is obtained from health workers or lay people, will influence whether they become family planning acceptors.

Low coverage of the use of contraceptives will affect the quality of life of families and will hinder improving the level of public health, especially maternal and child health<sup>27</sup>. Seeing this situation, there may be an increase in cases of unwanted pregnancies due to the higher number of non-MKJP family planning participants, where, as is known, the failure rate for MKJP is 0-2 per 1000, which is smaller than for non-MKJP, namely 10 per 1000 failure rates.

From the research that various researchers have carried out, knowledge and attitudes significantly influence a person's actions. Inside is very tied and consistent to a situation that can affect a person's behavior and actions because understanding can clarify a decision or think in the category of safe (positive) or bad (negative).

Knowledge factors greatly influence the formation of attitudes. The existence of knowledge will affect a person's perception so that people have an attitude, and this can then be seen in their actions<sup>22</sup>. The role of knowledge in family planning is directed at EFA's

understanding of the healthy age for pregnancy and childbirth, the spacing of pregnancies that are too risky, and the ideal number of children to achieve a happy and prosperous family.

Installing an IUD requires cooperation with the husband for reasons of fear that the thread will interfere during intercourse. The husband's support is vital for decision-making regarding family planning because if the husband does not allow or support, only a few mothers dare to continue installing the contraceptive device. The husband's support is critical to motivate and support the wife in choosing which contraceptive method to use. The lack of support from the husband often means that the wife has no right to decide when making decisions. Support that can be provided includes choosing suitable contraception that suits his wife's condition, reminding her to control and delivering it when there are side effects or complications. So, WUS minimal knowledge will influence WUS participation in selecting IUD contraceptives.

## CONCLUSION

This research concludes that WUS' knowledge about IUD contraception is minimal, only at the level of expertise. The attitude of WUS towards IUD contraception is less responsive to IUD contraception. WUS's actions regarding the IUD are at the level of consultation with their partner. Government agencies in Batu OGe Village will likely collaborate more with health agencies, especially regarding family planning information. It is hoped that the puskesmas will provide outreach and education to WUS about IUD contraception.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this research project. We have conducted this study with full transparency and without any external influences that could compromise the objectivity or integrity of the research. This includes financial, personal, or professional relationships that might be perceived as conflicts of interest. Our commitment to impartiality and the pursuit of knowledge remains unwavering.

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Original Article

## Family Psychoeducation to Improve Parents' Coping Strategies in Caring for Thalassemia Children

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### ABSTRACT

*Thalassemia is a genetic disorder of the synthesis of alpha or beta globin chains, either in whole or in part. Families who care for children with thalassemia will experience psychosocial problems. Ignorance is the reason why families find it difficult to adapt. Therefore, it is necessary to provide knowledge and the ability to adapt to stressors so that family coping is positive. This study aims to determine the effect of Family Psychoeducation on parents' coping strategies in caring for children with thalassemia. The research design used a "Quasi experiment pre-post-test with a control group." The purposive sampling technique was used with a sample of 44 people divided into two groups. The instrument used is Brief COPE. The results showed that in the intervention group, there was a significant difference in the average score with a p-value of 0.000. Meanwhile, in the control group, there was no significant difference in the average score with a p-value of 0.492. There is a difference in the average score between the intervention group and the control group, with a p-value of 0.023. In conclusion, there is an influence of family psychoeducation on parents' coping strategies in caring for children with thalassemia.*

**Keywords:** Family, Coping, Psychoeducation, Thalassemia

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### INTRODUCTION

Thalassemia is a hereditary disease that affects a significant number of people worldwide. One of the countries within the world's thalassemia belt is Indonesia, indicating a high frequency of thalassemia carrier genes<sup>1</sup>. According to data from the Indonesian Thalassemia Foundation, the prevalence of thalassemia cases in Indonesia is projected to reach 10,973 in 2021<sup>2</sup>. The province with the highest contribution to the number of people affected by thalassemia is West Java, accounting for 40% of cases<sup>3</sup>. The Chairperson of the Association of Indonesian Thalassemia Parents (POPTI) Tasikmalaya said there were 280 people with thalassemia in Tasikmalaya,

many of whom were dominated by children. Until now, it is known that a definitive treatment that completely cures thalassemia has not been found. One way to maintain the quality of life of Thalassemia patients is through supportive therapy with routine blood transfusions<sup>4</sup>.

People with thalassemia will face an impact on physical health due to their lifelong need for blood transfusions. In addition to physical challenges, individuals with thalassemia also experience psychosocial issues. According to qualitative research conducted by Mariani et al. (2020), children with thalassemia often report instances of bullying and face limitations in their interactions with the environment<sup>5</sup>.

This psychosocial problem has many effects, not only on people with thalassemia but also on their parents or families who have

children with thalassemia. Families must be willing to sacrifice money, energy, and time to care for and accompany their children for lifelong treatment<sup>6</sup>.

Simple interviews conducted by researchers with Thalassemia Center officers at RSU Prasetya Bunda Tasikmalaya and 4 parents of children with thalassemia obtained information that when parents heard that their child was diagnosed with thalassemia, they would experience a stage of rejection, which eventually led to cases of non-compliance with transfusions and medication because parents were reluctant to accompany their children. In addition, 3 out of 4 parents said they had not fully reached the acceptance stage. Sometimes, families still find it difficult to accept reality when faced with problems. This statement follows research conducted by (Ulfa & Hasyim, 2018) that families experience the grieving process repeatedly when their child is diagnosed with thalassemia. Even families often return to the denial phase every time they take their child for a transfusion<sup>7</sup>. Ignorance of the family regarding the concept of illness, how to treat it, and the fear of loss also make it difficult for families to adapt<sup>8</sup>. The efforts that the family can make to reduce the threat or pressure caused by the stressor depend on how the family uses coping mechanisms<sup>9</sup>. However, in dealing with difficult situations, individuals tend to use faulty or maladaptive coping mechanisms. If these coping mechanisms are continuously used, they can result in higher stress levels and can cause depression<sup>10</sup>. This phenomenon illustrates that the family needs to be equipped with knowledge and the ability to deal with stressors so that coping is positive<sup>9</sup> because the family has an important role in making decisions about caring for sick family members<sup>7</sup>.

One effort that can help the family acceptance process in carrying out its functions in patients with chronic illnesses is psychoeducation. Family psychoeducation is an intervention that provides educative information regarding the problems faced by families in caring for children with thalassemia<sup>7</sup>. The results of a study conducted on 21 families with children with thalassemia major showed that psychoeducational interventions affected parents' anxiety<sup>9</sup>. Therefore, researchers are interested in researching to know the effects of family psychoeducation on parents' coping strategies

in caring for children with thalassemia at RSU Prasetya Bunda Tasikmalaya. From this background, the issue of how effective psychoeducation is in improving coping strategies for families with children with thalassemia can be raised.

## METHOD

The type of research used in this study was quantitative with a quasi-experimental design method employing a pre-post test with a control group design. The research was conducted in May 2023 at Prasetya Bunda General Hospital in Tasikmalaya City. This hospital serves as a thalassemia center and a referral hospital for thalassemia cases. The population for this study consisted of parents who had children with thalassemia major, aged 6-17 years, and undergoing treatment at RSU Prasetya Bunda Tasikmalaya, totalling 95 respondents. The sample size was determined using the Slovin formula, resulting in 22 respondents per group. Purposive sampling was employed as the sampling technique.

Data retrieval involved the use of demographic sheets and the COPE brief coping strategies questionnaire, which had been translated into Indonesian<sup>11</sup>. The reliability of the questionnaire was tested using Cronbach's Alpha, yielding a result above 0.6 (Carver, 1997). Additionally, the reliability test Apriska (2016) conducted resulted in  $\alpha = 0.746$ <sup>11</sup>.

The research began by sorting and collecting respondents who met the inclusion criteria. Informed consent was obtained from the respondents as approval for their participation, followed by the completion of the demographic sheet. Subsequently, the respondents were given a questionnaire to assess the coping strategies they used when dealing with stressors while caring for children with thalassemia. This was followed by Session I, which involved providing educative information about thalassemia. After Session I, the parents were given a 15-minute rest period, after which Session II commenced. Session II focused on sharing coping strategies among natural parents to manage stressors associated with caring for children with thalassemia. The researchers also provided tips and tricks for stress management and effective coping strategies. Following the two sessions, the respondents received a digital pocketbook on psychoeducation, which had been delivered

earlier via WhatsApp. The post-test was conducted >14 days after providing the family psychoeducation. Eight methods can be used in implementing psychoeducation methods, namely training methods, case discussions, role plays, group discussions exercises individual, presentation and behavioral modelling consisting of four sessions in this study, the data were tested for normality using the Shapiro-Wilk analysis due to the small sample size (<50 per group) and a homogeneity test. The normality test results indicated that the data were normally distributed, enabling a paired sample t-test to determine the effect of family psychoeducation before and after the intervention and education groups, as per Prasetya Bunda General Hospital procedures in the control group. Additionally, an independent t-test was performed to ascertain whether there was a difference in the average coping strategy scores between the intervention group and the control group.

The Ethics Committee approved this study of the Poltekkes Kemenkes Tasikmalaya, with the number No.DP.04.03/16/65/2023.

## RESULTS

**Table 1. Distribution of respondents by age**

	Intervention			Control		
	N	Mean	SD	N	Mean	SD
Age	22	37.09	7.892	22	36.41	7.062

**Table 2. Distribution of respondents based on gender**

Gender	Intervention		Control	
	N	%	N	%
Male	6	27.3	4	18.2
Female	16	72.7	18	81.8
Amount	22	100.0	22	100.0

**Table 3. Distribution of respondents based on education**

Education	Intervention		Control	
	N	%	N	%
Elementary School	6	27.3	5	22.2
Junior High School	7	31.8	7	31.8
Senior High School	7	31.8	8	36.4
University	2	9.1	2	9.1
Amount	22	100.0	22	100.0

**Table 4. Distribution of respondents by occupation**

Profession	Intervention		Control	
	N	%	N	%
Unemployment	6	27.3	14	63.6
Labour	16	72.7	3	13.6
Self Employed	7	31.8	4	18.2
Civil Servant	0	0.0	1	4.5
Amount	22	100.0	22	100.0

**Table 5. Distribution of respondents based on family income**

Profession	Intervention		Control	
	N	%	N	%
<Rp.1.000.000	8	36.4	7	31.8
Rp.1.000.000-2.500.000	9	40.9	10	45.5
Rp.2.500.000-5.000.000	3	13.6	1	4.5
>Rp.5.000.000	2	9.1	4	18.2
Amount	22	100.0	22	100.0

**Table 6. The distribution of respondents is based on the total number of children and the number of children suffering from thalassemia at RSU Prasetya Bunda Tasikmalaya**

	Intervention			Control		
	Media	Min	Max	Media	Min	Max
Number of Children	2.00	1	4	2.00	1	4
Number of Thalassemia Children	1.00	1	1	1.00	1	2

**Table 7. Differences in average scores before and after giving family psychoeducation in the intervention group**

	Paired Samples T Test				
	Mean	N	SD	SE	p-Value
Pretest	80.39	22	6.521	1.390	0.000
Posttest	85.73	22	6.453	1.376	0.000

**Table 8. Differences in average scores before and after providing education according to the procedures of RSU Prasetya Bunda Tasikmalaya in the control group**

	Paired Samples T Test				
	Mean	N	SD	SE	p-Value
Pretest	80.91	22	7.603	1.621	0.427
Posttest	80.73	22	7.548	1.609	0.427

**Table 9. Differences in the average score after providing education between the**

## **intervention group and the control group**

<b>Independent Samples T Test</b>				
	<b>Mean</b>	<b>SD</b>	<b>SE</b>	<b>p-Value</b>
Intervention	85.73	6.453	1.376	0.023
Control	80.73	7.548	1.609	0.023

## **DISCUSSION**

### **Characteristics of Respondents**

The results showed that the average age of parents caring for children with thalassemia at Prasetya Bunda General Hospital in the intervention group was 37.09 in the control group, the average age was 36.41. This age is included in early adulthood, namely the age of 26-45 years. One's mindset and strength would mature with age. According to Notoatmodjo's theory, as a person age, their level of knowledge also increases because of their life experiences<sup>12</sup>.

The results showed that most of the respondents or parents of children with thalassemia were female, namely 16 people in the intervention group (72.7%) and 18 people in the control group (81.8%). Overall, 34 people (77.3%) were female. Meanwhile 10 people (22.7%) were male. In this study, most of the parents who accompanied their children to carry out blood transfusions at Prasetya Bunda General Hospital were mothers. This statement is in line with research by Marnis et.al. (2018) that in undergoing the process of treating thalassemia children are more often accompanied by their mothers<sup>13</sup>. Research (Widadi & Oktaviani, 2018) says that mothers will try and do anything for the sake of their child's recovery<sup>14</sup>. The mother's role is to provide emotional support, direct assistance, and appropriate and accurate information, while the father's is to provide direct and material assistance. According to (Thahir, 2014) coping used by women is also more constructive, which means looking for efforts to solve problems, while men are more likely to use destructive coping, which means prioritizing feelings<sup>15</sup>.

The results showed that the education of the parents was mostly up to the high school stage, namely 8 people (36.4%) in the control group while in the intervention group, there was the same number, namely 7 people (31.8%) between the junior and senior high school stages. According to (Fijianto et al., 2021) higher education can affect emotional intelligence, so people who have a high level of education will adapt more quickly<sup>16</sup>. The

results of research on the experiences of mothers caring for thalassemia children also state that when someone has extensive knowledge they are more aware of the importance of maintaining the health and welfare of the family<sup>14</sup>. So that it can support in improving the quality of life of children during the treatment process.

The results showed that most of the parent's employment status did not work either in the intervention group of 9 people (40.9%) or in the control group of 14 people (63.6%). This happens because most of those who accompany their children are mothers who work as housewives. Mothers who take their children for treatment have the opportunity to socialize and exchange information to increase knowledge with health workers and other parents who have the same problem<sup>17</sup>.

The results showed that most of the income levels of families of children with thalassemia were equivalent to the Tasikmalaya UMR, namely around Rp. 1,000,000 – 2,500,000 both in the intervention group of 9 people (40.9%) and in the control group of 10 people (45.5%). Income is the cause of psychosocial problems in thalassemia families, even though BPJS covers the thalassemia treatment itself, the family also needs transportation costs and expenses for unexpected matters<sup>18</sup>. According to Bulan, one of the factors that can improve the quality of life for thalassemia children is the family's economic status. Because, the better the economic status of the family, the more attention the family pays to the health of the child, including sources of funds and treatment<sup>19</sup>.

The results showed that most of the parents with thalassemia had two children altogether and one child who had thalassemia. This is because some parents are traumatized and ultimately reluctant to have more children<sup>6</sup>.

### **Differences in average scores before and after providing education in the intervention and control groups.**

Based on the results, the average score of the intervention group's coping strategies before giving family psychoeducation was 80.36 and after given family psychoeducation was 85.73. The results of the analysis using the paired sample t-test in the intervention group obtained a p-value of 0.000 ( $p < 0.05$ ), which means that there was a significant difference



between before and after giving family psychoeducation. As for the results of the study, the average score of the control group's coping strategies before providing education according to the procedures of Prasetya Bunda General Hospital was 80.91 and after providing education according to the procedures of Prasetya Bunda Hospital, it was 80.73. The difference in the average score of these results is -0.18. Results of analysis of paired samples t-test in the control group obtained a P-value of 0.427 ( $p > 0.05$ ), meaning that there was no significant difference in the average score of coping strategies.

The difference in these results can be influenced by confounding variables that researchers cannot control. At the time of implementation, several respondents said that stress arose when the family had difficulty getting blood bags and ultimately did not focus on solving problems so that coping became ineffective. Economic problems are also a complaint for some families because caring for a thalassemia child requires money. The results of the study were also influenced by families who were unable to express the feelings they experienced. In addition, there is no psychoeducation program about treating children with thalassemia from the hospital which can be used as a source of information and support for parents so that the coping used by families can still change when faced with problems during the treatment process.

The problems respondents complain about are in accordance with Lazarus and Folkman's theory that materials, social support, social skills, and problem-solving skills can affect individual coping. Meanwhile, factors that can influence coping strategies are age, education, and experience.

Family psychoeducation is a form of providing health information to families to improve the family's ability to solve problems faced by the family<sup>20</sup>. Psychoeducation is an intervention that can improve or enhance positive responses from parents or families that are expected to maintain psychosocial and role function changes. Psychoeducation aims to rehabilitate families so that when faced with the same problems or other challenges the family will not experience disturbances<sup>21</sup>.

In psychoeducation, there is a process of socialization and exchange of opinions that it contributes to the destigmatization of psychological disorders that are at risk of

hindering treatment. Psychoeducation gives them the advantage of overcoming problems and preventing emotional disturbances with effective coping strategies<sup>22</sup>.

### **Differences in average scores of coping strategies after providing education between the intervention group and the control group.**

The results of the independent samples t-test statistic showed a p-value of 0.023 ( $p < 0.05$ ), which means that there was a significant difference in the average score before and after being given education between the intervention group and the control group. Based on the results of the study, the difference in the average score of coping strategies in the intervention group was 5.37 while in the control group, it was -0.18. This shows that the intervention group that was given family psychoeducation was more effective than the control group that was only given general education according to standard hospital procedures.

The results of this study are in line with Nurhasanah's research, (2017) that there is a significant difference after giving psychoeducation, namely a p-value of 0.001<sup>9</sup>. Other research also shows that psychoeducation can improve self-care abilities in families caring for children with thalassemia with a p-value of 0.000<sup>7</sup>. Psychoeducation also has the effect of increasing the ability of families to deal with anxiety in parents who have children with thalassemia<sup>2</sup>. In psychoeducational research, it has also been shown to influence the level of knowledge, attitudes, actions, and beliefs in preventing coronary heart disease in families who are at risk of experiencing coronary heart disease<sup>23,24</sup>. In the case of mental health, psychoeducation also influences the burden and support of families treating schizophrenia<sup>22</sup>.

Research (Hendrawati, 2018) shows that there is an influence of family psychoeducation in increasing the socialization of schizophrenia<sup>25</sup>. Family psychoeducation can reduce the stigma that appears in the family so that if the stigma is reduced or even disappears, the family will easily train sufferers to socialize. For parents who have mental retardation, psychoeducation can increase the knowledge of children who have mental retardation with a p-value of 0.012.

Based on the results of data processing, it can be concluded that there is an influence of

family psychoeducation on parents' coping strategies in caring for children with thalassemia at RSUD Prasetya Bunda Tasikmalaya

## CONCLUSION

Based on the characteristics of the respondents, the average age was 36-37 years, and they were educated up to high school. Most of the respondents did not work because the majority of respondents were women. The family income of children with thalassemia ranged from Rp. 1,000,000 to 2,500,000. Additionally, the majority of respondents had two children, and one of them suffered from thalassemia.

There was a difference in the average score before and after providing family psychoeducation in the intervention group, with a p-value of 0.000. However, there was no difference in the average score before and after providing education according to RSUD Prasetya Bunda General Hospital procedures, with a p-value of 0.427. Furthermore, there was a difference in the average score between the intervention and control groups, with a P-value of 0.023. Therefore, it can be concluded that family psychoeducation influences parents' coping strategies in caring for children with thalassemia at RSUD Prasetya Bunda Tasikmalaya.

As a result, it is recommended that parents develop and utilize effective coping strategies to ensure optimal care for their children who suffer from thalassemia. Parents are also encouraged to express their feelings to other family members, which can help reduce the burden of stress. Health services should consider making family psychoeducation an educational program or supportive therapy for families, enabling them to better navigate life as a thalassemia-affected family.

The study's findings indicate that the scores of family coping strategies were different between those who received psychoeducational interventions and those who received education according to standard hospital procedures. Thalassemia centre officers are urged to promote the importance of participating in POPTI as a platform for addressing issues faced by individuals with thalassemia. Future researchers are advised to conduct further studies on the psychosocial problems faced by families with thalassemia or other chronic

illnesses, as well as the influence of confounding variables on the coping strategies employed by parents or families with children affected by thalassemia.

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## CONFLICT OF INTERESTS

The authors have no conflict of interests to declare, financial or otherwise.

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Original Article

## Oral Health-Seeking Behavior During The COVID-19 Emergency Policy Period in Padang City, Indonesia

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### ABSTRACT

The increase in positive cases of Coronavirus Disease (COVID-19) has encouraged the Indonesian government to take lockdown policies by implementing Large-Scale Social Restrictions (PSBB) and Emergency Community Activity Restrictions (PPKM), which affect the paralysis of the health sector, especially dentistry. All actions in dental practice are limited to emergency case handling only, and many dentists have closed during the pandemic. The purpose of this study was to determine the differences in oral health-seeking behavior during the first phase of the lockdown in Padang City, West Sumatra, Indonesia. A survey method with a cross-sectional design was done by involving 120 respondents who have dental pain history. The data was collected by a self-administered questionnaire via google-form then analyzed by computerization using the fisher test. The results showed that during the PSBB period, most of the people in Padang (85%) treated dental pain independently, and only 15% asked for caregiver aids, specifically, only 3.3% of respondents take professional service. Meanwhile, during the PPKM period, the utilization of healthcare has increased by around 56,7%, (especially 43.4% treated by dental professionals, and 43.3% of respondents did self-medication. Thus, there was a significant difference of finding dental pain treatment behavior during PSBB and PPKM in Padang City ( $p = 0.004$ ). As a result, limitation search for managing oral problems during COVID-19 has encouraged society to take self-medication or non-professional caregivers, so it is highly recommended to consult with dental professionals in the course of the pandemic through teledentistry without face-to-face meetings.

**Keywords:** COVID-19, Behavior, Oral Health-Seeking, Emergency, Policy

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## INTRODUCTION

Since the first emergence of positive cases of COVID-19 in Indonesia, until the significant increase of cases per day from March 2020 to July 2021, the Indonesian government has implemented *Large-Scale Social Restrictions* (PSBB), transitional PSBB, *Community Activity Restrictions* (PPKM) and micro PPKM during the COVID-19 emergency<sup>1,2</sup>. A few provinces in Indonesia including West Sumatra implemented PSBB for 3 stages starting from April 23 to June 7, 2020. Then, based on the Decree of the Minister of Health of the Republic of Indonesia Number HK.01.07/MENKES/260/2020 dated April 17, 2020, the

West Sumatra Provincial Government also implemented the PSSB for 14 days, starting from April 22, 2020 to May 5, 2020 through the Regulation Number 180-297 of 2020. It is related to the temporary suspension of everyone's activities outside the home, one of which was by urging the public to reduce treatment activities to medical facilities except for handling emergency cases. Furthermore, the second phase of PSBB was extended from May 6 to May 29, 2020 and phase three from May 30 to June 7, 2020. After the end of the PSBB and Transitional PSBB, the West Sumatra implemented PPKM from 3-20 July 2021<sup>3</sup>.

COVID-19, which was announced by *World Health Organization (WHO)* has announced COVID-19 as a pandemic outbreak in March 2020, so it has greatly affected paralysis in various health sectors, especially the practice of dentistry<sup>4</sup>. The rapid transmission of COVID-19 between humans poses a high risk for dental practitioners, who are often exposed to saliva, blood, patient breathing, and aerosols during dental and oral care<sup>5-9</sup>. A number of policies by related parties around the world, even in Indonesia, such as the *American Dental Association and the Iowa Dental Board*, the *Indonesian Dental Association (PDGI)*, and the *Association of Indonesian Faculties of Dentistry (AFDOKGI)*, also recommend stopping all dental practices starting March 16, 2020, and limited services specifically for emergency cases only<sup>7,10,11</sup>.

Several policies aimed to break the chain of COVID-19 spreading set by the Dental Association as well as the Central Government and Regional Governments in Indonesia are also very influential on the practice of dentistry and patient visits to dental practice. Oral complaints especially dental pain is one of the main reasons patients seek treatment<sup>12,13</sup>. However, the rules that call for the handling of only emergency dental and oral cases indirectly also have an impact on the number of dentist practices that are closed<sup>6,8</sup>. So that, people who have oral health problem have difficulty accessing dental health services and negatively affect the quality of life of each individual<sup>14</sup>. To the best of the author's knowledge, there has been no research on the behavior of seeking dental pain treatment during the COVID-19 pandemic policies. So, this research is very important to know the behavior of finding dental pain treatment during the implementation of government policies during the COVID-19 pandemic in Padang City, West Sumatra Province, and is expected to be a reference in socializing and taking other policies when facing a pandemic emergency situation.

While scientific studies were explored during the outbreak of COVID-19, there is no research about community dental health behavior, specifically during large-scale policy period in Indonesia. So, this research is required to fully elucidate Indonesian health behavior during two lockdown stages.

## METHOD

This research is a cross-sectional study conducted from June 2020 to October 2021. The samples in the study were obtained using purposive sampling techniques with the following criterias: 1) aged over 17 years; 2). Have complaints of cavities or dental pain during the emergency period of the COVID-19 pandemic (PSBB and PPKM and trying to treat them); 3) reside in the city of Padang, West Sumatra, Indonesia minimal for five years,; 4) be willing to be a research sample. A total of 120 respondents (60 respondents during each the PSBB and PPKM period) participated by filling out a number of questions through a *Google Form* related to the sociodemographic characteristics of respondents and dental and oral treatment search behavior during the COVID-19 pandemic. The three main questions to assess respondents' behavior in seeking dental treatment include not doing anything, doing self-medication, and getting treatment. The next question delves into self-medication information provided by respondents with the use of traditional medicines or modern medicines. Meanwhile, outgoing treatment is given an open question with the choice of answers to seek treatment through dental professional service or non-dental professional caregiver. The data was analyzed by *fisher-tests*, then processed using a computerized system.

## RESULTS

Respondents who participated in the PSBB were dominated by females (61.7%) in the age range of 31–40 years (41.7%). Likewise, in the PSBB condition, more respondents were female (58.3%) at the age of 31–40 (43.3%). The percentage based on education and employment levels during PSSB and PPKM was quite different. Most of the respondents' education levels during the PSBB period were in the middle category (55%), and they worked as civil servants (41.7%). Meanwhile, during the PPKM period, most respondents already had a higher education level (60%) and were private employees (40%) (Table 1).

**Table 1.** Frequency distribution of respondents' characteristics on dental treatment seeking behavior during the COVID-19 emergency PSBB and PPKM periods in Padang City, West Sumatra (n=120)

Characteristics of Respondents	PSBB		PPKM	
	n	%	n	%
Age (years)				
-30	21	35	20	33.3
-40	25	41.7	26	43.3
-50	14	23.3	14	23.3
Gender				
Male	23	38.3	25	41.7
Female	37	61.7	35	58.3
Recent Education				
SD	1	1,7	-	-
Middle-High School	33	55	24	40
College	26	43.3	36	60
Work				
Not Working	19	31.7	20	33.3
Private Employees	11	18.3	24	40
State Officer	25	41.7	8	13.3
Self employed	5	8.3	8	13.3

**Table 2.** The differences in dental treatment search behavior during the COVID-19 emergency PSBB and PPKM periods in Padang City, West Sumatra (n=120).

No	Treatment Search Behavior	PSBB		PPKM		p-value
		n	%	n	%	
1.	Self-medication using					0.004*
	A. Modern medicines	31	51.7	22	36.6	
	B. Folk remedies	20	33,3	4	6,7	
	Total	51	85	26	43.3	
2.	Looking for treatment out					
	A. Professional Dental Service	2	3.3	26	43.4	
	B. Non-Professional Dental Service	7	11.7	8	13.3	
	Total	9	15	34	56.7	

*p*<0.05

Table 2 shows that not only in the PSBB period but also in the PPKM period, the majority of efforts to overcome dental pain were dominated by self-medication using modern medicines rather than traditional remedies. Meanwhile, looking for professional treatment

during the two periods was still a small proportion, like only 3.3% at PSBB and 43.4% at PPKM.

Unfortunately, almost all Indonesian patients will visit Non-Professional Dental Service to solve their oral pain, such as uncertified dental therapists. This study result proves that a number of respondents overcome their dental problems by Non-Professional Dental Service, around 11.7% at PSBB and 13.3% at PPKM, respectively. Hence, oral health seeking behavior between PSBB period and PPKM had a significant difference (*p* =0.004).

## DISCUSSION

PSBB has been the "best of the worst" government's solution given that there is a very high risk if the government chooses the lockdown or territorial quarantine policy option during COVID-19 pandemic. Based on Indonesian Regulation Article 55 of Law, Number 6 of 2018, the implementation of regional quarantine gives rise to the responsibility of local governments and the central government to meet all the basic living needs of the people and the well-being of society<sup>15</sup>. On one hand, lockdown emergency policies like PSBB and PPKM were chosen by the government as pandemic emergency mitigation in the Regulation of the Minister of Health Number 9 of 2020 to break the chain and prevent the possible spread or contamination of COVID-19 but it also had some negative impacts, especially on the health sector<sup>3,16,17</sup>.

The implementation of the PSBB and PPKM policies certainly has an impact on several lines of health seeking activities, including delayed access to necessary medical treatment and routine dental care<sup>2,16,18</sup>. This study proved that most samples who experienced dental pain during the PSBB period do self-medicate with contemporary drugs (85%) and use traditional medicines (33.33%). On the contrary, respondents during the PPKM period not only take self-medicate but also began to seek treatment from dental professional service (34%). The reason caused by the region regulation to travel was not as tight as PSBB phase. As long as the other reason is according to Manu et al.'s 2019 research, around 77.8% of respondents managed toothache with self-medication using both traditional and modern remedies, but the

hazards of an inaccurate diagnosis or ineffective treatment could arise from this circumstance of self-medication which could increase dental health problem<sup>17</sup>.

In general, sociodemographic can be one of predisposing factors that affect dental health-care seeking behaviour during COVID-19 pandemic<sup>4,19-23</sup>. Women more suffer from dental pain than men during the PSBB and PPKM period and manifest to their health treatment behaviour. This result is linear to some study in the prior life before pandemic, for example Chambisa's study claimed that the more percentage of oral health seeking behaviour done by women than men, then it is supported by Yaddanapalli research, said that men take advantage of less dental care than women. However, it is contrary to a study conducted by Malvania in 2011 which stated that men visit dental practices more than women. The difference is caused by the number of respondents and sampling technique<sup>25-27</sup>.

According to social constraints, the closure of dental offices and served only emergency cases result in many people prefer to do self-medication by looked for alternative treatments and methods to deal with their dental health issues<sup>24</sup> (Lee et al., 2021). One of the solutions linear to new global phenomena like digitalization era. Regarding the internet of things and online health platform also lead the society not only using self-medication that cause several potential misleading choices, but also can find treatment out by professional dental care give for example using teledentistry<sup>8</sup>.

Teledentistry is a new concept remarkable futuristic breakthrough and a component of telemedicine using information technology to allow virtual face-to-face contact between dental professionals and patients. It has the potential to increase accessibility, enhance oral healthcare delivery, and cut costs, which involves sending clinical data and photographs over long distances for dental consultation and treatment planning<sup>7-9</sup>. Dental professionals' use of teleconsultation services may affect patients' decisions on whether to get treatment. People may be more likely to seek medical advice online if these services are provided than they would be to visit a physical clinic<sup>26</sup>.

Financial aspect also affect the dental health seeking behaviour. During the pandemic, there was a very noticeable increase in the unit cost of every dental procedure, which was

partly brought on by the high cost of level 3 personal protective equipment. All respondents dealt with dental pain by going to a health clinic for treatment (100%) during the PPKM period that provide Indonesian National Health Insurance (BPJS), for example visit dental clinic and community health center (puskesmas) Puskesmas is the most popular treatment option because the costs are carried entirely by BPJS and similar to result of Manu's study<sup>17</sup>. Meanwhile, the important concept about finding treatment out is dental primary care providers and dental public health professionals seek to restore the population to healthy oral hygiene practices without hastening the development of COVID-19<sup>28</sup>.

## CONCLUSION

The behavior of finding dental treatment during the PSBB and PPKM in the city of Padang, West Sumatra, Indonesia is very significantly different. During the PSBB period, it was more dominated by independent treatment, while during the PPKM period, respondents had sought treatment out. As a result, there are a number of significant difficulties that must be addressed together as a result of the development in behavior in handling dental health issues autonomously during the COVID-19 epidemic. Designing strategies that enable accurate and secure access to oral health information is essential for dental practitioners, scientists, and policymakers. It is highly recommended that an adequate education about the best way to solve the oral problem during the emergency situation is a crucial priority with using teledentistry as an alternative way. In addition, the health promotion from the related stakeholder and strengthening the ethics decision making surrounding self-medication and non-professional caregiver usage during emergencies will potential to modify personal conduct.

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## CONFLICTS OF INTEREST

The author declare no conflict of interest.

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Original Article

## ***Analysis of Contact Dermatitis Incidence Factors in Fishermen in The Working Area of Wapunto Health Center***

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### **ABSTRACT**

*The prevalence of contact dermatitis in the Working Area of Wapunto Public Health Center, increases yearly, that is, in 2018 was 22.3% per 1000 population, in 2019, was 29.4% in 2020, was 35.2%. The purpose of this study was to determine the factors related to contact dermatitis disease in fishermen in the Working Area of Wapunto Public Health Center, Muna Regency. The type of study was observational quantitative with a cross-sectional study design. The total population in this study were 255 families, while the sample was 72 respondents using cluster random sampling. Data analysis using chi-square test. The results of the study showed that there was a relationship between contact time with value  $X^2_{count} > X^2_{table}$ , namely  $19,412 > 3,481$ , personal hygiene with value  $X^2_{count} > X^2_{table}$  namely  $26,331 > 3,481$ , history of allergies with value  $X^2_{count} > X^2_{table}$ , namely  $11,250 > 3,481$ , use of PPE with value  $X^2_{count} > X^2_{table}$  namely  $31,065 > 3,481$  with contact dermatitis disease in fishermen in the Working Area of Wapunto Public Health Center, Muna Regency. In conclusion, there is a relationship between contact time, personal hygiene, history of allergies, and PPE use. Therefore, fishermen should reduce the risk or prevent the incidence of contact dermatitis by further improving personal hygiene, such as washing hands and feet using soap, changing work clothes and using clean and not humid PPE.*

**Keywords :** Contact Duration, Personal Hygiene, Personal Protective Equipment, Dermatitis

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## **INTRODUCTION**

Dermatitis is a common skin disease, with 5.7 million doctor visits per year due to dermatitis. The prevalence of contact dermatitis in Indonesia varies widely. 90% of skin diseases are contact dermatitis, both irritant and allergic. Contact dermatitis accounts for 92.5% as one of the occupational diseases, 5.4% due to skin infections, and 2.1% caused by other things <sup>1</sup>.

In Southeast Sulawesi, the incidence of contact dermatitis is considered quite high, where there are four cities/districts with prevalence above the national prevalence of 6.8%, namely Bau-Bau City, Wakatobi,

Kendari, and North Kolaka. Meanwhile, the prevalence of contact dermatitis in Muna Regency was 5.4% <sup>2</sup>.

Data from the Muna Regency Health Office shows that the prevalence of contact dermatitis has increased every year. Where in 2017 the prevalence of dermatitis was 10.2% who sought treatment at the Public health center, in 2018 the prevalence was 12.89%. who sought treatment at the Public health center. And in 2019 the prevalence of cases who sought treatment at the public health center was 14.89% <sup>3</sup>. Meanwhile at Wapunto Health Center, contact dermatitis is always a disease that is included in the top 10 diseases with the

highest incidence. Where in 2018 the prevalence of dermatitis was 22.3% of patients per 1000 population, in 2019 the number of prevalence cases was 29.4% and in 2020 the prevalence of cases was 35.2% <sup>4</sup>.

Contact dermatitis can cause skin disorders with symptoms such as itching characterized by patches, rashes, skin thickening and inflammation <sup>5</sup>. There are various factors that influence the incidence of contact dermatitis in fishermen, which is why dermatitis is called a multifactor disease. Lack of attention to personal hygiene in fishermen is the cause of contact dermatitis, where fishermen do not pay attention to their personal hygiene, especially hand hygiene and work clothes. Bad contact habits, because the longer the contact occurs, the greater the likelihood of inflammation or irritation so that it triggers abnormalities in the skin. In addition, allergic history is also one of the causes that risks making the skin more sensitive to dermatitis and fishermen who do not pay attention to the use of Personal Protective Equipment (PPE) when going to sea are causes that can trigger contact dermatitis in fishermen <sup>6</sup>.

The results of initial observations that have been made, found that most fishermen have experienced symptoms of contact dermatitis, such as red and dry skin, itching on the surface of the skin, and thickening of the skin, especially on the hands and feet. Meanwhile, from the results of open interviews, it was found that they have a habit of long contact and sometimes long in a wet state in the sea and then under the heat of the sun, there are also fishermen who do not pay attention to personal hygiene such as not washing hands and feet with soap after work, not changing work clothes after going to sea. There are also fishermen who do not use PPE, such as work shoes and gloves. This condition triggers the onset of contact dermatitis infection in fishermen.

The purpose of this study was to determine the factors related to contact dermatitis disease in fishermen in the Working Area of Wapunto Public Health Center, Muna Regency.

## METHOD

This research is observational quantitative research using a Cross-Sectional Study design. This research was conducted

from February 2 to March 2, 2021, in the Wapunto Health Center Working Area, Muna Regency. The population in this study were all people who worked as fishermen in the Wapunto Health Center Working Area, as many as 255 families with a sample size of 72 families. The research sampling technique used the Cluster Random Sampling technique. Data collection was done using a questionnaire sheet. Data analysis using the Chi-square test, then the data is presented in tabular form and narrated.

## RESULTS

**Table 1. Frequency Distribution Based on Respondent Characteristics in the Work Area of the Wapunto Health Center, Muna Regency**

Characteristics	n	%
Age		
≤ 30	30	41,7
> 30	42	58,3
Education		
Finished Elementary School	37	51,3
Finished Junior High School	25	34,7
Finished High School	10	13,9
Total	72	100,0

**Table 2. Frequency Distribution Based on the Incidence of Contact Dermatitis, Length of Contact, Personal Hygiene, History of Allergies, and Use of PPE in the Work Area of the Wapunto Health Center, Muna Regency**

Variable	n	%
Contact Dermatitis		
Did not Suffer	32	44,4
Suffered	40	55,6
Length of Contact		
Infrequent	29	54,2
Frequent	43	45,8
Personal Hygiene		
Good	30	41,7
Poor	42	58,3
History of Allergies		
Without	48	66,7
With	24	33,3
Use of PPE		
Used	28	38,9
Did not use	44	61,1
Total	72	100,0

The characteristics of respondents in table 1 show that of the 72 respondents studied, the age group > 30 years of 42 (58.3%) respondents was more than the age ≤ 30 years of 30 (41.7%) respondents. The distribution of

respondents' education, the most was the elementary level as many as 37 (51.3%) respondents and the least was at the high school level, namely 10 (13.9%) respondents.

The distribution of research variables in table 2 shows that out of 72 respondents, 32 (44.4%) of them did not suffer from contact dermatitis and 40 (55.6%) respondents suffered from contact dermatitis. Based on the length of contact, there were 29 (54.2%) respondents who had infrequent contact as fishermen and there were 43 (45.8%) respondents who had frequent contact as fishermen. Based on personal hygiene, there were 30 (41.7%) respondents with good personal hygiene and 42 (58.3%) respondents with poor personal hygiene. Based on allergy history, there were 48 (66.7%) respondents without allergy history and 24 (33.3%) respondents with allergy. Based on the use of PPE, there were 28 (38.9%) respondents

who used and 44 (61.1%) respondents who did not use.

Based on the length of contact with the incidence of contact dermatitis in fishermen in table 3, it is known that among 29 respondents who had a rare length of contact there were 7 (24.1%) respondents who suffered from contact dermatitis. Whereas among 43 respondents who had frequent contact duration there were 33 (76.7%) respondents who suffered from contact dermatitis. The Chi Square test results obtained the value of  $X^2_{count} > X^2_{Tabel}$  (19.412 > 2.705), so the alternative hypothesis is accepted, thus there is a relationship between the length of contact with the incidence of contact dermatitis of fishermen in the Wapunto Health Center Working Area. Furthermore, the value of  $\Phi (\phi) = 0.519$  which means that there is a moderate relationship.

**Table 3. Bivariate Analysis of the Relationship between Length of Contact, Personal Hygiene, History of Allergies, and Use of PPE with the Incidence of Contact Dermatitis in the Working Area of the Wapunto Health Center, Muna Regency**

Variable	Contact Dermatitis				Total		Statistical Test
	Did not Suffer		Suffered		n	%	
	n	%	n	%			
<b>Length of Contact</b>							
Infrequent	22	75,9	7	24,1	29	40,3	$X^2_{hit} = 19,412$ $X^2_{tab} = 2,705$ $\Phi = 0,519$
Frequent	10	23,3	33	76,7	43	59,7	
Total	32	44,4	40	55,6	72	100,0	
<b>Personal Hygiene</b>							
Good	24	80,0	6	20,0	30	41,7	$X^2_{hit} = 26,331$ $X^2_{tab} = 2,705$ $\Phi = 0,605$
Poor	8	19,0	34	81,0	42	58,3	
Total	32	44,4	40	55,6	72	100,0	
<b>History of Allergies</b>							
Without	28	58,3	20	41,7	48	66,7	$X^2_{hit} = 11,250$ $X^2_{tab} = 3,841$ $\Phi = 0,395$
With	4	16,7	20	83,3	24	33,3	
Total	32	44,4	40	55,6	72	100,0	
<b>Use of PPE</b>							
Used	24	85,7	4	14,3	28	38,9	$X^2_{hit} = 31,605$ $X^2_{tab} = 2,705$ $\Phi = 0,663$
Did not use	8	18,2	36	81,8	44	61,0	
Total	32	44,4	40	55,6	72	100,0	

Based on personal hygiene with the incidence of contact dermatitis in fishermen table 3, it is known that among 30 respondents who have good personal hygiene there are 6 (20.0%) respondents who suffer from contact dermatitis. While among 42 respondents who had personal hygiene there were 34 (81.0%) respondents who suffered from contact dermatitis. The Chi Square test results obtained the value of  $X^2_{count} > X^2_{Tabel}$  (26.331 >

2.705). So that the alternative hypothesis is accepted, thus there is a relationship between personal hygiene and the incidence of contact dermatitis of fishermen in the Wapunto Health Center Working Area. Furthermore, the value of  $\Phi (\phi) = 0.605$  which means there is a strong relationship.

Based on the history of allergies with the incidence of contact dermatitis in fishermen in table 3, it was found that among 48

respondents without a history of allergies there were 20 (41.7%) respondents who suffered from contact dermatitis. While among 24 respondents with a history of allergies there were 20 (83.3%) respondents who suffered from contact dermatitis. The Chi Square test results obtained the value of  $X^2_{count} > X^2_{tabel}$  (11.250 > 3.841) so that the alternative hypothesis is accepted, thus there is a relationship between allergic history and the incidence of contact dermatitis in fishermen in the Wapunto Health Center Working Area. Furthermore, the value of Phi ( $\phi$ )=0.395 which means that there is a weak relationship.

Based on the use of PPE with the incidence of contact dermatitis in fishermen in table 3, it shows that among 28 (38.9) respondents who used PPE there were 4 (14.3%) respondents who suffered from contact dermatitis. Meanwhile, among 44 (61.0) respondents who did not wear PPE, 36 (81.8%) respondents suffered from contact dermatitis. The Chi Square test results obtained the value of  $X^2_{count} > X^2_{tabel}$  (31.605 > 2.705), so the alternative hypothesis is accepted, thus there is a relationship between the use of PPE and the incidence of contact dermatitis in fishermen in the Wapunto Health Center Working Area. Furthermore, the value of Phi ( $\phi$ ) = 0.663 which means that there is a strong relationship.

## DISCUSSION

Length of Contact is the time span of a person in contact with materials containing chemicals either in a period of hours or days. The length of contact for workers each day is always different depending on the type and process of work. The longer the worker is in contact with chemicals or allergens, the more likely it is that irritation or inflammation of the skin can occur which triggers skin disorders. Generally, the time span of a person working in one day is 8 hours <sup>7</sup>.

There are respondents who have a length of contact rarely but suffer from the incidence of contact dermatitis, it is known from the results of interviews that when going to sea do not pay attention to personal hygiene such as bathing immediately after work, washing work clothes and not wearing Personal Protective Equipment (PPE) such as the use of work shoes, gloves to avoid irritation of the skin that can cause contact dermatitis when going to

sea. In addition, there are respondents who have frequent contact but do not suffer from contact dermatitis. From the results of the interview, it is known that even though the respondents have frequent contact with irritants, the respondents wear personal protective equipment such as using gloves, work shoes and glasses and apply good personal hygiene so that the respondents are not at risk of suffering from contact dermatitis.

The existence of a relationship between the length of contact with the incidence of contact dermatitis in fishermen is basically related to the working hours of respondents who have exceeded the standard of normal working hours, namely 8 hours / day. From the research results, it is known that normally fishermen catch fish at sea for less than 8 hours. But there are other activities, such as collecting fish from the net to the shelter until the fishermen return to the mainland to sell the caught fish. Where these activities are carried out with the body and clothes used are wet, due to long hours of activity. This is what triggers the onset of dermatitis, due to the growth of fungi or marine animals. Working in wet and humid places can trigger fungi to multiply, which can risk the occurrence of contact dermatitis in fishermen.

Agreed with research done Induha Village with a p-value = 0.027 at a confidence level of 95% or  $\alpha = 0.05$  which means that there is a significant relationship between the length of contact with the incidence of contact dermatitis in fishermen in Induha Village, Latambaga District, Kolaka Regency <sup>1</sup>.

Maintaining personal hygiene, including proper handwashing practices, is a crucial preventive measure to minimize the incidence of contact dermatitis. However, it is important to highlight that errors during handwashing can actually serve as triggers for dermatitis, particularly when hands are not thoroughly cleaned and remnants of chemicals remain on the skin surface <sup>8</sup>.

Handwashing with soap and water is an effective method to remove dirt, irritants, and potential allergens from the hands, reducing the risk of dermatitis. However, incomplete or inadequate handwashing can lead to the persistence of harmful substances on the skin, which can cause or exacerbate dermatitis symptoms <sup>9</sup>.

There are respondents with good personal hygiene but suffer from contact dermatitis, due to other factors that can cause

contact dermatitis, for example respondents have a long contact with seawater for more than 8 hours so that they often come into contact with irritants, which can trigger contact dermatitis, even though they always maintain good personal hygiene. In addition, there are respondents with poor personal hygiene but do not suffer from contact dermatitis, because respondents do not have long contact with irritants and respondents also use boots, glasses and gloves when going to sea so that respondents are not at risk of suffering from contact dermatitis.

The relationship between personal hygiene and the incidence of contact dermatitis in fishermen is basically related to the unsanitary working environment of the respondents and the inadequate facilities available, which makes fishermen not care about their personal hygiene. The habit of bathing and washing hands and feet is very meaningful considering that these parts of the body are often in direct contact with irritants. Meanwhile, poor hand and foot washing habits can worsen the skin condition, especially for skin that has previously been infected with dermatitis. The same applies to cleaning work clothes, as residue from irritants left on clothes can risk causing infection to the body if worn repeatedly without cleaning first. In washing work clothes, it is also necessary to separate them from the clothes of other family members so that they are not contaminated with residues of irritants or allergens.

In agreement with research by <sup>10</sup> which states that if someone always maintains personal hygiene well, it will reduce the risk of skin disorders compared to respondents with poor personal hygiene. Also agree with research by <sup>11</sup> which states that there is a relationship between personal hygiene and the incidence of dermatitis in fishermen in Pamandati Village, Laine District.

Allergy is an abnormal response to a material that exists in everyday life. Various kinds of allergic diseases often appear, such as allergies to dust, drug allergies, food allergies and allergies to certain animals. A history of allergies can also be one of the causes of the skin becoming more sensitive to dermatitis skin disease <sup>12</sup>.

There were respondents with no history of allergy but suffered from contact dermatitis. This is caused by other factors, such as lack of attention to personal hygiene such as sharing

towels with fellow workers who suffer from dermatitis and the use of water that is not in accordance with health requirements. In addition, respondents did not use complete PPE when going to sea, for example not using gloves and boots. In addition, there are respondents who have a history of allergies, but do not suffer from contact dermatitis. This is related to the respondents who went directly to the health service to conduct a self-examination when an allergic reaction appeared, so that the health center immediately examined and gave medicine to the respondents. In addition, respondents used complete PPE when going to sea. This makes respondents avoid dermatitis even though they have a history of allergies.

The relationship between allergy history and the incidence of fishing contact dermatitis is basically related to the allergies that respondents have. Respondents who have allergies while at sea are more at risk of dermatitis due to direct contact with irritants.

In line with research conducted on Bajo tribe fishermen in Lora Village, Mataoleo District, Bombana Regency, which obtained a value of  $X_2 = 6.786 > X_2 = 3.841$ . This shows that there is a relationship between allergic history and the incidence of dermatitis in fishermen <sup>13</sup>. This finding also aligns with research done to find the risk factor of dermatitis among healthcare worker which state that individuals with a pre-existing history of allergies tend to experience more severe symptoms and a higher intensity of dermatitis compared to those without allergies. The presence of allergies can exacerbate the inflammatory response triggered by contact with irritants in the fishing environment, leading to a more pronounced dermatitis reaction <sup>14</sup>.

By establishing a clear connection between allergies and contact dermatitis, the study's results emphasize the importance of considering individual allergic histories when assessing the risk of dermatitis in this specific occupational group. The direct exposure to irritants in the environment can exacerbate allergic reactions, leading to an increased likelihood of developing dermatitis <sup>15</sup>.

Personal Protective Equipment (PPE) is a set of equipment used by workers to ensure that part or all of their body is protected from the risk of accidents that can arise when working. A worker who uses PPE in accordance with the rules, eating this can reduce the risk of

dermatitis, both the amount and time span of contact dermatitis. Conversely, if workers who rarely and do not wear PPE according to the rules, there will be a greater risk of contact dermatitis, compared to workers who obey wearing PPE.

There are respondents who wear PPE properly, but experience the incidence of contact dermatitis. This is because workers do not apply good personal hygiene such as washing hands and between fingers, washing work clothes, showering after work. In addition, there are respondents who do not wear PPE but do not experience contact dermatitis. This is because workers do not have prolonged contact with seawater under the sun which can cause skin irritation. The relationship between the use of PPE and the incidence of contact dermatitis means that the use of PPE is a risk factor for the incidence of contact dermatitis in fishermen. Where respondents who use PPE correctly and according to the rules have a low risk compared to fishermen who do not use PPE. This is because fishermen are in direct contact with seawater and irritants for a long period of time, namely more than 8 hours / day.

The results of this study are in line with research conducted by <sup>16</sup> with the title Analysis of Factors of Contact Dermatitis Incidence in Fishermen. The Chi Square test results obtained a value of  $p = 0.000$  which means there is a meaningful relationship between the use of PPE and the incidence of contact dermatitis.

The existence of a relationship between the regular use of PPE and the incidence of contact dermatitis, means that if workers do not wear PPE, there is a high risk of contact dermatitis, while workers who already wear PPE can also be at risk of suffering from contact dermatitis due to the use of PPE that does not meet standards, for example the use of work shoes that are translucent and below the knee of the knee which causes seawater to enter on the surface of the skin and hand protection that is not waterproof <sup>17</sup>. Working in a wet place can cause humid conditions on the skin, the use of PPE that does not meet usage standards will make the skin unprotected so that it will be easy for allergens or irritants to irritate the skin surface which is at greater risk of contact dermatitis.

## CONCLUSION

This study concluded a relationship

between the length of contact, personal hygiene, history of allergies, and the use of PPE with the incidence of contact dermatitis of fishermen in the Wapunto Health Center Working Area, Muna Regency.

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## CONFLICTS OF INTEREST

The authors state that there are no conflicts of interest.

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## ***Mapping of Important HIV/AIDS Hotspots in Palu City Following Natural Disaster***

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### **ABSTRACT**

*This study aims to obtain a map of the distribution of HIV and AIDS Key Population Hotspots based on the criteria for MSM, Waria and FSW after the natural disaster in 2018. The remapping method uses a Geographic Information System (GIS) application. The data processing technique uses the waterfall model scheme, namely, completing the application in a structured or sequential manner, where a stage must be completed first before going to the next stage. No Ethical consideration is needed. The shift in key population hotspot data from 2017 and to 2022 data and then Natural Disasters (Earthquake, Liquefaction and Tsunami) in 2018 had an impact on geographical location shifts with conditions in 2017, 4 Districts became key population hotspot locations with 29 hotspots while in 2022 14 key population hotspots were found consisting of 5 sub-districts, so there was an additional 1 sub-district which became a geographically shifting hotspot. Features of activity hubs centered on major population centers, such as hotels, boarding houses, salons, cafés, clubs, city parks, and malls in 2017; in 2022, other amenities like laundry will be included. Male Fellow (MSM), Female Sex Workers (FSW), and Transgender are the features of the major population hotspots since 2017, however in 2022 Natural Disasters (Earthquake, Liquefaction, and Tsunami) in 2018 did not suffer a shift.*

**Keywords:** Key Population Hotspots, HIV and AIDS, Post-Disaster

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### **INTRODUCTION**

Initiation of antiretroviral therapy (ART) at or soon after HIV diagnosis and sustained viral suppression substantially reduces HIV transmission<sup>1,2,3</sup> and HIV-related morbidity and mortality<sup>4</sup>. In 2014, the Joint United Nations Programme on HIV/AIDS (UNAIDS) set ambitious global targets to achieve HIV epidemic control, recommending programs aimed at 90% of people living with HIV (PLHIV) knowing their HIV status, 90%

of people diagnosed with HIV infection receiving sustained ART, and 90% of people receiving ART to achieve viral suppression<sup>5</sup>.

Key populations are groups at risk of contracting or transmitting HIV caused by unsafe sex or the use of unsterile injecting drugs. In HIV and AIDS prevention and control programs, key populations are defined as people or groups whose social situations or behaviors make them vulnerable or at risk of being exposed to or exposing HIV to people in the group or outside the group. HIV and AIDS

risk behavior can carry a high risk of contracting HIV infection to oneself or others. These behaviors include sexual intercourse with multiple partners without a condom, using needles and syringes (insul), or non-sterile medical equipment, which may be contaminated with other people's blood, both on oneself and others, and receiving blood transfusions from the infected <sup>6</sup>.

The risk of HIV infection varies depending on the type of sexual activity. Anal and vaginal sex without a condom are the highest-risk modes of sexual transmission of HIV. For unprotected anal sex with an HIV-positive partner, the estimated risk of infection per act ranges from 0.06 to 0.82%, depending on the role in the sexual relationship (giver or receiver), insertive/giver or receptive/receiver <sup>7</sup>.

A meta-analysis study of heterosexual HIV transmission found that in high-income countries, before combination ARV therapy was introduced, the risk of transmission with any sexual intercourse was 0.04% if the female partner was HIV-positive and 0.08% when the male partner was HIV-positive. This rate is much higher in low-income countries if the HIV-positive partner is in the early or late stages of HIV infection, or if one partner has an STI. In vaginal sex, the risk of infection is greater for women with HIV-positive male partners than men with HIV-positive female partners <sup>8,9,10</sup>.

Sexually transmitted infections also increase the risk of HIV infection by more than two-fold for someone who has sex with an HIV-positive heterosexual person <sup>11,12</sup>, and more than double the likelihood of HIV-positive transmission to their sexual partner <sup>13,14</sup>. Condom use consistently reduced the risk of contracting STIs and HIV. Condom protection in HIV infection through insertive anal sex with an HIV-positive partner is 63%, receptive anal sex with an HIV-positive partner is up to 72%, and vaginal sex is up to 80% <sup>13,15</sup>.

Indonesia's high Disaster Risk Index (IRB) encourages the government to pay extra attention to disaster management efforts. According to the 2015-2019 National Medium-Term Development Plan, the BNPB targeted a 30% reduction in IRB by the end of 2019. Various efforts have been made by the BNPB to achieve this target, starting from increasing disaster management capacity in priority areas, in collaboration with ministries and other institutions, to formulate guidelines for

implementing new disaster management. However, in the midst of disaster management efforts carried out by the government and related institutions, one central issue generally escapes discussion. The issue is related to reproductive health services during emergencies. Disasters have a significant impact on the reproductive health of affected residents, particularly women, children, and youth. Damage to health infrastructure hampers comprehensive reproductive health services. Limited access to contraception in a disaster situation can increase the number of unwanted pregnancies and the incidence of STIs and HIV. Additionally, unstable post-disaster social conditions can increase the risk of sexual violence.

Indonesia's geographical, demographic, sociological, meteorological, and climatological dynamics not only make it rich in natural resources, but also make it prone to disasters (natural, non-natural, and social). This condition can be used as a laboratory to produce disaster experts, knowledge, and technology in Indonesia <sup>16</sup>. The history of disasters in Indonesia shows that the number of incidents and victims is increasing and complex <sup>17,18</sup>, which requires a reliable disaster management and disaster risk management system <sup>19</sup>. The Palu City Health Office report, February 2, 2018, stated that 98 residents of Palu City died as a result of contracting HIV and AIDS.

The Palu City Health Office noted that there were 1,114 cases of HIV and 662 AIDS cases. The highest number of cases was found to be dominated by youth aged 19-35 years, with an increasing trend occurring in housewives. He emphasized that efforts to strengthen preventive socialization activities, diagnosis systems, treatment systems, and patient rehabilitation, both within the family and in the community, are steps to be taken, and these activities are expected to have no new HIV and AIDS infections and no more discrimination against HIV and AIDS sufferers <sup>6</sup>.

This study aims to analyze the geographical and social mapping of HIV and AIDS Key Population Hotspots in Palu City and then create a Key Population Hopspot map to control and prevent HIV and AIDS in Palu City.

## METHOD

The research was conducted in Palu City for six months from April 2022. The population and research samples of 29 HIV and AIDS Key Population Hotspots were obtained from the 2017 Palu City Health Office report before the Natural Disaster (2018 Earthquake, Liquefaction and Tsunami in Palu City). Determination of the sample size by selecting the entire population (total sample).

The research method to obtain precise and accurate data for completeness in creating a Geographic Information System (GIS) is carried out in several steps. The research method is carried out, namely determining the type of research data, determining the data collection method, and determining the data processing techniques used; there are some data needed to making geographic information systems: primary data, obtained directly at the target of the research object. The data included information on the location of Key Population Hotspots, description of hotspot characteristics, the location of the latitude and longitude lines, and the location of activities (addresses) around the location using a cell phone GPS tool. Secondary data are obtained by the Health Service profile, which accommodates HIV and AIDS data in Palu City, which supports research. In completing the research obtained from the media library on the theory of application systems used in making regional geographic information system application programs in Palu City based on the web.

Data collection methods were as follows: 1) Observation, by carrying out field visits to Key Population Hotspots obtained from initial information from the Health Office, HIV and AIDS Community Liaison Officers, and partner reports (community observers of HIV and AIDS in Palu City including Community Reports, Police Reports, and NGO Reports. Searching for data by means of coming directly to the hotspot location, which is the target of the research object, data will be obtained regarding the images that will be included in the application and also the location points of the research object; 2) Interview: Collecting data by interviewing several people who become contact persons who understand the object of research. In this way, the writer can choose the best route to the location and find the location without losing much time while collecting data. 3) Library Studies:

collection of data and information, as well as knowledge obtained from books and websites on the Internet regarding the theory concerned in making applications.

Data processing techniques use the waterfall model scheme, namely, making applications complete in a structured or sequential manner, where a stage must be completed first before moving on to the next stage. If the first step is not completed, the second step cannot be performed. If the second step has not been completed, then the third step cannot be completed, and so on.

## RESULTS

The HIV and AIDS epidemic in Indonesia is concentrated. This means that transmission occurs mostly in key population groups who are vulnerable to infection because they are involved in risky behavior and have more than one sexual partner, such as female sex workers (WPS) and injecting drug users (IDUs/IDUs). Transmission in key populations can 'cross over' to the general population with the existence of bridge groups such as customers of sex workers who can infect their partners. Ultimately, the HIV and AIDS epidemic could spread to the general population if prevention was not implemented.

In the HIV and AIDS prevention and prevention program, data regarding the number and location of key HIV-affected populations (hereinafter abbreviated as "key populations") in Palu City so that treatment activities can be carried out on the target. To obtain this data, it is necessary to carry out mapping, which is one way to determine the number and location of key HIV and AIDS hotspots in Palu City. The mapping of key populations in Palu City in 2022 is an update of previous mapping. This needs to be done because the number of key populations is always dynamically fluctuating, bearing in mind that the mobility factor or overtour of key populations both between regions in Palu City and from and out of Palu City is quite high. In addition, the update also aims to identify existing conditions with the possibility of new hotspots emerging, targeting four key populations namely Men-Male (MSM), transgender Waria, and Female Sex Workers (FSW).

Concentrated epidemic control efforts include providing access to testing, prevention, and treatment services when key populations

require them. HIV and AIDS must be dealt with quickly and prevent from spreading to the general population through bridge populations. Identification and estimation of the size of key populations is important to provide an overview of the epidemic situation, and then be used as a reference in the preparation of coping strategies, planning, and budgeting of activities. Key population mapping is the first step in calculating estimates. The estimated number of key populations will be used as input to calculate the projected growth of the key populations. Projections need to be calculated because the life expectancy of people infected with HIV is improving with antiretroviral treatment. Thus, it will have an impact on financing prevention programs and health services for people infected with HIV.

Based on the Regulation of the Minister of Health Number 43 of 2016 concerning MSS in the Health Sector, which contains 12 types of basic services that must be carried out by the Regency/City Governments, point 12 states the target of Health Services for People at Risk of HIV Infection. The achievement of SPM is directed more to the authority of the Regional Government. The concept of SPM becomes Regional Government Performance; therefore, in this case, the Bandung City Government must ensure the availability of sufficient resources (facilities, infrastructure, tools, labor, and money/costs) so that the process of implementing SPM runs adequately. SPM is a provision regarding the type and quality of basic services, which are mandatory government affairs that every citizen is entitled to receive. The SPM is the minimum that must be carried out by the Regional Government for its people, so the SPM target must be 100% every year.

Mapping data collection was implemented for six months, starting from March 2022 to August 2022. The mapping data collection was carried out in Palu City. Mapping was carried out in collaboration with the Palu City Health Office and the Research Team from the Faculty of Public Health under the control of the Tadulako University Research and Community Service Institute. After conducting research on Social Mapping of Key Population Hotspots, the following data is obtained.

**Table 1. Data on Hotspot Distribution of HIV and AIDS Key Populations Prior to Natural Disasters (Earthquake, Liquefaction and Tsunami) in 2017**

NO	District	Hotspot	Location
1	Palu Timur	W Café	Jl. Tadulako
2	Palu Timur	C Salon	Jl. R.E Martadinata
3	Palu Timur	Hotel PI	Jl. M. Thamrin
4	Palu Timur	D Karaoke	Jl. Sigma
5	Palu Timur	F Karaoke	Jl. Thamrin Atas
6	Palu Timur	A Salon	Jl. Tombolotutu
7	Palu Timur	A Salon	Jl. Terkukur
8	Palu Timur	GYM D	Jl. Kotamso
10	Palu Timur	J Salon	Jl. Haji Hayun
11	Palu Selatan	S Salon	Jl. Tg. Karang
12	Palu Selatan	Kompleks Masomba	Jl. Tg. Pangimpunan
13	Palu Selatan	Cendrawasih	Jl. Cendrawasih
14	Palu Selatan	GYM M	Jl. Emi Saelan
15	Palu Selatan	Kompleks Purnawirawan	Jl. Purnawirawan
16	Palu Selatan	Taman Kota	Jl. W. Monginsidi
17	Palu Selatan	Gang Doly	Samping Mall Tatura
18	Palu Barat	Salon Mega	Jl. Nangka
19	Palu Barat	Salon Mimi	Jl. Sis. Al-Jufrie
20	Palu Barat	Salon Mega	Jl. Nangka
21	Mantikolore	Kompleks Pemancar	Jl. R.E Martadinata
22	Mantikolore	T Kafe	Jl. Cut Mutia
23	Mantikolore	Pantai Talise	Jl. Cut Mutia
24	Mantikolore	T Café	Jl. Balai Kota Selatan
25	Mantikolore	HT Salon	Jl. Hangtua
26	Mantikolore	Vatulemo	Walkot
27	Mantikolore	K Café	Jl. Prof Moh Yamin
28	Mantikolore	Eks Lokalilasasi Tondo	Jl. Dayoh Dara
29	Mantikolore	F Salon	Jl. Veteran

Table 1 shows an overview of HIV and AIDS Key Population Hotspots in Palu City in 2017 of the 29 Main Hotspots, consisting of nine Key Population Hotspots in the East Palu District area, seven Key Population Hotspots in the South Palu District area, three Key Population Hotspots in the West Palu District, and ten Key Population Hotspots in the Mantikolore District area. After the post-disaster re-mapping of Natural Disasters (Earthquake, Liquefaction and Tsunami) in 2022, the following data were found for HIV and AIDS Key Population Hotspots in Palu City:

**Table 2. Data on Hotspot Distribution of Key Populations of HIV and AIDS after Natural Disasters (Earthquake, Liquefaction and Tsunami) were based on the category of men who have sex with men (MSM).**

NO	District	Hotspot	Location
1	Palu Timur	Mr. D	Jl. Katamso
2	Palu Timur	Kampung Nelayan	Jl. Kaombona
3	Palu Timur	Swalayan B	Jl. S Parman
4	Palu Timur	D” Prem	Jl. Hangtua
5	Palu Timur	Café BC	Jl. Jabal Nur
6	Palu Timur	Hutan Kota	Jl. Jabal Nur
7	Palu Timur	Perdos	Jl.Tugu Perdamaian
8	Palu Timur	Citraland	Jl. RE Martadinata
10	Palu Timur	Gym T	Jl. Roviga
11	Palu Timur	Café 1xx	Jl. Setia Budi
12	Palu Barat	Mall PGM	Jl. Diponrgoro
13	Palu Barat	Kost Ed	Jl. Asam Dua
14	Palu Selatan	Gym M	Jl. Emi Saelan

Table 2 provides an overview of HIV and AIDS Key Population Hotspots in the category of men having sex with men in Palu City in 2022. There are as many as 14 hotspots, with 11 Main Hotspots in East Palu District, at least one Main Hotspot is in the South Palu Subdistrict, and two Hotspots are in West Palu District.

**Table 3. Data on Hotspot Distribution of Key Populations of HIV and AIDS After Natural Disasters (Earthquake, Liquefaction andTsunami) Based on Waria Category**

NO	District	Hotspot	Location
1	Palu Timur	A Salon	Jl. Tombolotutu
2	Palu Timur	C Salon	Jl. R. E Martadinata
3	Palu Timur	Lorong Tekukur	Jl. Tekukur
4	Palu Timur	Jl. Pramuka	Jl. Pramuka
5	Palu Timur	E Club	Jl. Thamrin Bawah
6	Mantikulore	F Salon	Jl. Veteran
7	Mantikulore	CH Salon	Jl. Merpati
8	Mantikulore	Taman Vatulemo	Jl. Balai Kota
10	Mantikulore	F Karaoke	Jl. Thamrin Atas
11	Palu Selatan	Gang Doly	Samping Mall Tatura
12	Palu Selatan	Kompleks Masomba	Jl. Tg Pangimpuan

13	Palu Selatan	L Laundry	Jl. Cendrawasih
14	Palu Barat	Kompleks Impres	Jl. Labu

Table 3 shows information on the Key Population Hotspots for HIV and AIDS with the transgender category in Palu City in 2022 as many as 14 of the most Hotspots with 5 Main Hotspots in East Palu District, 4 Main Hotspots are in the working area of Mantikulore Sub-District, 3 Main Hotspots are in the working area of Palu Sub-District South and at least 1 Main Hotspot is in the working area of West Palu District.

**Table 4. Data on Hotspot Distribution of Key Populations of HIV and AIDS after Natural Disasters (Earthquakes, Liquefaction and Tsunami) Based on the category of Female Sex Workers**

NO	District	Hotspot	Location
1	Palu Timur	PI Hotel	Jl. M. Thamrin
2	Palu Timur	D Karaoke	Jl. Sigma
3	Palu Timur	F Karaoke	Jl. Thamrin Atas
4	Palu Timur	E Club	Jl. Thamrin Bawah
5	Palu Timur	PL Café	Jl. Hangtua
6	Palu Timur	XX Club	Jl. Setia Budi
7	Palu Selatan	Komp. Purnawirawan	Jl. Purnawirawan
8	Palu Selatan	B Hotel	Jl. Basuki Rachmat
10	Palu Selatan	Hapy Pupy	Jl. Emisaelan
11	Palu Selatan	G Kost	Jl. Garuda
12	Mantikulore	Eks Lokalilasaki Tondo	Jl. Dayoh Dara
13	Mantikulore	Kompleks Pemancar	Jl. R.E Martadinata
14	Ulujadi	DM Club and lounge	Jl. Manonda

Table 4 shows the distribution of HIV and AIDS Key Population Hotspots in Palu City in 2022, as many as 14 Main Hotspots, consisting of six Key Population Hotspots in the East Palu District area, which is the largest District Area, four Key Population Hotspots in the South Palu District area, two Key

Population Hotspots in the Mantikolore District area, and one key population hotspot in the Ulujadi district area.

## DISCUSSIONS

### Distribution of HIV and AIDS Key Population Hotspots in Palu City Before the Disaster

Geographical mapping of key population hotspots in Palu City was obtained through a Geographic Information System application for all key population hotspots. The number of key population hotspots in Palu City before the liquefaction earthquake and tsunami occurred was 29 points, the most mapped of which were in the Mantikolore District 10 hotspots and the second order were 9 hotspots in the East Palu sub-district, generally spread over five sub-districts in the City Palu, namely seven hotspots in the South Palu District and three hotspots in the West Palu District area, which consists of 13 sub-districts in Palu City in 2022.

Key population hotspots were spread across the four sub-districts in Palu City. Many hotspots are located in the city center, especially in men. The figure below shows how key populations were distributed in Palu City before the natural disaster (the Earthquake, Luckifaksi and Stunami).

The Mantikolore sub-district was divided into eight sub-districts: Kawatuna, Lasoani, Layana Indah, Poboya, Talise, Talise Valangguni, Tanamodindi, and Tondo. The key population hotspot distribution map in Figure 2 shows that there are 15 key population hotspots. Mantikolore mortality ranks the highest in the distribution of key population hotspots, where there are three main hotspot criteria: MSM, FSW, and waria, who are active in karaoke places, salons, gyms, and cafes, as well as city parks.

Based on its geographical position, East Palu is bordered by the North of Palu Bay and Mantikolore District; South - South Palu; West - Kec. West Palu, East Kec. Mantikolore. East Palu District consists of five villages: West Besusu, Central Besusu, East Beusu, North Lolu, and South Lolu. The East Palu District is one of the oldest sub-districts in Palu City, with a land area of 7.71 km<sup>2</sup>. The East Palu District is located in the middle of Palu City, with the capital being the West Besusu sub-district. If

one observes from Figure 2 the key population hotspot distribution map, there are ten key population hotspots. The East Palu neighborhood ranks second in the distribution of key population hotspots, where there are three main hotspot criteria, namely MSM, FSW, and waria, who are active in karaoke, salons, gyms, and cafes, as well as the City Forest.

The South Palu District consists of five sub-districts: South Birobuli Sub-District, Petobo Sub-District, North Birobuli Sub-District, North Tatura Sub-District, and South Tatura Sub-District. South Palu District, which is part of Palu City, has administrative boundaries as follows: North side, East side, South side West side, Borders with East Palu District, Borders with Mantikolore District, Borders with Sigi Biromaru District, Sigi Regency: Borders with Tatanga District, If Observed in Figure 2, there are 7 key population hotspot distribution maps

West Palu District consists of 6 sub-districts, namely: Ujuna Sub-District, Baru Sub-District, Siranindi Sub-District, Kamonji Sub-District, Balaroa Sub-District, Lere Sub-District. West Palu District is part of Palu City and has the following administrative boundaries: north-side east side south-west side, Borders with Ulujadi District, Borders with East Palu District, Borders with Tatanga District, Borders with Donggala Regency and Sigi Regency.

The land area of West Palu District is 8.28 km<sup>2</sup> consisting of six sub-districts that extend from east to west, all of which can be accessed using four-wheeled or two-wheeled vehicles. The characteristics of the West Palu District area according to elevation (height above sea level (DPL), which is between 0 and 15 m) are measured based on the location of the sub-district office. The entire area is land and its morphology is relatively flat. Areas directly adjacent to the sea or coastal areas, namely Kelurahan Lere, whereas the other areas are not coastal areas. As shown in the distribution map of key population hotspots in Figure 2, there are three key population hotspots. Kematan Palu Barat ranks fourth in the distribution of key population hotspots, with 3 main hotspot criteria, namely FSW and waria, whose activities were in salons, gyms and boarding houses and malls Map of Distribution of HIV and AIDS Key Population Hotspots before the disaster (Earthquake, Liquefaction and



Tsunami) as follows:



**Figure 1. Distribution of Key Population Hotspots by District in Palu City Before Natural Disasters (Earthquake, Liquefaction and Tsunami)**

After the 2022 post-natural disaster (earthquake, liquefaction, and tsunami) remapping was carried out, an overview of key population HIV and AIDS hotspots in Palu City was obtained, then continued by comparing the 2017 data to the 2022 data, and a shift in the number of key population hotspots that could be identified was found. Judging from the distribution of hotspot data in 2017, there were

29 hotspots spread across the four districts in Palu City. In 2022, the distribution of hotspot data totaling 14 can be seen in Figure 2: Map of the distribution of Key Population HIV and AIDS Hotspots after the 2022 disaster (Earthquake, Liquefaction and Tsunami) based on MSM, Transgender and WPS criteria in Palu City, as follows:



**Figure 2. Distribution of Key Population Hotspots in Palu City After Natural Disasters (2018 Earthquake, Liquefaction and Tsunami) Based on MSM, Waria and FSW Criteria in 2022**



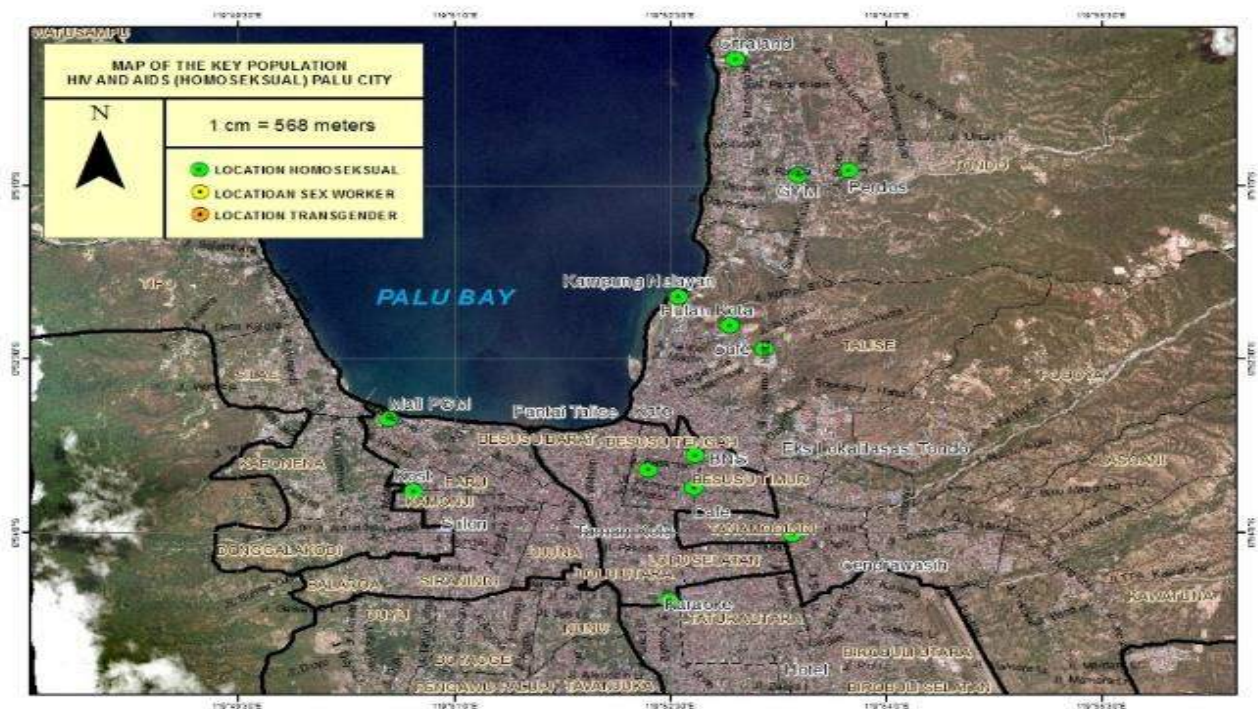
The distribution of key population hotspot data is 14 points in 2022 compared with the 2017 key population hotspot data, shifting both geographically and demographically based on hotspot characteristics and types of activity places. As a result of natural disasters (earthquakes, liquefaction, and tsunamis that occurred in 2018), the location and place of activity for key population hotspots have changed because of natural disaster situations that have had an impact on the economic, social, and environmental fields. Damage to infrastructure can disrupt social activities, casualties, ecosystem damage, and loss of shelter. The Central Sulawesi area is one of the earthquake-prone areas in Indonesia<sup>20,21</sup>, especially Palu City which is passed by the Palu Koro Fault, which is the main fault on Sulawesi Island and classified as an active fault<sup>22,23</sup>.

The earthquake disaster that occurred in Palu City on September 28 2018 at 15.00, with a magnitude of 6.1 Mw which rocked Palu City, resulted in the destruction of facilities and infrastructure on the Palu City Coast. The Lere coast is one of the areas that suffered considerable damage because it is located south

of Palu Bay, which allowed the tsunami to focus on that area. Communities living in coastal areas are vulnerable to various types of disasters, such as hurricanes, storms, tsunamis, and heavy rains.

The disaster claimed 2,045 lives and suffered a loss of 18.4 trillion, which was explained by the BNPB. The impact of the earthquake and tsunami disaster on the Lere coast of Palu City in the form of economic, social, and environmental factors. Disasters that occur in urban coastal areas, such as tsunamis, cause damage to roads, parking lots, construction sites, and buildings<sup>24,25</sup>. Disasters such as earthquakes also have an impact on asset damage, death and injury, loss of supplies, loss of communication, loss of power, loss of water services, loss of social services, loss of business, loss of social structures and functions<sup>26,27,28,29</sup>, and put forward the impact of disasters resulting in social damage that causes physical damage, loss or damage to property and infrastructure, psychosocial, socio-demographic, socio-economic, and socio-political disturbances.

**Distribution of HIV and AIDS Key Population Hotspots in Palu City after the Disaster (Earthquake, Liquefaction and Tsunami) based on MSM, Transgender and WPS criteria in 2022**



**Figure 3. Distribution of Population Hotspots based on Male-Male (MSM) criteria after Natural Disasters (Earthquake, Liquefaction and Tsunami) data for 2022**



The risks of communicable diseases and post-disaster deaths are generally due to several unavoidable conditions. First, the sudden occurrence of large-scale evacuations in a short time causes grouping of people at a certain point, with conditions as they are. Refugees usually have dense populations but do not have basic sanitation facilities and adequate drinking water. The BNPB released the number of refugees reaching 73 thousand people in 109 points, with inadequate services and facilities. Second, the damage to various health facilities, both hospitals and Puskesmas, as well as the limited supplies of medicines and health logistics, as well as personnel in the field, limited health services for disaster victims. In a disaster situation, health workers at the disaster site experience trauma and dilemmas. They are victims, but they also have to help others

because of their competence and expertise. The risk of refugees being infected with communicable diseases increases with a weakening of their physical condition. Decreased resistance of the human body increases the ability of germs to transmit diseases in a bad environment. Third, in an emergency, it is difficult to predict the end of this condition. It depends on the type and extent of the disaster, the affected population, and the severity of the impact caused by the disaster, both on humans and life support infrastructure, as well as how quickly relief efforts are taking place. Map of the distribution of HIV and AIDS Key Population Hotspots post-disaster (Earthquake, Liquefaction, and Stunami 2018) in 2022 based on MSM criteria in Palu City as follows:



**Figure 4. Distribution of Population Hotspots based on Transgender criteria after Natural Disasters (Earthquake, Liquefaction and Tsunami) in 2022**



**Figure 5. Distribution of Population Hotspots based on the criteria of Female Sex Workers (WPS) After Natural Disasters (Earthquake, Liquefaction and Tsunami) in 2022**

People living with HIV who are affected by disasters are also afraid of stigma and discrimination. Even in normal situations, stigma remains, particularly during disasters. It is impossible for many to admit "I am HIV" in a disaster evacuation tent. ARV drugs that are friends with PLWHA must be available in any situation, including during a disaster. There should not be a PLHIV who stops ARV because their psychological and physical conditions are very different. Therefore, the health protection for PLHIV must be completed. Disasters make people living with HIV more at risk of getting sick because their immune system decreases and they get sick and die. Natural disasters were confirmed as the main cause of the shift in key population hotspots. In addition to the problem of damage to infrastructure facilities, hotspots for key populations have also died, but this condition cannot be described in the results of this study because of the absence of tracing data on victims of natural disasters. related to HIV and AIDS key population hotspots in Palu City.

Based on the distribution of key population hotspots in Figure 3 and the mapping results using the Geographic Information System (GIS) application, information is obtained that the distribution of locations and conditions of hotspots is based on location characteristics, namely, GYM, Café, Salon, Karaoke Place, Boarding House, and Housing Complex and Mall. Using the criteria of Male to Male (MSM), Female Sex Workers (FSW), and Waria from the 14 main population hotspots in 2022.

The existence of key populations in the community as individuals or groups is dynamic and continuously changing, so the population size and social characteristics at each location or hotspot will also always change. Regarding the need for data for the implementation of HIV and AIDS prevention and control programs for key population groups, it is urgently necessary to update the location/hotspot mapping data, along with the number of key populations in each of these locations.

Mapping is a basic technique for gathering the information needed to plan interventions for MARPs. Program mapping is conducted to collect information on the magnitude of health problems and program coverage of existing services. The mapping that will be carried out is not only to obtain geographic information but also to obtain social data from each key population and the services

needed. Mapping is useful for describing the distribution and magnitude of a situation and problem in a particular area by utilizing the understanding of members of the population in that area (insider's perspective) in order to recommend a program that is appropriate and in accordance with the characteristics and needs of the region. Thus, mapping of key populations is a way to describe a characteristic social situation and risky behavior of key populations in an area.

HIV and AIDS risk behavior can carry a high risk of contracting HIV infection to oneself or others. These behaviors include sexual intercourse with multiple partners without a condom, using needles and syringes (insul), or non-sterile medical equipment, which may be contaminated with other people's blood, both on oneself and others, and receiving blood transfusions from the infected. Periodically, the Ministry of Health, through the Directorate General of Disease Control and Environmental Health, conducts Integrated Biological and Behavioral Surveillance (IBBS) to obtain an overview of the problem, risk factors, knowledge, and coverage of the HIV program in Indonesia. The 2011 IBBS aims to determine the prevalence of HIV and STIs (syphilis, gonorrhea, and chlamydia), knowledge related to HIV and AIDS, behavior at risk of contracting or transmitting HIV, and the scope of intervention programs for the most at-risk and vulnerable populations.

The characteristics found in the geographical mapping of key population hotspots in the city were as follows: 1) men who have sex with men (MSM) and men who have sex with their male partners. This group includes people who identify themselves as gay, bisexual, or straight. This category includes those who sell and/or buy sex with other men (male sex workers). 2) Female Direct Sex Workers (FSW): Women selling sex for money or goods as their main source of income. The main source means that there is certainty in obtaining income, not the size of the income. These women include those who work in brothels, streets, or public places where customers come to buy sex. These women may or may not work with brokers or pimps. 3) Waria: (male becoming female) or biologically male who identifies himself as female and/or behaves and dresses like female.

Demographic Profile. The largest key population group based on the characteristics of

men-to-male (MSM) female sex workers (FSW) and waria are evenly distributed in five sub-districts in Palu City. When compared to data on the distribution of key population hotspots in 2017 from four sub-districts, namely Mantikolore, Palu Timur, Palu Selatan, and West Palu for 2022 will add one subdistrict, namely Ulujadi District, with locations for activities such as salons, gyms, city parks, boarding houses, hotel cafes and malls, and laundry.

## CONCLUSION

Features of activity hubs centered on major population centers, such as hotels, boarding houses, salons, cafés, clubs, city parks, and malls in 2017. in 2022, other amenities like laundry will be included. Male Fellow, Female Sex Worker, and Transgender are the features of the major population hotspots since 2017, however in 2022 Natural Disaster (Earthquake, Liquefaction, and Tsunami) in 2018 did not suffer a shift. Natural disasters (tsunami, earthquake, and liquefaction) affect the changing HIV and AIDS key population hotspot data; following a post-disaster re-mapping, 29 key population hotspots were discovered, while 14 key population hotspots were detected overall. The year data's primary population hotspot data had a transition later on. The year's natural disasters—the earthquake, liquefaction, and tsunami—had an effect on a shift in geographic conditions. Four districts saw conditions that led to the creation of 29 key population hotspot locations; in contrast, one sub-district was added to the 14 population key hotspots, which are made up of five sub-districts. In 2010, there were other places of activity, such as laundry rooms, although the majority of the activity took place in areas near major population hotspots, such as salons, cafés, clubs, hotels, boarding houses, city parks, and malls. Men-male, Women's Sex Workers, and Waria have been the main demographic hotspots since 2011, but the year of natural disasters (earthquake, liquefaction, and tsunami) did not see any changes in these characteristics.

It is hoped that all parties will take a role in bringing back order between Male Fellows, Female Sex Workers, and Transgenders as hosts who carry HIV AIDS. The limitation of this research is that there is some previous data that is incomplete, but this

can be overcome by researchers by carrying out direct surveys at precise locations on the map. It is hoped that the impact of this research will be a source of knowledge for the government and officials regarding the distribution of people with HIV AIDS in the city of Palu in order to anticipate its spread.

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***Factors Associated with Exclusive Breastfeeding at the Bulili Health Center, South Bureaubuli Village, Palu City***

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**ABSTRACT**

*Exclusive breastfeeding is the best nutrient for babies. The impacts of not receiving exclusive breastfeeding are infection, high risk of infectious diseases such as diarrhea and pneumonia, low immune system, and decreased brain development. breastfeeding reduces baby and toddler morbidity and mortality. Human milk glycans, which contain oligosaccharides in both their free and conjugated forms, are demonstrated in studies to be a component of a natural immune process that explains how human milk protects breastfed children from diarrheal illness. This study aims to analyze factors associated with exclusive breastfeeding in the work area of Bulili Public Health Center South Birobuli Subdistrict Palu. This quantitative research was conducted through a cross-sectional approach. This study involved 90 mothers with babies aged 7-12 months, which was carried out from March 2023. The sample was selected using simple random sampling based on inclusion criteria. Direct interviews were used to collect primary data, and secondary data were obtained from Indonesia's health profile, data from the Palu City Health Office 2021, and data on exclusive breastfeeding. The data were processed using the chi-square statistical test with a significance degree of  $\alpha = 0.05$ . The results of the study were knowledge ( $p=0.018$ ), attitude ( $p=0.001$ ), interest in formula milk promotion ( $p=0.018$ ), and family support ( $p=0,002$ ). In Conclusion, there is a significant association between knowledge, attitude, interest in formula milk promotion, and family support with exclusive breastfeeding practice. It is suggested for mothers to increase knowledge, attitude, and family support by gaining information and using social media appropriately.*

**Keywords:** *Exclusive Breastfeeding, Knowledge, Behaviour, Interest on Formula Milk Promotion, Family Support*

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**INTRODUCTION**

According to <sup>1</sup>, breast milk is the

greatest meal for newborns 0 to 6 months old. The protective elements and nutrients in breast milk guarantee a healthy nutritional status and

lower the child's morbidity and mortality rates<sup>2</sup>. According to several epidemiological research, breastfeeding shields young children and newborns from infectious disorders such as acute respiratory infections and diarrhea<sup>34</sup>. Despite being vital to a baby's development, exclusive breastfeeding is still not widely practiced. Due to a number of variables that differ by region, exclusive breastfeeding is prone to fluctuation<sup>5</sup>.

Mothers are impacted by the complicated event of pregnancy and delivery. Physical and psychological difficulties can result from a variety of changes. Postpartum blues, a type of depression brought on by these changes, can develop after having delivery. Half of new moms have postpartum blues, a brief increase in emotional reactivity, within the first week following giving birth<sup>67</sup>.

The greatest diet for infants, especially those under six months old, is breast milk. The most complete nourishment for a baby's growth and development is breast milk<sup>8</sup>. Low breastfeeding rates in Indonesia pose a risk to the growth and development of young children. Among other reasons, many moms feel that breastfeeding is unsuccessful because their milk is insufficient and does not release<sup>9</sup>. Starting breastfeeding at a young age benefits both the mother and the child. Breastfeeding has several advantages for women, including fostering love and attachment between them and their children. A baby's subsequent development may be impacted by emotional and mental illnesses brought on by the mother and baby's lack of bonding. Working women who feed formula or other foods besides breast milk to their infants before they are six months old are another element that permits a lack of bond between mother and kid<sup>10</sup>. According to data from the World Health Organization (WHO) for 2016, 38% of women worldwide exclusively breastfeed their infants. In Indonesia, there is an even distribution of exclusive breastfeeding, yet the success rate is still not great. According to the data, between 15.3% and 74.2% of infants under 6 months are exclusively breastfed. However, the proportion of data obtained by the 24-hour recall approach was consistently greater than the population's actual data<sup>11</sup>.

Observational studies conducted in the

1960s and 1970s have shown that breastfeeding reduces baby and toddler morbidity and mortality<sup>12,13,14,15</sup>. Human milk glycans, which contain oligosaccharides in both their free and conjugated forms, are demonstrated in studies to be a component of a natural immune process that explains how human milk protects breastfed children from diarrheal illness<sup>16</sup>. Additionally, nursing helps to ensure proper nutrition and subsequently non-specific immunity by reducing exposure to contaminated foods and fluids. Despite data showing that exclusive breastfeeding has beneficial and affordable health effects on a child's survival<sup>17</sup>.

The objectives of this study is to analyze factors associated with exclusive breastfeeding in the work area of Bulili Public Health Center South Birobuli Subdistrict Palu.

## METHOD

This quantitative research was conducted through a cross-sectional approach. This study involved 90 mothers with babies aged 7-12 months, which was carried out from March 2023. The sample was selected using simple random sampling based on inclusion criteria. Direct interviews were used to collect primary data, and secondary data were obtained from Indonesia's health profile, data from the Palu City Health Office 2021, and data on exclusive breastfeeding. The data were processed using the chi-square statistical test with a significance degree of  $\alpha = 0.05$ . No need Ethical Clearance in this study.

## RESULTS

Based on table 1 there is a relationship between knowledge and exclusive breastfeeding with  $p = 0.018$  in the working area of the Bulili Health Center, South Birobuli Village. It can be seen that 44 people who have poor knowledge, there are 36 people (48.6%) do not give exclusive breastfeeding and 8 people (10.8%) give exclusive breastfeeding, while out of 30 people with good knowledge there are 16 people (21.6%) do not give exclusive breastfeeding and 14 people (18.9%) gave exclusive breastfeeding.

**Table 1. The relationship between the meticulous variables and exclusive breastfeeding**

Variable	Exclusive breastfeeding				Total		<i>p-value</i>
	Exclusive Breastfeeding		Not Exclusive Breastfeeding		n	%	
	n	%	n	%			
<b>Knowledge</b>							
Good	14	18.9	16	21.6	30	40.5	0.018
Not Good	8	10.8	36	48.6	44	59.5	
<b>Behaviour</b>							
Good	10	13.5	5	6.8	15	20.3	0.001
Not Good	12	16.2	47	63.5	59	79.7	
<b>Formula Milk Promotion</b>							
Not Interested	13	17.6	14	18.9	27	36.5	0.018
Interested	9	12.2	38	51.4	47	63.5	
<b>Family support</b>							
Supported	16	21.6	16	21.6	32	43.4	0.002
Not Supported	6	8.1	36	48.6	42	56.8	

Based on the findings between attitudes and exclusive breastfeeding, a significant relationship was found with a value of  $p = 0.001$  in the working area of the Bulili Health Center, South Birobuli Village. Of the 59 people with a bad attitude, 47 people (63.5%) did not give exclusive breastfeeding and 12 people (16.2%) gave exclusive breastfeeding, and out of 15 people with a good attitude, 5 people (6.8%) did not give exclusive breastfeeding and 10 people (13.5%) gave exclusive breastfeeding.

Based on the findings, there is a significant relationship between interest in promoting formula milk and exclusive breastfeeding with a value of  $p = 0.018$  in the working area of the Bulili Health Center, Birobuli Selatan Village. Of the 27 people with an interest in promoting formula milk who were not interested, 14 people (18.9%) did not give exclusive breastfeeding and 13 people (17.6%) gave exclusive breastfeeding, while of the 47 people with an interest in promoting formula milk who were interested there were 38 people (51.4%) did not give exclusive breastfeeding and 9 people (12.2%) gave exclusive breastfeeding.

Based on the results of the analysis, there is a significant relationship between family support and exclusive breastfeeding with a value of  $p = 0.002$  in the working area of the Bulili Health Center, Birobuli Selatan Village. 42 people with unsupportive family support, 36 people (48.6%) did not give exclusive breastfeeding and 6 people (8.1%) gave exclusive breastfeeding, while out of 32

people with family support, 16 people (21.6%) did not give exclusive breastfeeding and 16 people (21.6%) gave exclusive breastfeeding.

Knowledge is the result of experience lived by someone after feeling something. Knowledge can influence how a person perceives information. As a result, people who are knowledgeable enough will more easily receive information than people who are less knowledgeable. According to <sup>18,19</sup>, the theory of planned behavior (TPB) is a useful theoretical framework for forecasting behavior change and has also been used to forecast nursing behavior. The main factors influencing behavior, according to the TPB, were attitude (knowledge), subjective norm, and practice control <sup>19</sup>. A growing number of studies have assessed the relationships between breastfeeding behavior and knowledge, attitude, subjective norm, and practice control <sup>18,20</sup>. Due to the disparity in populations, the conclusions are contradictory, and it is still unclear which component is more crucial than others.

One can get knowledge from various sources. Often, interactions with other people, or health care providers broaden their acquaintance. Low maternal knowledge affects exclusive breastfeeding, mothers can provide additional food with formula milk, filtered water or give bananas and honey before the age of 6 months <sup>21</sup>.

Based on the findings, there is a significant relationship between knowledge and exclusive breastfeeding. Mothers may not really know about exclusive breastfeeding, so



they may not breastfeed properly. The better the mother's knowledge about this problem, the more effective coverage of exclusive breastfeeding will be, mothers with positive knowledge will not give exclusive breastfeeding to their babies, effectively influenced by internal factors, and this is also supported by a lack of education about the benefits and content of exclusive breastfeeding.

Previous research that has been done<sup>22</sup> with the results of statistical tests using the chi-square test obtained  $p = 0.00$ ,  $p$  value  $< \alpha$  value  $= 0.05$  indicating that there is a correlation between mother's knowledge of exclusive breastfeeding at Cendrawasih Makassar Health Center 2021. Research is not in line with<sup>23</sup> that mother's knowledge is not related to exclusive breastfeeding. In this study, the percentage of mothers who had good knowledge of giving exclusive breastfeeding to their babies (73.3) was higher than mothers who had less knowledge (26.7%).

Attitude is a person's readiness to react to an object in a certain way, which involves their thoughts and feelings. Reactions can be either positive or negative behavior. If breastfeeding mothers have a positive perspective about exclusive breastfeeding, they will make the decision to provide exclusive breastfeeding and will continue to provide it<sup>23</sup>. Attitudes are not just recording previous events, but deciding for or against something<sup>24</sup>. Based on the findings, there is a significant relationship between attitudes and exclusive breastfeeding. The mother's positive attitude towards exclusive breastfeeding determines a person's willingness to provide exclusive breastfeeding for 6 months. Different from<sup>23</sup> shows that the mother's attitude is not related to exclusive breastfeeding (0.127). In this study, it was seen that the percentage gave exclusive breastfeeding (80%) compared to mothers who had less attitude (20%).

Mothers are advised to use formula milk, it is possible that mothers do not fully understand exclusive breastfeeding, the nutritional content contained in breast milk is better than formula milk, so mothers are easily influenced by formula milk<sup>25</sup>. Promotion of formula milk encourages people to continue formula feeding. Formula milk for housewives comes in attractive shapes and packaging and is offered in various ways, one of which is through television promotions. Continuous promotion of formula milk makes mothers

believe that formula milk is better than breast milk, so they prefer to give formula milk to their babies<sup>26</sup>. Based on the findings using chi-square, a significant relationship was found between interest in formula milk promotion and exclusive breastfeeding. The more exposure to formula milk advertisements, the more likely they are not to exclusively breastfeed their babies.

The results of this study are in line with research<sup>25</sup> based on statistical tests using the continuity correction test obtained a value of  $p$ -value  $= 0.000$  ( $p < \alpha$  of the value  $\alpha = 0.05$ ). This means that  $H_0$  is accepted, which means that there is a relationship between the promotion of formula milk and the failure of exclusive breastfeeding in infants aged 0-6 months at the UPTD Puskesmas Bojo Baru, Barru Regency in 2022.

External factors that greatly influence exclusive breastfeeding is family support. The existence of family support has an impact in the form of increasing self-confidence in breastfeeding mothers. Family support can be in the form of information, appreciation, instrumental and emotional support. Information about breastfeeding is not collected completely and continuously by the family, so the family's role is not big in continuing to provide exclusive breastfeeding<sup>23</sup>.

Family support can make an important contribution to exclusive breastfeeding. Family support, both informational support, emotional support, instrumental support and assessment support, is very important for exclusive breastfeeding mothers. Family support for exclusive breastfeeding plays an important role in achieving the goal of exclusive breastfeeding, because the family will also determine how soft the response to breastfeeding is, which is greatly influenced by the emotional state or emotions of the mother. Therefore, it is necessary to increase awareness and support for breastfeeding mothers to ensure exclusive breastfeeding by involving the family<sup>27</sup>.

Based on the findings using Chi-Square it is known that there is a relationship between family support and exclusive breastfeeding. Providing emotional motivation and other practical support from husbands or family can have a positive influence on mothers who practice exclusive breastfeeding, because the family is one of the factors that can influence a

mother's decision to breastfeed.

Research conducted by <sup>28</sup> shows that there is a relationship between family support and exclusive breastfeeding with a p value = 0.003 <0.05. Positive family support cannot be separated from positive family attitudes as well. Not like research <sup>29</sup> showed that it was not related to exclusive breastfeeding (p=0.861). More than half of the respondents stated that they had received support from their families to provide exclusive breastfeeding for their babies, namely 52.6%.

## CONCLUSION

It can be concluded that there is a significant relationship between knowledge, attitudes, interest in promoting formula milk and family support with exclusive breastfeeding in the working area of the Bulili Health Center, Birobuli Selatan Village, Palu City. between attitudes and exclusive breastfeeding, a significant relationship was found with a value of p = 0.001 in the working area of the Bulili Health Center, South Birobuli Village. there is a significant relationship between interest in promoting formula milk and exclusive breastfeeding with a value of p = 0.018 in the working area of the Bulili Health Center, Birobuli Selatan Village. there is a significant relationship between family support and exclusive breastfeeding with a value of p = 0.002 in the working area of the Bulili Health Center, Birobuli Selatan Village. It is hoped that mothers will increase their knowledge, attitudes and family support by digging up information and making good use of social media.

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## ***The Effect of Counter Pressure and Birthball on The Time of The First Stage of Labor and Prevention of Perineal Rupture***

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### **ABSTRACT**

*Mothers with prolonged labor have a higher risk of bleeding. This study aimed to determine the effect of the counterpressure technique with a birthball on the length of the first stage of perineal rupture. This type of research is quantitative with a quasi-experimental design using an observation form conducted in Kendari City Hospital from May to August 2023. The design used was a two-group-only post-test, with a control group. The study population comprised multiparous mothers in the first active stage. The sample size consisting of 20 who were given the counterpressure technique with birthball, 20 who were only given the counterpressure technique, and 20 who received no treatment. The inclusion criteria were mothers who were willing to become respondents and mothers who gave birth with normal births. The samples were collected using purposive sampling. The t-test was used to determine the differences between the three groups. The results of the difference test in the length of active phase I between the group given the counterpressure technique with birthball (intervention I) and the control group were p-value (0.000). The results of the analysis for the group given the counterpressure technique (Intervention II) with the control group were p-value (0.000). The results of the analysis for the group given the counterpressure technique with birthball (Intervention I) with the counterpressure technique (Intervention II) were p-value (0.759). In Conclusions, Providing counterpressure techniques with a birthball or simply providing counterpressure techniques is effective in reducing the incidence of perineal ruptures.*

**Keywords:** Counter Pressure, Birthball, First Stage, Perineal Rupture

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### **INTRODUCTION**

Most normal births are associated with trauma to the baby<sup>1</sup>. Anterior perineal trauma is an injury to the labia, anterior vagina, urethra, or clitoris, and is usually associated with low morbidity. Posterior perineal trauma is an injury to the posterior vaginal wall, perineal muscles or anal sphincter<sup>2,3</sup>. There is considerable variation in the number of reported incidences of perineal trauma between countries, due in part to differences in

definitions and reporting practices<sup>4,5,6</sup>. Studies with limited use of episiotomy reported perineal trauma rates requiring suturing between 44% and 79%<sup>7,8,9</sup>, and a recent Cochrane Review found no evidence to support the routine use of episiotomy<sup>10</sup>. Higher rates of perineal injury are consistently noted in first vaginal deliveries and instrumental deliveries<sup>11</sup>.

The cause of complications in childbirth, which causes increased mortality and

morbidity in the mother and fetus, is prolonged labor. Mothers with prolonged labor have a higher risk of bleeding due to uterine atony (33%), laceration of the birth canal (26%), infection (16%), fatigue (15%), and shock (10%). Meanwhile, in the fetus, it can increase the risk of severe asphyxia, cerebral trauma, infection, and injury due to the procedures<sup>12</sup>. The incidence of prolonged labor is caused by several factors such as the position of the fetus, pelvic abnormalities, histological abnormalities, wrong direction of labor, large fetus, congenital abnormalities, grand multipara, and premature rupture of membranes<sup>13</sup>.

Several physiological efforts can be made to speed up and facilitate the opening of the cervix, such as walking, emptying the bladder, applying counterpressure techniques around the sacrum, sitting on a birth ball, stimulating the nipples, having intimate relationships, calming down, and consuming fruit. This could stimulate the opening of the cervix<sup>14</sup>. The counterpressure technique for 20 min on the sacrum area will reduce the sensation of pain, provide a sense of comfort, and speed up labor. This is supported by the research of Abdolahian, Ghavi, Abdollahifard and Sheikhan which resulted that mothers who were massaged either on the back or sacrum in the first stage of labor or on the perineum in the second stage, reported a decrease in pain and also had a much shorter labor, staying at home shorter illness and less postpartum depression. Movement when pushing the pelvis can help change the baby's position to a more appropriate position (back of the head) so that it can speed up the progress of labor<sup>15</sup>.

Another effort to prevent prolonged labor is the birthball method because sitting on a birthball can stimulate postural reflexes and maintain spinal posture in good condition, thus facilitating the descent of the fetal head and reducing the length of the first stage<sup>16</sup>. The birthball technique by applying pelvic rocking, apart from reducing inflammation and speeding up labor, can also prevent perineal rupture, which is one of the causes of mortality and morbidity. The mother's movement on the birthball with guided guidance increases the elasticity of the perineal muscles, thereby reducing the risk of perineal rupture<sup>17</sup>.

There are still many mothers who experience prolonged labor in the first stage of the active phase, so the author is interested in

conducting research at Kendari City Regional Hospital by combining counterpressure techniques with a birthing ball to speed up the first stage of the active phase and prevent perineal rupture. This study aimed to determine the effect of the counterpressure technique with a birthball on the length of the first stage of perineal rupture. The novelty of this study is the combination of counterpressure techniques with a birthing ball to speed up the first stage of the active phase and prevent perineal rupture.

## METHOD

This type of research is quantitative with a quasi-experimental design, namely, by looking at the length of the first active phase and perineal rupture using an observation sheet. The design used in this study was a two-group-only post-test, with a control group. The intervention group used the counterpressure technique with a birthball or counterpressure technique alone, while the control group received no treatment. This study was conducted at Kendari City General Hospital. This study was conducted from May to August 2023. The study population comprised multiparous mothers in the first active phase. Based on initial studies, 91 mothers gave birth between January and March of 2023. The research sample consisted of multiparous mothers in the first active phase. Based on the results of calculations using the sample size formula, the sample size was 60 respondents, consisting of 20 who were given the counterpressure technique with birthball, 20 who were only given the counterpressure technique, and 20 who received no treatment. The samples were collected using purposive sampling. The inclusion criteria were mothers who were willing to become respondents and mothers who gave birth with normal births. Meanwhile, the exclusion criteria in this study were pathological/abnormal birth and primiparous mothers. This research received permission from the Kendari Ministry of Health Polytechnic Research Ethics Committee (No. D.P. 03.04/056/2023). Univariate analysis showed the mean, standard deviation, maximum, and minimum values of each variable. Bivariate analysis showed differences in the duration of the first stage of the active phase by looking at the independent T test, and to see the birth canal tear, the chi-square test was used. The conclusion from hypothesis

testing is that there is a difference/influence if the p-value is <0.05, and there is no

difference/influence if the p-value is  $\geq 0.05$ .

## RESULTS

**Table 1. Characteristics of Respondents**

Category	Group			p-value
	Intervention I	Intervention II	Intervention III	
<b>Age</b>				
20-35	17 (85%)	17 (85%)	17 (85%)	0,1
>35	3 (15%)	3 (15%)	3 (15%)	
<b>Parity</b>				
2	14 (70%)	14 (70%)	14 (70%)	0,1
3	6 (30%)	6 (30%)	6 (30%)	
<b>Opening</b>				
4	7 (35%)	12 (60%)	9 (45%)	0.7
5	7 (35%)	5 (25%)	5 (25%)	
6	4 (20%)	1 (5%)	4 (20%)	
7	2 (10%)	2 (10%)	2 (10%)	

Table 1 shows that the majority of respondents from all groups have an age range–20-35 years. Seventeen mothers (85%) were included in each group. Three mothers (15 %) were older than 35 years in all groups. The results of the difference test analysis using the chi-square test showed that there were no differences among the three groups in the age category ( $p = 0.1$ ). Respondent characteristics based on parity mostly had parity two in all groups. In each group, 14 mothers (70%) had a parity of 2. Six mothers (30%) in each group had a parity of 3. These results showed that the respondents were homogeneous, and it was also seen in the results of the analysis of differences using chi-square that they did not have a

difference with the p-value, namely 0.1. Characteristics of respondents based on opening in the group given the counterpressure technique with birthball were 7 mothers (35%) who came with 4 openings, 7 mothers (35%) who came with 5 openings, 4 mothers (20%) who came with 6 openings, and 2 mothers (10%) came with an opening of 7. In the group that was only given the counterpressure technique, it showed that the majority came with an opening of four with a total of 12 mothers (60%), respondents who came with an opening of five were five mothers (25%), one mother who came with an opening of six (5%), and two mothers who came with an opening of seven.

**Table 2. Differences in the length of the first active phase for mothers giving birth**

Variable	Mean Difference	T Value	p-value
Intervention I- Control	70,70	4,315	0,000
Intervention II- Control	65,65	4,021	0,000
Intervention I - Intervention II	5,05	0,309	0,759

Based on Table 2, the results of the difference test (independent T test) in the length of active phase I between the group given the counterpressure technique with birthball (intervention I) and the control group were p-value (0.000)  $> \alpha$  with a T value of 4.315. The results of the analysis for the group given the counterpressure technique (Intervention II) with

the control group were p-value (0.000)  $> \alpha$  with a T value of 4.021. The results of the analysis for the group given the counterpressure technique with birthball (Intervention I) with the counterpressure technique (Intervention II) were p-value (0.759)  $> \alpha$  with a T value of 0.309.

Based on Table 2, the results of the difference test (independent T test) in the length of active phase I between the group given the counterpressure technique with birthball (intervention I) and the control group were p-value (0.000) >  $\alpha$  with a T value of 4.315. The results of the analysis for the group given the counterpressure technique (Intervention II) with the control group were p-value (0.000) >  $\alpha$  with a T value of 4.021. The results of the analysis for the group given the counterpressure technique with birthball (Intervention I) with the counterpressure technique (Intervention II) were p-value (0.759) >  $\alpha$  with a T value of 0.309.

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Based on Table 3, it can be seen that out of 60 respondents, the incidence of birth canal tearing was 16 (27%), consisting of 2 mothers from the group given the counterpressure technique with a birthball, 3 mothers from the group given the counterpressure technique, and 11 mothers from the control group. The results of the analysis of differences using the chi-square test showed that there were differences in the incidence of birth canal lacerations between the three groups.

**Table 3. Differences in the incidence of Vaginal tears**

Variabel	Grup			p-value
	Intervention I	Intervention II	Control	
<b>Vaginal Tears</b>				
Exist	2 (10%)	3 (15%)	11 (55%)	0,002
Not Exist	18 (90%)	17 (85%)	9 (36%)	

The frequency distribution of respondent characteristics based on age revealed that 51 respondents (85%) and 9 respondents (15%) gave birth in Kendari City Hospital in the range of 20-35 years.

## DISCUSSIONS

These results show that the majority of respondents fall into the healthy reproductive age category. The age range of 20-35 years is known as the healthy reproductive age or a safe age for pregnancy and childbirth. At this age, the reproductive organs and psychology are more mature so they are ready to face childbirth<sup>18</sup>.

Mothers are said to be at high risk if the pregnant woman is under 20 years old and over 35 years old<sup>19</sup>. Maternal age < 20 years and > 30 years is a risk factor for birth complications<sup>20</sup>. Age greatly determines the health of the mother giving birth and influences the length of the first stage of labor. Age during the healthy reproductive period is associated with reproductive organs that are still healthy, and the elasticity of the muscles is good, especially in the perineum<sup>21</sup>. Increasing age affects muscle elasticity, especially in perineal muscles. Too old an age affects low elasticity<sup>22</sup>. However, there are other factors that influence the length of the first stage and the incidence of perineal rupture, including parity.

The characteristics of the respondents based on parity were parities 2 and 3. Most of the respondents were parity 2, namely 42 mothers, 70%). Parity number 2-3 are the safest numbers for pregnant women and giving birth women. Unpleasant experiences of pregnancy and childbirth will affect subsequent pregnancies and childbirths. The results of the independent t-test analysis showed a p-value of 0.000 <  $\alpha$ . Based on these values,  $H_a$  is accepted and statistically there is a difference in the length of the first active phase in mothers giving birth between the groups given the counterpressure technique and the birthball versus the control group.

This is supported by research conducted by Abdollahian, Ghavi, Abdollahifard and Sheikhan who said that mothers who had massage either on the back or sacrum in the first stage of labor or on the perineum in the second stage, reported a decrease in pain and also had a much shorter labor. years, shorter hospital stay, and less postnatal depression. The mother's movements when pushing the pelvis can help change the baby's position to a more appropriate position (back of the head) so that it can speed up the



progress of labor<sup>15</sup>.

Training using birthball is very effective in the birthing process. Most respondents who were given birthball exercises completed spontaneous labor<sup>23</sup>. His research showed that there was a difference in the length of labor in the control group who underwent birthball exercises compared to the control group. Birthball has also been shown to be effective for uterine contractions. Various benefits that can be obtained from sitting upright on the ball are increasing blood flow to the uterus, placenta, and baby, reducing pressure and increasing pelvic area, providing comfort to the ankle, pushing the baby's head down, relaxing the pelvis, and providing comfort to the mother. Using a birth ball in a squatting position causes the perineum to stretch optimally, so that blood flow to the baby becomes smooth. In addition, the pelvis widens, thereby speeding up the baby's descent<sup>24</sup>.

Based on the research results, it was found that there was a difference in the length of the first active phase between the counterpressure group and the control group. It was found that the mean difference in the length of the first stage of the active phase between the treatment and control groups was 65.65 minutes with a p-value of 0.000 ( $p < 0.05$ ), which means that counterpressure massage influenced the length of the first stage of the active phase of labor. The research results are in line with research<sup>25</sup>, which showed that there was a difference in the length of the first stage between mothers who were given the counterpressure technique and those who did not receive treatment ( $p = 0.039 < 0.05$ ). Unhandled physiological pain and maternal anxiety during childbirth can result in prolonged labor in the mother and asphyxia in the baby, leading to death of the mother and baby<sup>26</sup>.

The results of the analysis of differences using the chi-square test showed that the p-value was  $0.002 < \alpha$ . This shows that there were differences in the incidence of perineal rupture among the three groups. The results of the research are in line with the study conducted by<sup>22</sup>, showing that the test analysis of the control group and the birthball group showed a p-value = 0.000, which means that there was a difference between the control group and the birthball group in the tearing of the birth canal in mothers giving birth. The perineum is the skin and muscles located

between the vagina and the anus. Perineal rupture can occur in almost all first births (primiparous) and is not uncommon in subsequent births<sup>27</sup>. This research also shows that multiparity, where respondents have parity 2 and 3, does not guarantee that perineal rupture will not occur. Many factors can prevent tears, one of which is providing counterpressure therapy with a birthball.

Mothers in labor who receive counterpressure therapy with a birthball will perform pelvic movements using the pelvic rocking technique. This technique makes the mother move in circles, right and left, forward and backward on the birthing ball, and also provides counterpressure that can provide a feeling of comfort to the mother. Apart from having an impact on reducing pain and accelerating labor, this action can also provide relaxation to the perineal muscles so that they are not stiff and can directly prevent perineal rupture.

The results of the study showed that there were differences between the intervention group and the control group and also showed that the group that was not given counterpressure care had a longer average length of the first active phase, namely 287 minutes, but the group that was given counterpressure care with the use of a birthball or without the average duration of active phase I was faster, namely 217 and 222 minutes, respectively. This proves that counterpressure has an effect on speeding up the first stage of labor in the active phase. This is in line with research<sup>25</sup>. The results showed that women giving birth who were given a counterpressure massage experienced the first stage of the active phase faster than the control group who were not given a counterpressure massage. Research conducted at the Wongsonegoro Regional Hospital regarding the use of counterpressure techniques on the duration of the second stage showed that there was a significant influence where respondents who received this technique had quicker second-stage labor compared to respondents who did not receive treatment using only standard care<sup>28</sup>.

In this study, counterpressure was statistically able to help mothers adapt to pain. When the mother feels calm and relaxed, the fear that arises can be overcome so that excessive adrenaline production can be anticipated, and substances that inhibit pain stimuli can be secreted properly. By reducing

adrenaline levels, blood vessels can vasodilate properly, thereby facilitating blood flow, which carries oxygen to the uterus. When there is sufficient oxygen in the uterus, contractions can run well so that the mother is able to push optimally, resulting in smooth delivery, especially during the first active phase [15][16].

Massage sends neurotransmitter impulses to the limbic system and amygdala. The hypothalamus then passes to the anterior pituitary. With this massage, the anterior pituitary body produced higher amounts of endorphins. Endorphins not only help reduce labor pain but also increase the work of endogenous oxytocin in helping stimulate myometrial contractions in the process of cervical dilation<sup>31,32</sup>. This shortened the first period of the active phase.

The results of this study are supported by research<sup>33</sup> showing that massage techniques help mothers feel more refreshed, relaxed, and comfortable during labor. One study stated that mothers who are massaged for 20 minutes every hour during the labor stages will be freer from pain. This is because massage stimulates the body to release endorphin compounds, which are natural pain relievers. Endorphins can also create feelings of comfort and pleasure, thereby reducing mothers' anxiety<sup>30</sup>. The massage technique used is counterpressure, which is a strong pressure massage that places the heel or flat part of the hand.

During labor, massage also makes the mother feel closer and cared for by the person caring for her. The touch of someone who cares for and wants to help is a source of strength when a mother is sick, tired, or anxious. When massaging, attention must be paid to the mother's response, whether the applied pressure has been applied. This is in accordance with research in Iran showing that continuous support provided by midwives during labor reduces pain intensity, length of labor, and the incidence of postpartum depression<sup>34</sup>. During the birthing process, a birthball is an important tool that can be used in various positions. Movement exercises using a birth ball by slowly rocking and swinging the pelvis forward, backward, right and left can relieve pressure and increase the area of the pelvis, encourage the descent of the baby's head, help the uterus contract more effectively, accelerate cervical dilatation, and help relax the ligaments on the pelvis<sup>35</sup>

This research is in line with studies conducted by<sup>36</sup> that from the results of the correlation test analysis of the pelvic rocking exercise variable with the incidence of perineal rupture using the Chi-square test, a  $\rho$  value of 0.028 ( $p < 0.05$ ) was obtained, which can be interpreted as a relationship between pre-therapy and the incidence of perineal rupture with a moderate level of significance. This study shows that pre-therapy with a birthball can reduce the incidence of perineal rupture in mothers giving birth. The use of a birth ball can play a key role as a non-pharmacological method for relieving pain and anxiety, as well as enhancing positive birth experiences by achieving good labor progress and outcomes. The maternity ball exerts and even pressure on the perineum can be reduced thus stimulating dilatation and widening of the pelvic outlet more effectively<sup>37</sup>.

## CONCLUSION

There was a difference in the length of the first active phase in mothers giving birth between the group given the counterpressure technique with a birthball and the control group, as well as between those given only counterpressure. There were differences in the incidence of perineal rupture among parturient mothers in the three groups. Counterpressure techniques with a birthball or just giving counterpressure techniques each for 20 min/h until complete opening is effective in speeding up the first stage of labor in the active phase. The counterpressure technique with a birthball has an influence on perineal rupture. Providing counterpressure techniques with a birthball or simply providing counterpressure techniques is effective in reducing the incidence of perineal ruptures.

This research will be very useful for treating perineal rupture in pregnant women by using a birth ball. The use of a birth ball should measure the size of the birth ball itself. It is hoped that measuring the size of the birth ball can be done before using it. It is hoped that the limitations of this research can be complemented by future researchers.

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## ***Android-based "MamaKIA" Educational Media Development Application for Pregnancy Midwifery Care***

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### **ABSTRACT**

*An Android-based pregnancy care application designed and adapted to the needs of pregnant women is part of efforts to encourage sustainable midwifery care, which is expected to make it easier to convey, understand, and apply because it is in accordance with current client needs. This research aims to develop android-based educational media for midwifery care. The development of Android-based Midwifery Care Education Media was carried out using a research and development approach consisting of a preliminary study stage consisting of a literature study and field study (two respondents), and product development consisting of product design and media expert validation testing. (one respondent), material experts (one respondent), and application trials by community health center midwives in the work area of the Konawe District Health Service (35 respondents) who were selected using purposive sampling. Research data were collected using questionnaires, and quantitative and qualitative analyses were conducted. The validation results from media experts obtained a score of 69.47% in the feasible category and 98.33% from material experts in the very appropriate category, and the test results from 35 respondents obtained a score of 92.86%, including the very appropriate category. The Android-based educational media application developed for midwifery care is very suitable for use and needs to be tested for its effectiveness in midwifery care during pregnancy. The "Mama KIA" application is very feasible in terms of materials, media, and testing and meets the requirements for midwifery care by midwives.*

**Keywords:** *Pregnancy Care, Educational Media, Android, Mama KIA, Application Development*

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### **INTRODUCTION**

Currently, Internet technology is widely available on smartphones. Currently, smartphones are equipped with social media sites and application software applications <sup>1</sup>. Android is a form of current technological development, and it is estimated that in 2021, Android users will reach 1.5 billion <sup>2</sup>. Everyone uses the Internet to obtain the necessary information. This information can be found on

the Internet by anyone who accesses it. Pregnant women are motivated to obtain the information they need during pregnancy <sup>3</sup>. Midwifery documentation is very important for midwives to provide services because midwifery services provided to clients require recording and reporting that can be used as a reference to claim responsibility and accountability for various problems that may be experienced by clients related to the services provided <sup>4</sup>. Documentation refers to authentic

notes or original documents that can be used as evidence in legal matters<sup>5</sup>. Documentation in midwifery is evidence of recording and reporting that midwives have in carrying out care records that are beneficial not only for the interests of clients but also for midwives and the health team in providing health services based on accurate and complete written communication<sup>6</sup>. Apart from being a recording and reporting system, midwifery documentation is also used as information about the patient's health status as a whole in midwifery care activities carried out by the midwife. Documentation also plays a role in the collection, storage, and dissemination of information to maintain a number of important facts continuously at the same time as a number of events<sup>7</sup>.

Danger signs of pregnancy are those that mothers encounter during pregnancy and are used as warning signs. These danger signs are used by mothers and healthcare providers to indicate that pregnancy complications occur immediately. One of the main factors causing maternal death is the mother's lack of knowledge and insight into the dangerous signs of pregnancy<sup>8</sup>. Every woman needs to be aware of the danger signs during pregnancy due to unpredictable complications. The dangerous signs during pregnancy include bleeding, blurred vision, seizures, dizziness, swollen feet and hands, and fever<sup>9,10,11</sup>.

There are several factors that cause maternal death, one of which is a lack of knowledge among women, families, and medical personnel about the dangerous signs of pregnancy. The most common cause of maternal death is delays in decision-making and delays in receiving appropriate action<sup>12,13</sup>. Knowledge about the danger signs of pregnancy will help mothers and families make the right decisions to get fast and appropriate treatment, reducing maternal mortality<sup>10</sup>. Providing education to pregnant women is one way to reduce the MMR. However, only 54% of pregnant women received appropriate and efficient health education. The average satisfaction level of the pregnant women who received ANC services from health workers was 67.38%. The average dissatisfaction rate of the pregnant women was 48.20%. This figure shows that the quality of service and management of ANC services in Indonesia remains a critical issue<sup>14,15,16</sup>.

Maternal Mortality Rate is an indicator

of the success of maternal health efforts and the level of public health<sup>17</sup>. In Indonesia, the maternal mortality rate increased from 265 per 100,000 live births in 2000 to 126 per 100,000 live births in 2015<sup>18</sup>. However, this figure does not meet the MDGs target of 102 per 1,000 live births<sup>19</sup>. In contrast, neonatal and under-five deaths decreased respectively from 22.3 per 1,000 live births and 52.3 per 1,000 live births in 2000 to 13.7 per 1,000 live births and 26.0 per 1,000 live births, respectively<sup>18</sup>. Indonesia, as part of the global community, will face even greater challenges through the joint commitment contained in the Sustainable Development Goals (SDGs), namely, reducing the global maternal mortality rate to less than 70 per 100,000 live births and the newborn mortality rate to less than 12 per 1,000 live births, and the maternal mortality rate in each country is no more than 140 per 100,000 live births in 2030<sup>20</sup>. To achieve this, efforts are needed to provide access to maternal and child health services as well as family planning services as part of efforts to accelerate the reduction in maternal mortality<sup>17</sup>.

Improving education and midwifery services can reduce maternal and infant morbidity and mortality rates, improve psychosocial conditions, reduce medical interventions, improve public health, and improve outcomes from health services<sup>21</sup>. Health services are provided by midwives at home, in the community, and in health service facilities. Education and health promotion are efforts made by midwives to encourage clients to maintain and improve the quality of their health, pregnancy, and baby. The use of smartphone-based health applications is currently increasing along with the increasing use of smartphones. In general, people are interested in providing health information on their cell phones. The use of smartphone-based health applications has been proven to effectively support health promotion<sup>22,23</sup>.

Currently, there has been an increase in the use of health platforms to obtain information that supports pregnancy<sup>24</sup>. The provision of education is increasingly being developed through the availability of various educational applications, especially for pregnant women, which can be accessed online. Various applications have been developed to support maternal and child health, such as an Android-based pregnant women's health application<sup>25</sup>, smartphone-based prenatal education for

parents with risk factors for preterm birth<sup>26</sup>, and applications for early detection of high-risk pregnancies. Pregnant women use health applications more to obtain information that supports their pregnancy than face-to-face meetings or using pregnancy health books<sup>24</sup>. If midwives provide education using an application that can be used during antenatal care, or when clients and families can access it themselves from home, it is hoped that it can be designed systematically and according to the mother's needs in each phase.

In an effort to increase promotive and preventive efforts to support sustainable midwifery care, the creation of online educational media for sustainable midwifery care is expected to support midwives and students as prospective midwives in providing comprehensive midwifery care that will support the empowerment of women and families, as well as supporting mothers and families to maintain and improve maternal and child health. Applications that are designed and adapted to the needs of mothers are part of efforts to encourage sustainable midwifery care, with the hope that they can make information easier to convey and be understood and applied because it suits the client's needs. This research aimed to provide an Android-based midwifery care educational application that can support the educational process provided by midwives in providing sustainable midwifery care.

## METHOD

Android-based Midwifery Care Education Media was developed using a research and development approach. The Mama KIA application can be accessed via the website with the link <https://play.google.com/store/apps/details?id=com.mamakia>. This research consists of stages of preliminary studies, product development, and product testing<sup>27</sup>. The preliminary study has several stages, namely, literature study and field survey, to prepare content drafts for educational media. Next, product development is carried out, including product design stages and product validation tests by 1 (one) media expert and 1 (one) material expert, followed by a product revision stage resulting from validation tests. The final stage was product testing on users of 35 midwives from 4 (four) community health centers in the work area of the North Konawe Health Service, who were selected

using purposive sampling, followed by final revision. The inclusion criteria for determining the sample were midwives who had actively worked for at least 5 years in their work area. Quantitative and qualitative data were used for data analysis. Quantitative data was obtained from the results of filling out validation questionnaires from material experts and media experts, as well as assessing the feasibility of the application by midwives, while qualitative data was obtained through suggestions/input provided by media experts and material experts during validation tests, and midwives during application trials.

## RESULTS AND DISCUSSIONS

This application was developed through several stages, including preliminary studies, product/application design, validation tests, product revisions, trials, and revisions. The following is a display of the Mama Kia application on an Android smartphone:



**Figure 1. Display of the Mama Kia Application on an Android Smartphone**

The stages carried out in the preliminary study included a literature review and field survey. A literature study was conducted to determine what education should be given to mothers during pregnancy care and 10 educational items were obtained, including: pregnancy checks, daily care during pregnancy, things to avoid during pregnancy, physical activity and exercise, discomfort during pregnancy and its management, lactation management, pregnancy exercises, danger signs of pregnancy, other problems in pregnancy, and preparation for childbirth.

Furthermore, the results of the study were compiled in a questionnaire containing

pregnancy education material, midwives' level of approval (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree), and suggestions. The questionnaire was then used during a field survey involving 2 (two) midwives to determine the material needed by midwives to provide education to pregnant women via an android-based application. The results of the field survey showed that all respondents agreed with the ten educational items, with a range between agree and strongly agree. Some of the suggestions given include (1) pregnancy counseling, (2) fetal stimulation, (3) avoidance of foods/drinks during pregnancy, (4) contraindications for pregnancy exercise, and (5) use of postpartum contraception. At this stage, the content is obtained for application design, which is then used to prepare the initial product in the form of educational material concepts that will be included in the application to be developed.

The next stage of research is to design an Android-based midwifery care educational media application. The product developed in this study is an Android-based application that can be accessed offline. This application consists of information in the form of articles and videos, an educational menu (examination, treatment, avoidance, activities/exercises, discomfort, danger signs, other problems, preparation for breastfeeding, pregnancy exercise, preparation for childbirth, and postpartum contraception), and an item search (item education, articles, videos). After product development was completed, an Android-based midwifery care application media was obtained with the application name "MamaKIA" which was taken from the acronym "Teaching Media for Understanding Maternal and Child Health" as the initial application product.

Next, the research carried out feasibility tests were conducted for the applications that were created, including media expert validation

tests, material expert validation tests, and application trials. This feasibility test uses statements on a Likert scale, namely, 5 (strongly agree), 4 (agree), 3 (so-so), 2 (disagree), and 1 (strongly disagree)<sup>28</sup>. Criteria for interpreting media suitability include: 0% - 20% = very unfit, 21% - 40% = Not worth it, 41% - 60% = Quite Decent, 61% - 80% = Decent, 81% - 100% = Very Decent<sup>29</sup>.

At the media expert validation stage, the researcher provided a media expert validation questionnaire sheet that contained statements about the suitability of the display (seven statement items), ease of use (four statement items), and consistency and graphic presentation (eight statement items). Media experts provide recommendations that the application is suitable for use with revisions with several inputs regarding the use of color and type as well as font size in the application. At the material expert validation stage, the researcher conducted a feasibility test of the application from the aspects of appropriateness of content (five statements), language (five statements), and presentation (two statements) using material experts from a midwife professional organization. The trial stage for using the application was carried out with 35 midwives from 4 (four) Community Health Centers in the work area of the Konawe District Health Service. Trial use of the application was carried out with pregnant women, where midwives provided pregnancy education using the application to pregnant women and then filled out a questionnaire containing a statement regarding the suitability of using the application. The trial questionnaire consisted of 14 statement items, with statements related to perceived ease of use (three statement items), perceived usefulness (three statement items), attitude toward (three statement items), behavioral intention (three statement items), and actual usage (two statement items).

**Table 1. Validation Results of Media Experts and Material Experts**

Variable	Media Expert Validation	Material Expert Validation	Test Results
Total Score	66	59	2450
Score Percentage	69,47	98,33	92,86
Score Intervals	61%<X<80%	81%<X<100%	81%<X<100%
Category	Worthy	very worthy	very worthy



Design revisions are carried out to make improvements to applications that have been designed based on assessments carried out by media and material experts, so that the application is suitable for testing on users. Based on the results of the product feasibility assessment, this Android-based midwifery care educational media application was found to be highly feasible. At this final stage, few changes have been made. The changes made are aimed at improving the product, namely, adding the appearance of the application in the form of images and materials.

With the increase in smartphone users and easy access to information through mobile applications, it is concluded that these interventions influence knowledge and individual gain and can help mothers maintain health, manage individual conditions, and take preventive measures<sup>30</sup>. According to<sup>31</sup>, Android is an open mobile operating system based on Linux. Android can be used by anyone who wants to use it on their device. The factor causing the popularity of Android applications is the speed factor, which is the efficiency of the application in providing data according to the user's wishes<sup>32</sup>. Health information, especially regarding the dangerous signs of pregnancy, is easy to obtain, not only from the health sector. However, currently, there are many mass media that facilitate and provide detailed educational information about pregnancy<sup>33,34</sup>. However, web-based systems are highly dependent on the availability of a good and stable internet network to access a project that will be created<sup>35</sup>. In addition, a web system also requires a good network security system so that the work created will be better and last for a certain period of time; therefore, additional costs are needed for hosting and cyber security services<sup>36</sup>.

Switching a system from a conventional to an android-based application requires further work and complete rebuilding of the system<sup>37,38,39</sup>. Some of the advantages that can be achieved if the system is upgraded to Android applications include increased practicality, web hosting is no longer needed, and users can avoid Internet access when using the system because it requires only one installation<sup>40,41</sup>.

## CONCLUSION

This midwifery care educational media application contains material related to adolescent reproductive health, including pregnancy checks, daily care during pregnancy, things to avoid during pregnancy, physical activity and exercise, discomfort during pregnancy and its management, and lactation management., pregnancy exercises, dangerous signs of pregnancy, other problems during pregnancy, preparation for childbirth, and postpartum contraception. The application validation stage was carried out by media experts, with a score of 69.47% in the feasible category and 98.33% from material experts in the very feasible category. The test results from 35 respondents, including the very feasible category, obtained a score of 92.86 %. The "Mama KIA" application developed is very feasible in terms of materials, media and testing and meets the requirements for use during midwifery care by midwives.

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Original Article

## **Legal Protection for Medical Volunteers in the Implementation of Emergency Medical Measures**

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### **ABSTRACT**

*The presence of medical volunteers during a medical emergency is very much needed and expected. Their presence is temporary according to the duration of the crisis. However, the current regulations do not explicitly discuss legal protection for medical volunteers during a health emergency. This type of research is normative juridical research that focuses on examining the application of rules or norms in positive law, especially concerning legal synchronization. Due to the type of normative juridical research, the approach used is the statute approach, which is taken by examining various laws that have to do with the legal issues being handled. The results of the study explain that the form of legal protection for medical volunteers in an emergency period can be understood and developed in the context of health, disaster, and employment regulations, namely Law Number 36 the Year 2009 concerning Health, Law Number 29 the Year 2004 concerning Medical Practice, Law No. 36 of 2014 concerning Health Workers and Law Number 38 of 2014 concerning Nursing, Regulation of the Minister of Health of the Republic of Indonesia Number 75 of 2019 concerning Health Crisis Management, Law Number 11 of 2020 concerning Job Creation. For its implementation, several Decrees of the Minister of Health and Circular Letters of the Ministry of Manpower were issued which regulate and guarantee legal protection for health workers, including medical volunteers, during a health emergency which includes protection of work norms, protection of Occupational Health and Safety norms and protection labor social security norms.*

**Keywords :** Medical Volunteer, Legal Protection, Public Health Crisis

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## **INTRODUCTION**

The presence of medical volunteers is very important and meaningful when there is an emergency for public health due to natural or non-natural disasters. The mobilization of medical volunteers to become health workers and vaccine clinical trial volunteers during the Covid-19 pandemic from late 2019 to 2022 shows the vitality and urgency of the presence of medical volunteers during this emergency. At the start of the Covid-19 pandemic in Indonesia, around 5,500 medical volunteers were recruited specifically for Jakarta; yet another province. Even so, until now, the presence and role of medical volunteers in

carrying out various medical actions during an emergency period still generates debate and in-depth discussion from the perspective of medical ethics and health law <sup>1</sup>.

The ethical dilemma that often arises when there are limited health resources during an emergency is the demand that the allocation of medical resources must remain in accordance with the principles of medical ethics <sup>2</sup>. In the era of the COVID19 pandemic, White and Lo (2020) recommended ethical guidelines for allocating resources which emphasized that considerations of race, religion, gender, wealth, citizenship, insurance ownership, property, intellectual disability, status and social relations should not be used <sup>3</sup>. Meanwhile, Emanuel et al.

recommend ethical guidelines based on the principles of optimizing benefits, providing fair treatment, giving priority to health workers or patients who have instrumental value in a pandemic, and prioritizing those who are more vulnerable<sup>4</sup>.

These medical ethical considerations seem to provide rational support for the presence of medical volunteers as part of efforts to prioritize public safety during emergencies including the Covid-19 pandemic. Even so, every action in a medical context is very vulnerable to dealing with legal problems because it is related to interventions against authorities and even the safety of other human lives, especially patients<sup>5</sup>. Because of this, legal problems are clearly visible when the question arises, how is the legal protection of these medical volunteers both in terms of work safety, welfare and if in a series of medical activities during an emergency period it causes dissatisfaction from the subjects served.

In general, the definition of medical volunteers (medical volunteers) can refer to the limitations formulated by Volunteer FDIP that, *"Medical volunteers are the medical professionals, students, nurses and doctors participating in different medical and healthcare support programs to make some positive impact in the community by contributing their medical skills and knowledge."* Thus, in practice, medical volunteers are volunteers with a health education background who are recruited at certain times to strengthen existing health workers in handling public health emergencies<sup>6</sup>.

In the realm of law, the subject of *"medical volunteer"* is not explicitly stated in the laws and regulations in Indonesia. Even so, based on the definition of medical volunteers, they can be equated with the concept of *'health workers'* in Law Number 36 of 2014 concerning Health Workers. In the law, in article 1 paragraph 1 it is written that, *"Health Workers are everyone who devotes himself in the health sector and has knowledge and/or skills through education in the health sector which for certain types require authority to carry out health efforts."*

Even though medical volunteers can definitively be categorized as health workers so that they can carry out medical actions according to their respective capacities, the legal and administrative status of medical

volunteers, especially those recruited in public health emergency situations, is different from health workers who have permanent and official work ties at home. certain hospitals or health facilities. This of course has implications for a number of treatments for medical volunteers from various aspects including from a legal aspect. From a legal perspective, the problem that arises is the logic and form of adequate and certain legal protection for medical volunteers when carrying out medical actions during public health emergencies such as natural disasters and especially the Covid-19 pandemic.

In addition, looking at article (1) general provisions of the Regulation of the Minister of Health of the Republic of Indonesia Number 75 of 2019 concerning Health Crisis Management, health workers in this context can also include the Emergency Medical Team, the Public Health Rapid Response Team ). The Emergency Medical Team (Emergency Medical Team) and hereinafter referred to as EMT are groups of professionals in the health sector who provide medical services directly to people affected by disasters or emergencies as health workers in support of the local health service system. Meanwhile, the Public Health Rapid Response Team, hereinafter referred to as PHRRT, is a group of public health workers whose job is to respond quickly to public health conditions.

Even though it appears that medical volunteers are part of the health workforce, research related to legal protection in the context of emergency medical measures in Indonesia still focuses more on legal protection for health workers with permanent work ties rather than those with temporary status. The research that has been presented is still about legal protection for health workers, especially doctors who are permanent employees of a health institution. Meanwhile, medical volunteers for medical emergency measures are usually temporary or during emergency conditions<sup>7</sup>.

For this reason, this legal research aims to analyze regulations and forms of legal protection for medical volunteers who take medical roles and actions during emergencies in order to have legal certainty. The Covid-19 pandemic is the main context that represents this health emergency.

## **METHOD**

Legal research aims to find solutions to legal issues that arise in order to obtain prescriptions for what should be done on the issues discussed. This study emphasizes normative juridical research which focuses on examining the application of rules or norms in positive law, especially with regard to legal synchronization. Due to the type of normative juridical research, the approach used is the statute approach, namely an approach carried out by examining various laws that are related to the legal issues being handled, namely by looking at the consistency and suitability between one law and another. or with the Constitution. Apart from that, in order to clarify the analysis, another approach is also used, namely the conceptual approach which focuses on views, doctrines in the science of law.

## **RESULTS**

The results of the study explain that the form of legal protection for medical volunteers in an emergency period can be understood and developed in the context of health, disaster, and employment regulations, namely Law Number 36 the Year 2009 concerning Health, Law Number 29 the Year 2004 concerning Medical Practice, Law No. 36 of 2014 concerning Health Workers and Law Number 38 of 2014 concerning Nursing, Regulation of the Minister of Health of the Republic of Indonesia Number 75 of 2019 concerning Health Crisis Management, Law Number 11 of 2020 concerning Job Creation. For its implementation, several Decrees of the Minister of Health and Circular Letters of the Ministry of Manpower were issued which regulate and guarantee legal protection for health workers, including medical volunteers, during a health emergency which includes protection of work norms, protection of Occupational Health and Safety norms and protection labor social security norms.

## **DISCUSSION**

### **1. Regulation on Legal Protection of Medical Volunteers**

Authors should discuss the results and how In the Unitary State of the Republic of Indonesia (NKRI), the concept of legal protection cannot be separated from the

protection of human rights. In short, legal protection is an effort to organize various interests in society so that there are no collisions between interests and can enjoy all the rights granted by law. Organizing is done by limiting certain interests and giving power to others in a measurable manner.

The law aims to integrate and coordinate various interests in society, by limiting these various interests, because in a traffic of interests, the protection of certain interests can only be done by limiting the interests of other parties. The interest of law is to deal with human rights and interests, so that law has the highest authority to determine human interests that need to be regulated and protected.

In other words, legal protection is providing protection for human rights (HAM) that are harmed by other people and this protection is given to the community so that they can enjoy all the rights granted by law. In Hadjon's opinion, legal protection for the people is a preventive and repressive government action. Preventive legal protection aims to prevent disputes from occurring, which directs government actions to be careful in making decisions based on discretion, and repressive protection aims to resolve disputes, including handling them in the judiciary <sup>8</sup>.

Legal protection is needed in the health sector because the world of health is work that is directly related to human rights, especially the right to life. Therefore, state policy in forming laws in the health sector is a juridical basis that can serve as a guideline for the public in general and for health workers in particular. Legal protection and certainty law and legal justice for the community and health workers are very important, because with regulations in the health sector, the rights and obligations of health workers and the community are protected and there is legal certainty <sup>9</sup>. Legal protection and legal certainty for health workers providing health services is an opportunity and at the same time an encouragement to provide the best health services for people in every region of the Republic of Indonesia <sup>7</sup>.

The constitutional basis of legal protection for health workers in Indonesia is Article 28D paragraph (1) of the 1945 Constitution: "Everyone has the right to recognition, guarantees, protection and fair legal certainty and equal treatment before the law." Another basis is Article 28H paragraph

(1) of the 1945 Constitution which reads, "Everyone has the right to live in physical and spiritual prosperity, to have a place to live, and to get a good and healthy environment and has the right to receive health services". Implementing the mandate of the Constitution, the Indonesian government passed and issued at least 4 laws and regulations related to health which discussed legal protection for health workers, namely Law Number 36 of 2009 concerning Health, Law Number 29 of 2004 concerning Medical Practice, Law No. 36 of 2014 concerning Health Workers and Law Number 38 of 2014 concerning Nursing.

For health workers including medical volunteers, the mandate to the state to provide legal protection is clearly stated in Article 27 paragraph (1) of Law Number 36 of 2009 Concerning Health (Health Law) which confirms that health workers are entitled to compensation and legal protection in implementing duties according to their profession. This provision is clearly supported by Law No. 36 of 2014 concerning Health Workers in particular article 57 point (a) which states that Health Workers in practicing have the right to obtain legal protection as long as carrying out their duties in accordance with Professional Standards, Professional Service Standards, and Standard Operating Procedures.

Some of these laws and regulations clearly show the state policy of providing legal protection to health workers which includes the rights and obligations of health workers. Even so, in the context of medical volunteers during emergency medical procedures, the mandate of the four laws does not yet clearly define the rights and obligations of medical volunteers, especially during emergencies, whose status is usually in particular legal protection as professional workers who have temporary work contracts. that is, during a health crisis. According to the general provisions of Article 1 of the Regulation of the Minister of Health of the Republic of Indonesia Number 75 of 2019 concerning Health Crisis Management, a Health Crisis is an event or series of events that results in fatalities, injuries/illness, displacement, and/or potential hazards that impact on public health. requires a rapid response beyond the normal course of action and inadequate health capacity.

This condition of abnormal response does not only apply to the vulnerable public but also to the safety of health workers including

medical volunteers. Therefore, the legal protection given to medical volunteers must also cover various aspects of life, including health, work safety and socio-economic welfare. Thus, it is inevitable to make Law Number 11 of 2020 concerning Job Creation ("Job Creation Law") and Government Regulation Number 35 of 2021 concerning Work Agreements for Specific Periods, Outsourcing, Working Time and Break Time, and Termination of Employment ("PP 35/2021") as implementing regulation to become part of the regulatory system for legal protection for medical volunteers who are bound by temporary contracts with the government.

According to the original article 1 number 10 of Government Regulation Number 35 of 2021 concerning Work Agreements for Specific Time, Outsourcing, Working Time and Rest Time, and Termination of Employment ("PP 35/2021"), contract workers are a term that is commonly used for workers with specific time work agreement ("PKWT"). PKWT itself is a work agreement between workers and employers to enter into a working relationship for a certain time or for a certain job. In order to clarify the position of part-time workers, including medical volunteers during an emergency, article 57 of the Job Creation Law emphasizes that PKWT is made in writing and must use Indonesian and Latin letters and be made specifically for one type of work. This written agreement legally strengthens the position of medical volunteers.

Apart from that, being a medical volunteer also puts your life at risk because you have the potential to be exposed to the same disease. Therefore, laws and regulations related to social security, health and safety are also regulated in Law Number 24 of 2011 concerning the Social Security Administration Agency ("UU BPJS") and Law Number 40 of 2004 concerning the National Social Security System ("UU BPJS") SJSN). According to the mandate of the BPJS Law, basically, everyone, including foreigners who work for a minimum of 6 (six) months in Indonesia, is required to become a participant in the Social Security program.

Employers, in this case the central and regional governments, are obliged to gradually register themselves and their workers or medical volunteers as participants with the



BPJS, in accordance with the social security program they are participating in and workers have the right to register themselves as participants in the social security program at the employer's expense if the employer has obviously not registering their workers with BPJS.

Meanwhile, what is meant by an employee is any person who works by receiving a salary, wages or other forms of remuneration. This means there is no difference between permanent workers (with an Unspecified Time Work Agreement) and contract workers (with a Specific Time Work Agreement). With this kind of regulatory system, how practical are the types and forms of legal protection for medical volunteers during emergency medical procedures? Several regulations and decisions of the Minister of Health to answer the rights and obligations of health workers during the Covid-19 pandemic can be used as a reference.

### **1. Forms of Legal Protection for Medical Volunteers in Emergency Periods**

The characteristics of health emergency conditions which are high risk for all parties make the type and form of legal protection for medical volunteers as part of the health workforce must cover various aspects of the life of medical volunteers. Article 57 of Law No. 36 of 2014 concerning Health Workers describes that Health Workers in practicing have the right to:

- a. Obtain legal protection as long as carrying out tasks in accordance with Professional Standards, Professional Service Standards, and Standard Operating Procedures;
- b. Obtain complete and correct information from Health Service Recipients or their families;
- c. Receive compensation for services;
- d. Obtain protection for occupational safety and health, treatment in accordance with human dignity, morals, decency, and religious values;
- e. Get the opportunity to develop their profession;
- f. Refuse the wishes of Recipients of Health Services or other parties that conflict with Professional Standards, code of ethics, service standards, Standards

- g. Operational Procedures, or provisions of Laws and Regulations; and obtain other rights in accordance with the provisions of the Laws and Regulations.

Encouraged by the mandate of the Law on Health Workers and the fact of the ferocity of the Covid-19 pandemic, the Ministry of Health issued a Decree of the Minister of Health HK.01.07/MENKES/327/2020 Concerning the Determination of Corona Virus Disease 2019 (Covid-19) Due to Work as a Specific Occupational Disease in Certain Jobs. Considerations for the Decree of the Minister of Health include:

- a. That health workers and non-health workers in carrying out their work to handle Corona Virus Disease 2019 (COVID-19) are at high risk of contracting Corona Virus Disease 2019 (COVID-19) so that they can cause work-related illnesses;
- b. That in order to guarantee the fulfillment of the rights of every worker against risks in dealing with Corona Virus Disease 2019 (COVID-19), it is necessary to determine Corona Virus Disease 2019 (COVID-19) due to work as a specific work-related disease based on certain criteria;
- c. That based on the considerations referred to in letters a and b, it is necessary to stipulate a Decree of the Minister of Health regarding the Designation of the Corona Virus Disease 2019 (COVID-19) as a Specific Occupational Disease in Certain Jobs;

In addition, to clarify the issue of reimbursement for Covid-19 patient care costs, the Minister of Health also issued a Decree of the Minister of Health number HK.01.07/MENKES/446/2020 Concerning Technical Guidelines for Claiming Reimbursement of Service Fees for Patients with Certain Emerging Infectious Diseases for Hospitals Organizing Services Covid-19. Furthermore, processing these provisions, the PB IDI Team (Indonesian Doctors Association) issued a Standard Guide for Doctor Protection in the Era of Covid-19 in August 2020<sup>10</sup>.

The following two points are types and forms of legal protection for doctors and medical volunteers during health emergencies,

especially the Covid-19 pandemic, based on several Minister of Health Decrees.

### 1. Legal Protection

As a pandemic that has such an enormous impact, the government has established Corona Virus Disease 2019 COVID-19 as an Occupational Disease (PAK) that is specific to certain jobs through Decree of the Minister of Health Number HK.01.07/MENKES/327/2020. Based on Presidential Regulation Number 7 of 2019 concerning Occupational Diseases, work-related COVID-19 is included in the category of types of occupational diseases caused by other biological factors in the workplace where there is a direct relationship between exposure to biological factors that arise due to work activities and the disease experienced by workers that can be scientifically proven using appropriate methods.

Furthermore, in these provisions, the government clearly states that certain jobs as referred to in the FIRST Dictum are work performed by health workers and non-health workers in handling Corona Virus Disease 2019 (COVID-19). In this context, medical volunteers during the Covid-19 pandemic are included. Thus, legal protection for medical volunteers during an emergency is placed in the context of insurance against work accidents or as part of a worker protection program in cases of work-related illnesses.

The government regulates legal protection through the Occupational Accident Insurance Program (JKK) for PAK cases due to COVID-19 through the Minister of Manpower Circular No.M/8/HK.04/V/2020 concerning Worker/Labor Protection in the Occupational Accident Insurance Program in Disease Cases Due to Work Due to Corona Virus Disease 2019 (Covid-19). The norms of protection for doctors and health workers who become medical volunteers during an emergency should include protection of work norms, protection of Occupational Health and Safety (K3) norms and protection of workers' social security norms.

Legal protection related to work norms for medical volunteers includes wages, working time, rest time and leave. In an emergency context, protection of K3 norms in the context of handling COVID-19 includes prevention and control of work accidents and work-related COVID-19.

Meanwhile, the protection of workers' social security norms for doctors by ensuring membership in the national health insurance (JKN) is carried out through the JKN-BPJS Health program as well as work accident insurance and death benefits which are held through the Employment BPJS program.

During the emergency period, especially the Corona pandemic, every health worker/doctor including medical volunteers who are being treated for COVID-19, the government bears the costs related to the care and treatment of COVID-19 infection. This provision is contained in the Decree of the Minister of Health Number HK.01.07/MENKES/446/2020 concerning Technical Guidelines for Claiming Reimbursement for Patient Services for Certain Emerging Infectious Diseases for Hospitals Providing COVID-19 Services. Furthermore, with regard to Occupational Diseases suffered, COVID-19 also refers to these rules, but the final condition after treatment/care, namely recovery, disability or death, can be borne by BPJS Employment or in accordance with insurance that has been followed, such as ASN Doctors borne by PT. Taspen and TNI/Polri doctors are paid for by PT. ASABRI.

In addition, the items paid include compensation in the form of money (temporary inability to work compensation, disability compensation, rehabilitation costs, children's scholarships, funeral money, death benefits) and disability benefits. In addition, financing medical examinations related to COVID-19 that are not guaranteed or insufficient claims in the COVID-19 guarantee are the responsibility of the relevant health service facility.

#### 1. Sosial Intensive and Social Protection

Other forms of legal protection for health workers including medical volunteers during public health emergencies, especially the Corona pandemic, are related to economic and social welfare. Doctors and health workers as well as medical volunteers during the emergency period as workers receiving wages/salary as well as service/medical services need to know their rights and obligations related to service during the COVID-19 Pandemic.

Every doctor works according to competence and a maximum of three practice places are often in an insecure position against disease exposure. In the context of the Corona

pandemic, this reality has resulted in the lack of uniformity regarding service tariff references during the COVID-19 pandemic. This reference is the basis for calculating in reaching an agreement on the amount of medical services to be received and or provided between doctors and hospital directors.

In particular, in the context of an emergency the reference for medical service rates including medical volunteers during the COVID-19 Pandemic, especially for doctors, needs to be adjusted and aligned with the performance or effort required to establish a diagnosis until the required medical action/procedure including rehabilitation and an applicable nominal value. which is part of the service tariff component refers to the doctor's medical service reference (tariff) that has been issued by IDI and associations under its auspices.

The government provides welfare protection with regulations regarding the provision of incentives and death benefits for doctors and health workers who handle COVID-19 contained in the Decree of the Minister of Health number HK.01.07/MENKES/447/2020 concerning which was the result of a revision of the previous Decree of the Minister of Health, namely number HK.01.07/MENKES/392/2020. Even so, in IDI's records, there are weaknesses, namely for doctors who work in more than one referral hospital or their health facilities are not a referral hospital for COVID-19. Weaknesses in other fields are the non-uniformity in the determination of professional fee calculations according to the gradation of treatment classes. Often services are assessed by the value of the type of service class which is often not uniform<sup>10</sup>.

More clearly, based on the Decree of the Minister of Health number HK.01.07/MENKES/447/2020, during a public health crisis such as a pandemic, the types of health workers include specialist doctors, doctors, dentists, midwives, nurses, and other medical personnel, including medical staff. health workers such as doctors who take part in special resident assignments, doctors who take part in the Indonesian Doctor Internship Program, doctors who take part in the Utilization of Specialist Doctors, health workers who take part in the Special Assignment of Health Workers in Supporting

the Healthy Nusantara Program, and volunteers appointed by the Ministry of Health who are involved in handling COVID -19 proposed by the head of the health service facility where the assignment is. The said workforce also still gets incentives after providing COVID-19 treatment and carrying out quarantine.

In particular, for medical volunteers who work as doctors during the emergency period, incentives and death benefits for health workers who handle Corona Virus Disease 2019 (COVID-19) are given from March 2020 to December 2020, and can be extended according to the provisions legislation. The amount of health worker incentives is as follows:

- a. Incentives for health workers who provide COVID-19 services in hospitals are as high as: 1) Specialist Doctor IDR 15,000,000/OB; 2) General Practitioner IDR 10,000,000/OB
- b. The amount of incentives given to doctors who take part in special resident assignments and doctors who take part in the Indonesian Doctor Internship Program at hospitals involved in handling COVID-19 is the highest in the amount of IDR 10,000,000 (ten million rupiah) while doctors who take part in the Indonesian Doctor Internship Program at The Puskesmas involved in handling COVID-19 is a maximum of IDR 5,000,000 (five million rupiah).
- c. The maximum amount of incentives given to doctors participating in the Utilization of Specialist Doctors involved in handling COVID-19 is IDR 15,000,000 (fifteen million rupiah).
- d. The amount of incentives for clinical pathology specialists and clinical microbiology specialists who examine SARS-CoV-2 specimens directly in the laboratory is the same as the amount of incentives for specialist doctors.

Other legal protection can be seen in the Decree of the Minister of Health number HK.01.07/MENKES/447/2020, the amount of death benefit is Rp. 300,000,000 (three hundred million rupiah) given to health workers who died from exposure to COVID-19 who provided services at health care facilities or health institutions, including doctors who took resident special assignments, doctors who took part in the Indonesian Physician Internship Program, doctors who took part in Utilization of

Specialist Doctors, and health workers who take part in the Special Assignment of Health Workers in Supporting the Nusantara Sehat Program, and volunteers appointed by the Ministry of Health.

In general, according to this government regulation, sources of incentive funding for health workers who are handling Corona Virus Disease 2019 (COVID-19) are borne by the State Revenue and Expenditure Budget (APBN) and the Regional Revenue and Expenditure Budget through additional Health Operational Assistance (BOK). Meanwhile, funding for death benefits comes from the state budget.

## CONCLUSION

Forms of legal protection for medical volunteers in emergencies can be understood and developed in the context of health, disaster and employment regulations, namely Law Number 36 of 2009 concerning Health, Law Number 29 of 2004 concerning Medical Practice, Law Number 36 of 2014 concerning Health Workers and Law Number 38 of 2014 concerning Nursing, Regulation of the Minister of Health of the Republic of Indonesia Number 75 of 2019 concerning Health Crisis Management, Law Number 11 of 2020 concerning Job Creation and Government Regulation Number 35 of 2021 concerning Work Agreements for a Specific Time, Transfer Power, Working Time and Rest Time, and Termination of Employment. Implementing these laws and regulations, several Decrees of the Minister of Health and Circular Letters of the Ministry of Manpower were issued which regulate and guarantee legal protection for health workers including medical volunteers during a health emergency which includes protection of work norms, protection of Occupational Health and Safety (K3) norms and protection labor social security norms.

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## ***Sungkai Leaf Extract (*Peronema canescens* Jack) Reduces MDA Levels and Increases IL-10 Levels in MSG-Induced Wistar Rats***

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### **ABSTRACT**

*The addition of Monosodium Glutamate (MSG) to ready-to-eat food can change eating habits, coupled with a lack of activity which can have an impact on health. MSG as a trigger for increased reactive oxygen species (ROS), causing systemic damage, the impact of excessive MSG consumption can be reduced by modifying the diet to contain high sources of antioxidants. Sungkai leaf extract can be an alternative as a natural antioxidant. Sungkai leaf extract antioxidants are expected to neutralize ROS thereby repairing cell damage. Objective: This study aims to determine how giving sungkai leaf extract affects MDA and IL-10 levels in MSG-induced mice. Method: Experimental research with a Randomized Post test only control group design. The total sample was 24 male Wistar rats divided into 4 groups. KN healthy mice, K(-) were given 1g MSG/rat, P1 was given 1g MSG/rat and 28mg sungkai leaf extract/rat, P2 was given 1g MSG/rat and 56mg sungkai leaf extract/rat. Results: The average results showed a decrease in MDA levels and an increase in IL-10 levels after treatment for 21 days, the One way Anova test followed by Post hoc LSD showed that each treatment group was significantly different from the control group where the MDA level in group P2 was 0,07mg/ml ± 0.01 experienced a significant decrease compared to the KN group 0.07mg/ml ± 0.01 while IL-10 levels experienced a significant increase in the P1 group 130.10pg/ml ± 13.29 when compared to the KN group 60.43pg/ml ± 17.40. Conclusion: Sungkai leaf extract (*Peronema Canescens* Jack) was able to reduce MDA levels at a dose of 56 mg/mouse in mice injected with 1gr MSG/rat and experienced a significant increase in IL-10 levels with a dose of 28 mg sungkai leaf extract/rat injected with 1gr MSG/rat.*

**Keywords:** *Sungkai leaf extract, MDA levels, IL-10 levels, MSG*

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## **INTRODUCTION**

The habit of consuming fast food and lack of physical activity causes changes in eating patterns, the majority of these foods have harmful effects on human health. Food manufacturers use Monosodium Glutamate

(MSG) to improve the taste of food<sup>1</sup>. MSG is a commonly used food additive and can pose a threat to health<sup>2</sup>.

MSG is added to many processed foods with an estimated average daily human intake of around 0.3-1.0 g in industrialized European countries<sup>3</sup>.

In Germany, 10.0 g of MSG is consumed daily on average, compared to 0.58 g in the UK. The typical daily consumption in Nigeria is 0.56–1.00 g, however in Asia it is greater, with intakes of 1.1–1.6 g in Japan, 1.5–3 g in Taiwan, and 1.6–2.3 g in South Korea documented. Although the FDA claims that MSG is harmless, animal studies have shown that prolonged MSG use has harmful consequences<sup>4</sup>. Report on the use of MSG in Indonesia in 2013. RISKESDAS 2013 reported MSG consumption at 77.3%. Other intakes that are considered dangerous, such as sweet foods (53.1%), fatty foods (40.7%), and coffee (29.3%)<sup>5</sup>.

MSG can trigger an increase in reactive oxygen species (ROS), changing redox homeostasis and causing systemic damage<sup>1</sup>. Induces male reproductive toxicity through oxidative damage mechanisms in the form of increased lipid peroxidation and decreased antioxidant enzyme activity, hormonal dysfunction, and decreased sperm quality<sup>6</sup>.

The product of lipid peroxidation produced when oxidative stress increases is Malondialdehyde (MDA)<sup>7</sup>. High MDA levels are influenced by lipid peroxidation, indirectly indicating a high number of free radicals and indicating that the cell membrane is undergoing oxidation<sup>7,8</sup>. Potential damage to tissue activates Interleukin 10 (IL-10) to reduce the effects of inflammation and infectious conditions<sup>9</sup>. IL-10 is a potent anti-inflammatory cytokine, critical for maintaining immune system homeostasis and preventing chronic inflammatory disorders<sup>10</sup>.

IL-10 increases antibody synthesis and B cell proliferation and can increase the release of TNF receptors and decrease the production of reactive oxygen species (ROS), which can counteract the effects of TNF- $\alpha$ <sup>11</sup>.

Repeated MSG consumption has been linked in pre-clinical trials to the development of asthma, cancer-related obesity, diabetes, and oxidative stress. MSG use has also been linked to neurotoxic side effects as well as hepatotoxic, genotoxic, reproductive, renal, and other toxicities. MSG use has also been associated with epilepsy, Parkinson's disease, Alzheimer's disease, addiction, brain injury, anxiety, stroke, and depression<sup>12</sup>.

The impact of excessive MSG consumption can be reduced by modifying your diet to contain high sources of antioxidants. The

use of natural ingredients is becoming relevant as an option to reduce foodborne toxins and is a promising alternative<sup>1</sup>. High free radical content can be reduced with antioxidant compounds. Antioxidants are compounds that have the ability to release hydrogen to reduce levels of free radicals<sup>6</sup>. Based on this antioxidant mechanism, sungkai leaf extract can be an alternative as a natural antioxidant. Using sungkai leaf extract which is known to reduce free radicals in the body<sup>13</sup>. However, the relationship with MDA and IL-10 levels still needs further investigation.

Sungkai leaf extract antioxidants can neutralize ROS thereby repairing cell damage and balancing hormone secretion.

## METHOD

The type of research carried out was laboratory experimental with a Post Test Only Control Group Design research design. The research was carried out at the Integrated Biomedical Laboratory (IBL) Faculty of Medicine, Sultan Agung University, Semarang.

Sungkai leaves are obtained in the Jambi city area, Jambi Province because many sungkai plants grow well and the type of sungkai leaves used is the perfect sungkai leaf type because it can be obtained throughout the year. 1000 grams of sungkai leaf powder is then put in a dark colored container, stir until homogeneous, cover immediately then Stored in a room protected from sunlight for 5 days and shaken frequently. The soak was filtered with flannel cloth, the dregs were washed with solvent to a volume of 750 mL. The results were concentrated using a vacuum evaporator until a thick extract was obtained.

The research population was male Wistar rats (*Rattus norvegicus*) aged 3-4 months, weighing 200-250 grams, acclimatized for 7 days and kept in a room with good ventilation, room temperature 28-32oC. Wistar rats were given standard food and enough water to drink. Determining the subjects consisted of 24 mice. Subjects were taken randomly from mice that had been acclimatized for 7 days. Randomization was used to determine control and treatment group mice.

The treatment group was divided into 4 groups, namely the normal group (KN) without MSG induction and sungkai leaf extract, the negative group (K-) induced by MSG at a dose

of 1g/mouse without being given sungkai leaf extract, the treatment group 1 (P1) induced by MSG at a dose of 1g /rat and given a dose of 28 mg of sungkai leaf extract/rat, and treatment group 2 (P2) was induced by MSG at a dose of 1g/rat and given a dose of 56 mg of sungkai leaf extract/rat. On the 22nd day, blood was taken from all mice via the orbital sinus of the eye, then processed to obtain serum and MDA levels were measured using the Thiobarbituric acid assay (TBARS) method with spectrophotometry at a wavelength of 532-535 nm and IL-10 using the Enzyme-Linked method. Immunosorbent Assay (ELISA) was analyzed using the ELISA Reader. The data obtained from the research was tested for normality of the data using the Shapiro Wilk test and homogeneity test was carried out with the Levene test ( $p > 0.05$ ). To determine the differences between each group, the one way ANOVA test was used ( $p < 0.05$ ) and continued with the Post hoc/LSD test to determine significant differences between groups ( $p < 0.05$ ).

## RESULTS

This research quantitatively analyzed the flavonoid content of sungkai leaf extract in simplicia powder using 70% ethanol solvent, resulting in a result of 53.3 mg/ml. This result is higher when compared with the flavonoid content of sungkai bark extract of  $29.41 \pm 0.64$  mg quercetin equivalent/g extract<sup>14</sup>.

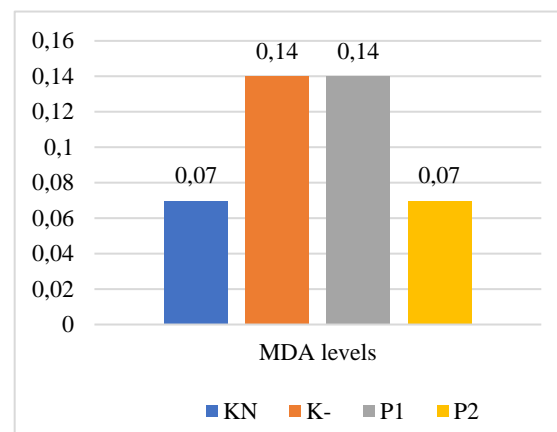
After giving treatment to the 4 test groups for 21 days, blood samples were taken and centrifuged to obtain serum on the 22nd day. The results of measuring MDA levels in the various groups are depicted in the following descriptive table:

**Table 1. Description of MDA levels groups**

Variable	Group				p
	KN N=5	K- N=5	P1 N=5	P2 N=5	
<b>MDA levels (mg/ml)</b>					
Mean $\pm$	0,07 $\pm$	0,14 $\pm$	0,14 $\pm$	0,07 $\pm$ 0,01	
SD	0,01	0,03	0,02		
Shapiro wilk	0,32*	0,27*	0,60*	0,12*	
Levene test					0,13**
One way Anova					0,000***

Table 1, it shows that the average MDA level of the normal group (KN) was 0.070 mg/ml  $\pm$  0.007, the negative group (K-) 0.142

mg/ml  $\pm$  0.217, the average of treatment group 1 (P1) 0.146 mg/ml  $\pm$  0.029 and the treatment 2 (P2) 0.070 mg/ml  $\pm$  0.010. The MDA level data for the four groups were all normally distributed ( $p > 0.05$ ) and also had a homogeneous data variance with a value of 0.132 ( $p > 0.05$ ). Based on the results of the One Way ANOVA test, a value of 0.000 ( $p < 0.05$ ) was obtained, indicating that there was a significant difference



in average MDA levels between the four groups.

**Figure 1. Graph of the average value of MDA levels for each group.**

The lowest average MDA levels were in the normal group (KN). In the negative group (K-) with the administration of 1gr MSG/rat there was an increase in MDA levels, in treatment group 1 (K1) with the administration of 1gr MSG/rat and 28 mg dose of sungkai leaf extract /mice MDA levels did not decrease, in fact tended to increase, whereas in treatment group 2 (K2) with 1gr MSG/rat and 56 mg sungkai leaf extract/rat experienced a decrease in MDA levels or the same as the normal group.

**Table 2. Differences in average MDA levels for each group**

Group	KN	K-	P1	P2
KN	-	0,000*	0,000*	1,000
K-	0,000*	-	0,744	0,000*
P1	0,000*	0,744	-	0,000*
P2	1,000	0,000*	0,000*	-

LSD post hoc test to see differences between groups. The differences in MDA levels are shown by pairs of groups, with the results of the LSD post hoc test.

The MDA level of the normal group (KN) using the LSD post hoc test was significantly different from the negative group



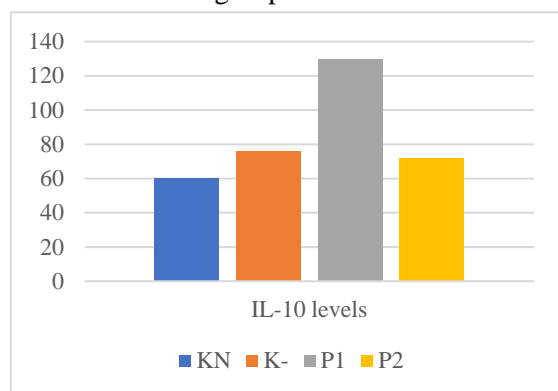
(K-), KN was significantly different from the P1 group and KN was not significant from P2. K- is significantly different from the KN group, K- is not significantly different from the P1 group and KN is significantly different from the P2 group. P1 is significantly different from KN, P1 is not significant from K-, and P1 is significantly different from P2. P2 is not significant with KN, P2 is significantly different from K-, and P2 is significantly different from P1.

**Table 3. Description of treatment MDA levels**

Variable	Group				p
	KN N=5	K- N=5	P1 N=5	P2 N=5	
<b>Kadar IL-10 (pg/ml)</b>					
Mean ±	60,43±	76,02±	130,10±	71,841±	
SD	17,40	5,71	13,287	9,23	
Shapiro wilk	0,603*	0,425*	0,693*	0,428*	
Levene test					0,28**
One way Anova					0,000***

Table 3, it shows that the average level of IL-10 in the normal group (KN) was 60.427 pg/ml ± 17.40, the negative group (K-) 76.02 pg/ml ± 5.71, treatment group 1 (P1) 130.096 pg /ml ± 13.287 and treatment group 2 (P2) 71.841 pg/ml ± 9.233.

Data on IL-10 levels for the four groups were all normally distributed ( $p > 0.05$ ), and had a homogeneous data variance with a value of 0.28 ( $p > 0.05$ ). Based on the results of the one way ANOVA test, a value of 0.000 ( $p < 0.05$ ) was obtained, indicating that there was a significant difference in average IL-10 levels between the four groups.



**Figure 2. Graph of the average value of IL-10 levels for each group**

The lowest average level of IL-10 in the

normal group (KN) without administration of MSG and sungkai leaf extract was 60.427 pg/ml ± 17.40 pg/mL, IL-10 levels increased in the negative group (K-) with The average value was 76.02 pg/ml ± 5.71, while the highest value was in treatment group 1 (P1) with sungkai extract administered at a dose of 28 mg/rat, the result was 130.096 pg/ml ± 13.287, IL-10 levels decreased in Treatment group 2 (P2) by administering 56 mg sungkai leaf extract/rat obtained an average value of 71.841 pg/ml ± 9.233.

**Table 4. Differences in average IL-10 levels for each group**

Group	KN	K-	P1	P2
KN	-	0,061	0,000*	0,159
K-	0,061	-	0,000*	0,596
P1	0,000*	0,000*	-	0,000*
P2	0,159	0,596	0,000*	-

LSD post hoc test to see differences between groups. The differences in IL-10 levels are shown by pairs of groups, with the results of the LSD post hoc test.

IL-10 levels in the normal group (KN) using the LSD post hoc test were not significant compared to the negative group (K-), KN was significantly different from P1, KN was not significant from P2. K- is not significant with the KN group, K- is significantly different from P1 and K- is not significant with P2. P1 is significantly different from KN, P1 is significantly different from K-, and P1 is significantly different from P2. P2 is not significant with KN, P2 is not significant with K-, and P2 is significantly different from P1.

## DISCUSSION

MDA levels in mice induced by MSG were 1g/rat for 21 days in group 2 with a dose of 56 mg/rat, namely an average of 0.070±0.010 mg/ml. In line with previous research by Kassab et al. (2022) and Elmas et al (2023) showed that administration of excess MSG increased MDA levels as indicated by a decrease in glutathione levels and a decrease in the activity of superoxide dismutase, catalase, glutathione peroxidase, and glutathione reductase<sup>15,16</sup>.

MDA as an inflammatory mediator (MDA epitope) can be found as a biomarker for oxidative stress in various inflammatory diseases, due to excessive or inadequate production of lipid peroxidation in situations of oxidative stress,



The MDA epitope as an indicator of damaged tissue or oxidized biomolecules and its exposure to autologous structures to alert the immune system to danger because non-physiological accumulation can trigger the activation of proinflammatory responses. In addition, IL-10 increases antibody synthesis and B cell proliferation and can increase receptor shedding<sup>7</sup>. TNF and reduces the production of reactive oxygen species (ROS), which can counteract the effects of TNF- $\alpha$ <sup>11</sup>.

Sungkai extract stimulates the immune system by increasing the number of leukocytes, proportion of lymphocytes, activity and phagocytic ability of macrophage cells, number of leukocytes, number of segmental neutrophil cells, and levels of proinflammatory cytokines (TNF- and IL-6)<sup>17</sup>.

Research by Lestari et al. (2021) who reported a microscopic histology of the liver when administered MSG at a dose of 5 g/kg BW showed a number of cell abnormalities of 40.5 (40-43) % with moderate damage, fatty degeneration and sinusoidal congestion were found<sup>18</sup>. Administration of sungkai leaf extract can improve (reversible) cell inflammation in the mitochondria and endoplasmic reticulum due to oxidation disorders. The active components of sungkai leaves increase the total strength of antioxidants in the blood and reduce peroxidation levels.

The results showed a significant increase in IL-10 levels in treatment group 1 (P1) with an average value of 130,096 pg/ml  $\pm$ 13,287, endogenous glutamate mechanisms play a role in physiological and pathological processes, glutamate produces energy in erythrocytes, an intermediate substance in protein metabolism, precursors of important metabolites such as GSH, oxidative stress modulators and central nervous system (CNS) neurotransmitters<sup>3</sup>.

This effect is mediated by intake factors of sungkai leaf extract which modulate signaling pathways and influence various mechanisms involved in inflammation<sup>17</sup>. Inflammation is characterized by interactions between pro- and anti-inflammatory cytokines associated with immune cell infiltration which facilitates the further development of tissue damage<sup>19</sup>. Defense against oxidative stress can occur through several mechanisms, the most effective of which is the antioxidant defense system<sup>20</sup>.

## CONCLUSION

Administration of sungkai leaf extract (*Peronema Canescens Jack*) reduced Malondialdehyde (MDA) levels at a dose of 56 mg/head (200gr rat) in male Wistar rats induced by MSG and administration of sungkai leaf extract (*Peronema Canescens Jack*) increased levels of interleukin 10 (IL-10) at a dose of 28 mg/head (200gr rat) in male Wistar rats induced by Monosodium Glutamate (MSG). The suggestion further research is needed on other molecular parameters such as levels of superoxide dismutase (SOD) and glutathione (GSH), as well as pro-inflammatory cytokines (TNF- $\alpha$  and IL-6) and examine the effect of sungkai leaves on the histopathological appearance of liver, kidney and testicular tissue.

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Original Article

**Implementation of Accelerated Stunting Reduction at the Biromaru Public Health Center, Sigi Regency**

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**ABSTRACT**

*This study aims to determine the implementation of stunting reduction policies at the Biromaru Public Health Center, Sigi Regency, a conceptual model using Edward III's theory from the aspects of Communication, Resources, Disposition, and Organizational Structure. The research method used is qualitative research, namely observation, in-depth interviews, and documentation. Based on the study results, it can be concluded that the stunting reduction policy implementation at the Biromaru Public Health Center in Sigi Regency has not run optimally. This is evident from the inadequate implementation of the aspects of Communication, Resources, Disposition, and Organizational Structure. Several obstacles hinder the implementation of stunting reduction policies. The resources at the Biromaru Health Center in Sigi Regency are lacking, especially in terms of facilities like scales and height measuring devices. Not all posyandu centers receive these resources due to budget limitations, which vary by village. This affects the optimal implementation of the policy. Regarding the Organizational Structure and Standard Operating Procedure (SOP), while they have not yet been established, all officers maintain a good working relationship, as confirmed through interviews showing their collaborative efforts in the program.*

**Keywords:** Policy Implementation, Stunting Decrease

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**INTRODUCTION**

Stunting is a critical nutrition issue globally, with developing countries like Indonesia facing a significant challenge. The severity of the problem lies in its associations with an increased risk of disease, higher mortality rates, diminished physical resilience, lower cognitive capabilities, reduced productivity, and suboptimal brain development, leading to delays in motor and mental growth. To comprehensively understand the root causes, conduct a detailed analysis, and explore potential solutions, we must consider

several key factors<sup>1</sup>.

Several factors cause children under five to experience stunting as written by <sup>2</sup>. Stunting in children under five is a consequence of several factors often associated with poverty, including nutrition, health, sanitation, and the environment. Five main factors cause stunting, namely poverty, social and cultural, increased exposure to infectious diseases, food insecurity, and community access to health services. Factors associated with chronic nutritional status in children under five are not the same between urban and rural areas, so efforts must be tailored to the influencing factors.

Nutrition is a very complex and important issue to address in Indonesia. Especially since Indonesia is one of the countries with the most complete nutrition problems. Several studies mention that nutrition problems in Indonesia tend to continue to increase, not comparable to some other ASEAN countries such as Malaysia, Singapore, and Thailand. One of the nutritional problems in Indonesia that is still problematic today is stunting<sup>3</sup>. From the data on the nutritional status of the Sigi District Health Office in August 2021, there were 16.7% of stunted children.

stunting cases, for the Puskesmas working area in Sigi Regency which has the highest stunting rate, is in the Biromaru Puskesmas working area where there are 377 (20.9%) cases of stunting toddlers in 2021, and the lowest cases of stunting toddlers are in the Lindu Puskesmas working area where there are only 18 (4.2%) cases of stunting toddlers<sup>4</sup>.

Stunting prevalence data from the work area of the public health center that has the highest stunting in Sigi Regency, namely Biromaru, recorded that in 2019 there were 488 cases of stunted toddlers, in 2020 there were 474 cases of stunted toddlers, and in 2021 there were 308 stunted toddlers recorded in the Biromaru health center work area<sup>5</sup>.

As a form of commitment to accelerate stunting reduction, the government has issued Presidential Regulation (*Perpres*) Number 42 of 2013 concerning the National Movement for the Acceleration of Nutrition Improvement, but this regulation has not been able to accommodate efforts to accelerate stunting reduction effectively so that it was replaced, Presidential Regulation (*Perpres*) Number 72 of 2021 concerning acceleration of stunting reduction. This regulation is to strengthen the framework of interventions that must be carried out and institutions in the implementation of accelerated stunting reduction.

To effectively address the issue of stunting in Sigi Regency, it is imperative to strengthen the analysis of the implementation of the Presidential Regulation, which necessitates the formulation of a corresponding District Regulation (*Perbup*). In this case, District Regulation Number 14 of 2020, specifically focusing on the acceleration of stunting reduction, serves as a critical instrument. This *Perbup* mandates the active participation of various cross-sectoral entities in the stunting

reduction acceleration program. A robust analysis of this situation reveals several key points: The existence of a District Regulation (*Perbup*) aligned with the Presidential Regulation underscores the importance of a well-structured legal framework in addressing the issue of stunting. It provides the necessary legal authority for implementing measures at the regional level. The involvement of cross-sectoral entities is a vital component of an effective stunting reduction program. By engaging multiple sectors such as healthcare, nutrition, education, and social welfare, it acknowledges the multifaceted nature of the problem and the need for a coordinated approach.

Additionally, this approach highlights the following: the presence of District Regulation Number 14 of 2020 indicates a commitment to consistency and alignment with national policies. This ensures that regional efforts are in harmony with broader national objectives in addressing stunting, fostering a unified approach to the problem. District regulations allow for tailoring solutions to the specific needs and challenges of Sigi Regency. This reflects an understanding of the unique local context and enables the development of targeted interventions to combat stunting effectively. The involvement of multiple sectors in the acceleration program necessitates a robust accountability and monitoring system. An in-depth analysis should focus on how the local government tracks progress, ensures compliance, and measures the impact of the program to adapt and improve interventions over time. Such an analysis serves as a crucial foundation for effective policy implementation and ultimately achieving meaningful reductions in stunting rates.

This study aims to determine the implementation of a stunting reduction policy implementation at Biromaru Health Center, Sigi Regency conceptual model using Edward III theory from aspects: Communication, Resources, Disposition, and Organizational Structure.

## **METHOD**

The type of research used is qualitative research, namely observation, in-depth interviews, and documentation. Qualitative research is research that seeks to find theories derived from data. Therefore, the theory used in the research is very influential. Whether

starting from the discovery of the phenomenon to the conclusion of the research.

## **RESULTS**

### **Communication**

Communication is the process of interaction between humans and humans and also between humans and the environment, two or more individuals influence each other's ideas, opinions, beliefs, and attitudes.

Based on field research at the Biromaru Health Center, Sigi Regency, communication on the guidelines for implementing the Stunting Reduction Acceleration program have been carried out well and have been consistent with making information and motivation for early prevention of stunting problems such as educational counseling on exclusive breastfeeding, nutrition counseling, counseling on the 5 Pillars of STBM, for pregnant women and parents of stunted toddlers, as well as to adolescent girls there is educational counseling and provision of ve from the Biromaru Health Center, which is to ensure public health and prevent children at risk of stunting. Factors that influence the implementation of the Stunting Reduction Acceleration program are when they directly intervene in problems in the field such as conducting counseling to educate the community and the communication is carried out repeatedly by the Biromaru Puskesmas so that it will make the community understand more about stunting.

As observed in the field research conducted at the Biromaru Health Center in Sigi Regency, this concept of communication holds true in the context of implementing the Stunting Reduction Acceleration program <sup>6</sup>. The research findings affirm that effective communication has been integral to the success of the program. It has been consistently employed to provide information and motivation for the early prevention of stunting, addressing issues such as exclusive breastfeeding, nutrition, and the "5 Pillars of STBM." This comprehensive approach encompasses educational counseling for pregnant women, parents of stunted toddlers, and adolescent girls, ensuring that the community receives the necessary guidance and support from the Biromaru Health Center. The repeated communication efforts by the Biromaru Puskesmas team have played a significant role in enhancing community

understanding of stunting-related matters. Such communication practices align with established theories of communication as a process of interaction and influence among individuals<sup>7</sup>.

### **Resources**

Resources are an important factor for effective program implementation, without resources, programs or policies are just paper or documents. In the context of public policy, resources have a very decisive role, because with adequate and quality resources the policy will be communicated to the target recipients of the policy as well.

In the research found in the field, the resources that have been given to the target community, seen from Human Resources (HR) are quite adequate, the number of personnel is sufficient, marked by the provision of training to cadres, but from the facilities there are still lacking such as scales and height gauges, not all posyandu get it they only give one village one tool while in each village has 45 posyandu this is because the budget is lacking and the budget depends on each village so that the Puskesmas in implementing the policy is not maximally implemented.

The research conducted at the Biromaru Health Center in Sigi Regency highlights the crucial role of resources in the effective implementation of public policies. Resources, encompassing both human and material assets, are the backbone of any program's success<sup>8</sup>. While the study reveals a satisfactory allocation of human resources, signified by training for cadres, it also brings to light a significant shortfall in essential material resources, specifically scales and height gauges. This scarcity is attributed to budget limitations that result in the allocation of just one set of tools for each village, despite multiple Posyandu centers within each village. The impact of this resource constraint underscores the substantial influence of resource availability and allocation on the practical execution of public policies, in line with existing scholarly literature

### **Disposition**

Disposition or implementation attitude is needed in policy implementation, even though communication and resources to support policy implementation are good, but if policy implementation has a bad attitude, then of course policy implementation will not be effective<sup>9</sup>.

Meanwhile, based on the results of field research, namely at the Biromaru Community Health Center, Sigi Regency, that the disposition of the guidelines for the implementation of the Stunting Reduction Acceleration program has gone well according to what is expected so that the policy has run effectively. Puskesmas Biromaru conducts online-based monitoring, namely EPPGBM, which is carried out every month through a special application from the Sigi District Health Office, and is connected to the Regent of Sigi Regency.

The field research at the Biromaru Community Health Center in Sigi Regency underscores the critical role of disposition or implementation attitude in policy execution. It is evident that even when communication and resources are well-managed, a positive disposition among those responsible for implementation is essential for effective policy execution<sup>10</sup>. In the case of the Stunting Reduction Acceleration program, the research findings indicate that the disposition of the guidelines for implementation aligns with expectations and has thus contributed to the program's success. This positive disposition is exemplified by the implementation of online-based monitoring, specifically the EPPGBM, conducted monthly through a dedicated application from the Sigi District Health Office. This level of proactive implementation attitude and accountability aligns with the principles of effective policy implementation

### **Organization Structure**

In the field research, there is an evaluation in the Stunting Reduction Acceleration program, the evaluation is carried out by the Biromaru Puskesmas nutritionist and reported at the end of each year to the Health Office through a special application. Biromaru health center in organizing the Acceleration of Stunting Reduction policy has been running well but seen from the Standard Operating Procedure (SOP) they have not made it and all officers have a good relationship, as evidenced by the results of interviews that officers work together to speed up the service process.

The organizational structure in handling stunting involves cross-sectoral coordination by BAPPEDA and is led by the Regent of Sigi, for the sensitive basis of the stunting program involves BKKBN and the Health Office, from the Sigi Regency Health

Office down to the Public Health Center which is from the Head of the Public Health Center to the manager and formed Pos Centing (*cegat stunting*).

### **DISCUSSION**

The results of the field research conducted at the Biromaru Health Center in Sigi Regency provide valuable insights into the critical factors influencing the success of the Stunting Reduction Acceleration program. Effective communication has emerged as a linchpin, with consistent efforts to educate the community on stunting prevention. These efforts, encompassing exclusive breastfeeding counseling, nutrition guidance, and the promotion of the "5 Pillars of STBM," reflect the Health Center's unwavering commitment to raising awareness and understanding among the community, particularly pregnant women, parents of stunted toddlers, and adolescent girls. Additionally, the research highlights the significance of resource availability, both human and material. While human resources appear sufficient with training for cadres in place, a shortage of essential equipment, such as scales and height gauges at Posyandu centers, poses a material resource challenge. Overcoming these budget constraints and ensuring equitable distribution of necessary tools across Posyandu centers is vital for the program's success. Together, these findings underscore the essential interplay of effective communication and adequate resources in driving the Stunting Reduction Acceleration program towards its objectives.

Moreover, this study highlights the positive disposition and implementation attitude of those involved in the program. The personnel at the Biromaru Health Center exhibit a strong commitment to the program's success, as evidenced by their adoption of online-based monitoring and regular reporting of progress. This proactive approach, backed by a clear sense of responsibility and accountability, contributes to the efficiency and effectiveness of the policy implementation. The organizational structure and cross-sectoral coordination are equally vital components in addressing stunting. The involvement of various stakeholders, from the local Health Office to the Regent of Sigi, coupled with collaborative efforts with agencies like BAPPEDA and BKKBN, underscores the

comprehensive and well-coordinated approach to tackling the issue of stunting. Although there is no formal Standard Operating Procedure (SOP) in place, the study found that strong working relationships among personnel compensate for this, with team members collaborating to expedite service delivery. In summary, the research underscores the integral role of a positive disposition, effective communication, and a well-structured organizational framework, alongside the need to address resource constraints and formalize operational procedures, for the long-term success in reducing stunting in the region

## CONCLUSION

Based on the results, it can be concluded that the Implementation of the Stunting Reduction Policy at the Biromaru Health Center, Sigi Regency, is as follows. Implementing the stunting reduction policy at the Biromaru Health Center in Sigi Regency from 4 (four) aspects, namely, communication, disposition, resources, and organizational structure, has not fully run optimally.

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Original Article

***The Effect of Progressive Muscle Relaxation Exercises on the Sleep Quality of Menopause Women in the Kolaka Health Center Work Area***

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**ABSTRACT**

*Menopause is the final phase of a woman's reproduction or it is said that the last menstruation experienced by a woman has a psychological impact, especially sleep disorders.. Four of five women who were surveyed stated that their sleep was often disturbed, especially when it was difficult to fall asleep and woke up feeling it was the middle of the night so they complained of blisters in the morning because the duration of sleep at night was around 4 o'clock. The purpose of this study was to analyze the quality of sleep of mothers before and after carrying out progressive muscle relaxation exercises. Quasy Experiment Method in one group pre test-post test design is the method used with a sample of 30 respondents. The quality of sleep before exercise and after exercise progressive muscle relaxation was measured using a questionnaire. Provision of progressive muscle relaxation exercises in accordance with Standard Operating Procedures (SOP). There were significant differences in the quality of sleep of mothers before and after progressive muscle relaxation exercises on sleep quality of postmenopausal women, namely sleep quality (p value 0.000), sleep latency (p value 0.000), efficiency (p value 0.000), sleep disturbance (p value 0.000), sleep disturbance (p value 0.000), value 0.001, and disturbed activity (0.005). Postmenopausal women's sleep quality improves after doing progressive muscle relaxation exercises is effective. It can be said that the application of progressive muscle relaxation exercises in menopausal women is very good so that the quality of sleep for menopausal women is of high quality.*

**Keywords:** *Progressive Muscle Relaxatio, Menopausa, Women*

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**INTRODUCTION**

Indonesia is projected that in 2025 there will be 60 million menopausal women. In 2016, there were 14 million women experiencing menopause or 7.4% of the total population. Kolaka Regency Health Profile in 2019, the number of women was 21,995 people. In 2016, there were 4467 people aged 50-54 years. In 2019 aged 50-54 years in 2016 there were 5575 people<sup>1</sup>.

The condition of a woman who is in her

last menstrual cycle is called menopause<sup>2</sup>. The problems often experienced by women facing menopause from a psychological perspective include emotional, fear, anxiety, irritability, difficulty concentrating, stress and decreased libido. In addition, if not treated properly, sleep disorders can cause physical and psychological disorders, resulting in poor sleep quality in menopausal women. This is because the ovaries progressively no longer produce estrogen<sup>3</sup>.

Psychological changes that often occur during menopause are depression, fatigue, lack



of enthusiasm, insomnia or difficulty sleeping. The problem of insomnia or difficulty sleeping will be experienced by some menopausal women. Apart from that, menopausal women will wake up at night and find it difficult to go back to sleep. The results showed that 63% of menopausal women experienced sleep problems, including difficulty falling asleep and waking up too early rarely, sometimes, or often<sup>4</sup>.

Sleep quality can be interpreted as a person's sleep satisfaction. Sleep quality can be divided into two (2) categories, namely sleep quantity and sleep quality. Sleep quantity includes sleep duration, sleep latency and subjective sleep. Sleep quality can be defined as the ability to maintain and achieve REM and non-REM sleep stages and create a fresh and healthy state when waking up from sleep<sup>5</sup>.

According to the sleep survey, women of all ages reported more sleep disturbances than men, with the incidence of moderate and severe insomnia increasing substantially after age 50-55 years in women. Based on the results of interviews with 5 menopausal women who were in the Kolaka Community Health Center work area, 4 of the 5 women revealed that they experienced sleep disorders such as difficulty getting to sleep and frequently waking up in the middle of the night so they complained of being sleepy in the morning because the duration of sleep at night was around 4 hours. Based on information provided by Puskesmas officials, progressive strength training has never been taught to menopausal women. Sahin in his research showed that there was an effect of progressive muscle relaxation in improving sleep quality with an average score before the intervention was  $10.81 \pm 4.01$  and after the intervention, with a score of  $6.25 \pm 3.34$  ( $p < 0.001$ ). Sleep quality improves when patients continuously and regularly follow progressive muscle relaxation therapy<sup>6</sup>. This study aims to examine the effect of progressive muscle relaxation training on sleep quality in menopausal women.

## METHOD

The research design uses Quasy

Experiment research with one group pretest-posttest design is the research method used. The population is menopausal women who live in Tahoa sub-district with a sample of 30 women who have experienced menopause. The sampling technique used by researchers is purposive random sampling, that is, the sample selected is considered to be representative of the population. One group was selected to assess sleep quality before the test and after the test.

The researcher made a visit to each respondent when carrying out the test. Before the test, sleep quality was assessed in menopausal women using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. Progressive Muscle Relaxation Exercises based on Standard Operating Procedures (SOP). Then after the test a reassessment is carried out.

Paired t-test using the SPSS version 23 application was used to analyze sleep quality data before the test and after the progressive muscle relaxation exercise test.. This research has been approved by the Regional Leadership Health Research Ethics Committee of the Indonesian Public Health Professionals Association (IAKMI) South Sulawesi with number 125/KEPK-IAKMI/VII/2021 and pays attention to research ethical principles.

## RESULTS

Based on univariate tests to analyze the characteristics of respondents and bivariate tests to analyze sleep quality before and after progressive muscle relaxation training in menopausal women, you can see the following table written in sub-headings for each variable.

**Table 1. Respondent Characteristics**

Respondent Characteristics	n	%
Age		
51 – 55 years old	12	40
56 – 60 years old	18	60
Education		
No school	2	6,7
Elementary school	3	10
Junior High School	7	23,3
Senior High School	13	43,3
Diploma/bachelor	5	16,7
Age of First Menarche		

9 – 10 years old	2	6,7
11 – 12 years old	5	16,7
13 – 14 years old	20	66,7
15 – 16 years old	3	10

Table 1 shows that most menopausal women are aged 56-60 years (60%), the highest education level is high school (43.3%) and the highest age at first menarche is 13 - 14 years (66.7%).

**Table 2. Analysis before and after progressive muscle relaxation therapy on the Sleep Quality of Menopausal Women.**

Sleep Quality	Pre therapy Mean (SD)	Post therapy Mean (SD)	p-value
Sleep Quality	2,40(0,498)	1,97(0,809)	0,000
Sleep Latency	2,80(0,407)	2,07(0,868)	0,000
Long Sleep	2,50(0,509)	2,37(0,490)	0,102
Efficiency	2,07(0,785)	0,90(0,845)	0,000
Sleep Disorders	2,13(0,346)	1,73(0,450)	0,001
Drug Use	0,30(0,794)	0,20(0,551)	0,083
Disruption of Activities	1,50(0,509)	1,23(0,430)	0,005

Note: p value: Wilcoxon test, significant (0.05)

Table 2 shows that there is a significant effect of progressive muscle relaxation training on menopausal women's sleep quality (p-value 0.000), sleep latency with a p-value of 0.000, efficiency with a p-value of 0.000, sleep disturbance with a p-value of 0.001, and activity disruption with a p-value of 0.005.

## DISCUSSION

Based on the results of research on pre and post-analysis of progressive muscle relaxation therapy on the sleep quality of menopausal women, it was found that it was significantly present before and after following progressive muscle relaxation therapy, namely in the sleep quality component, sleep latency component, efficiency component, sleep disturbance component and also activity disturbance component. . The research is in line with the research results <sup>7</sup>, namely, there is an increase in the quality of sleep in menopausal women by carrying out progressive muscle

relaxation <sup>8</sup> also stated that sleep hygiene education and progressive muscle training were proven to improve the quality of sleep. Another similar study by Nashiroh et al also explained that after doing progressive muscle training it had a good influence on the sleep quality of menopausal women <sup>9</sup>

Sleep quality is also influenced by gender, women are very dominant in experiencing sleep disorders, because women's activity is higher than men <sup>10</sup>. Sleep efficiency, defined as the ratio of sleep duration to time in bed, was strongly associated with total time in bed, depressed mood, and age, and slightly associated with menopausal status and loss of sexual interest <sup>11</sup>. It can be said that menopausal women will experience sleep problems which will affect sleep quality. Progressive Muscle Relaxation Exercise is a technique for practicing how to relax all muscles by tensing and relaxing several muscle groups and differentiating the sensation of tense and physical relaxation, accompanied by mental relaxation, thereby helping a person to meet their sleep needs <sup>12</sup>.

Sleep quality is also influenced by several factors, one of which is stress. Proven in Research <sup>13</sup> If you do muscle relaxation exercises for 20 minutes, you can significantly overcome stress, anxiety and reduce salivary cortisol. Progressive muscle relaxation will reduce body tension as well as bring positive changes in thinking and lead towards an open approach <sup>14</sup>. It can be said that progressive muscle relaxation has an impact on emotional well-being, and resistance to physical and emotional problems <sup>15</sup>. Bertich et al's research states that only about 2% of people use medication therapy to treat sleep disorders and it usually tends to be used to treat certain medical conditions <sup>16</sup>. Other research also revealed that there was no difference between the intervention group and the control group when providing progressive muscle relaxation therapy <sup>17</sup> because a menopausal woman had daily activities in her free time at home such as sewing, gardening, watching TV and praying. It can be said that a menopausal woman who does activities in her free time can reduce stress which affects sleep quality.

Progressive muscle relaxation therapy also did not have a detrimental physical or psychological impact on the respondents in this study. This is known from the results of research conducted in Turkey, which found that the therapy that is safe to use is progressive muscle relaxation therapy (not dangerous) so this is one important reason for the high compliance in the experimental group<sup>18</sup>. Therefore, menopausal women carry out progressive muscle relaxation therapy to treat sleep disorders. Apart from that, several studies have revealed that muscle relaxation therapy combined with music therapy also affects the sleep quality of menopausal women<sup>19,20</sup>. It can be said that progressive muscle relaxation therapy is safe and can be combined with other therapies that can have an impact on sleep disorders in menopausal women.

## CONCLUSION

Progressive muscle relaxation exercises have an influence on sleep quality in menopausal women. The therapy provided is also very simple so it is easy to teach to health workers at the Community Health Center so that it can later be applied to female patients who have entered menopause.

Progressive muscle relaxation therapy can also be combined with other therapies so that it can improve the sleep quality of menopausal women. Making leaflets, booklets or CDs containing information about how to carry out progressive muscle relaxation exercises by nursing educational institutions would be better as a form of active participation in society, especially menopausal women.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## *Caring Improvement with An Analysis of The Causes of Emotional Exhaustion in Professional Students*

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### ABSTRACT

The demand for quality services to patients and families continues to increase, especially for nursing services, so it requires nurses who have good caring. Students of the nursing profession who are future nurse candidates, cannot be separated from these demands. These demands can have the potential to bring emotional exhaustion to students. Emotional exhaustion can be caused by social support, workload, and self-efficacy. The purpose of this study was to analyze the increase in caring based on the analysis of the causes of emotional fatigue in nursing profession students. The research design in this study is a quantitative method with a cross sectional approach. The population of this study is professional students in two institutions in Jember. The number of samples in this study was 150 respondents, with accidental sampling techniques. Data taken from this study are caring behavior, self-efficacy, support, workload, and emotional exhaustion. In general, the results of this study were found that there was a relationship between social support and emotional fatigue ( $p$ -value =  $<0.0000$ ,  $B$ :  $-0.986$ ), there was a relationship between workload and emotional fatigue ( $p$ -value =  $<0.0000$ ,  $B$ :  $0.372$ ), there was no relationship between self-efficacy and emotional fatigue ( $p$ -value =  $0.356$ ,  $B$ :  $-0.84$ ) and there was a relationship between emotional fatigue and caring behavior ( $p$ -value =  $0.002$ , correlation coefficient:  $0.112$ ). Caring can be improved by means of support from students' families, educational institutions and places of practice and calculating the workload experienced by students when carrying out practice.

**Keywords:** Caring, Emotional Exhaustion, Nursing Professional Students

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### INTRODUCTION

Student is the status given to students who have graduated from high school and continue to college. The status of students, according to the wider community, is seen as an elite class that has the task of studying<sup>1</sup>. Learning assignments and achieving targets according to science can be boring and monotonous activities, thus increasing the saturation of students<sup>2</sup>. Nursing students themselves have two phases in their educational process, namely, the academic phase and the professional phase. Each phase has its process, and each mechanism has its

factors for its achievement<sup>3</sup>. In addition, nursing students are also required to apply caring in every aspect.

Caring is a special form of behavior from the performance carried out by nurses and students of the nursing profession. Swanson defines caring as a fundamental technique of nursing about values and feelings of commitment and responsibility that must be taught early<sup>4,5</sup>. Swanson's theory is useful in guiding how to build useful and effective caring strategies<sup>6</sup>. Nurse professional education is fully carried out in practice areas such as hospitals, health centers, nursing homes, families, and communities<sup>7</sup>. Caring for

students during their professional life is still not optimal. The causes include individual, psychological, and organizational factors<sup>8</sup>.

The number of nursing stations that must be faced with each assignment and exam requires students to be good at caring optimally with all its limitations. In this case, caring is at the heart of nursing practice and the ability to care is a desired component of nursing students<sup>9</sup>. The theory explains that a person's behavior and performance are influenced by three factors, namely individual factors, psychological factors, and organizational factors<sup>10</sup>. Gibson (2012) has stated that the variable abilities and skills in individual factors are the main factors influencing individual behavior and performance<sup>11</sup>. The elements included in abilities & skills are intelligence, numeracy skills, verbal comprehension, perception speed, deductive reasoning, spatial visualization, and subsequent memory. According to Puspitacandri research, intelligence is divided into four, namely intellectual intelligence, emotional intelligence, spiritual intelligence, and creative intelligence<sup>12</sup>. Intellectual intelligence is a cognition ability that is interpreted the same as intellectual intelligence, namely the ability which includes achievement in learning and problem-solving<sup>13</sup>. The intellectual intelligence of nursing students in this study was assessed from the Grade Point Average obtained. This demand can increase the emotional exhaustion that occurs in students and impact emotional intelligence<sup>14</sup>.

Emotional exhaustion arises because a person is overworked, dedicated and committed, working too much and too long and viewing their needs and wants as secondary. This can occur especially in health professions, such as nurses<sup>15,16</sup>. Emotional exhaustion is characterized by a lack of energy (energy) and excessive absorption of emotional resources<sup>17</sup>. Maslach et al stated that emotional exhaustion is an excessive emotional feeling and one's contact with other people drains a person's emotional resources that have run out<sup>18</sup>. Emotional exhaustion is always preceded by a common symptom, namely the emergence of anxiety whenever you want to start work<sup>19</sup>. Maslach defines emotional exhaustion as fatigue in individuals related to personal feelings characterized by helplessness and depression<sup>20</sup>. An unbalanced relationship

between work and oneself can lead to emotional tension, which results in the depletion of emotional resources. Emotional exhaustion is always preceded by a general symptom, namely the emergence of anxiety every time you want to start working, leading to feelings of helplessness in facing work demands, this if it occurs prolonged will cause burnout syndrome<sup>21,22</sup>. So that this can also affect student performance when practicing nursing in hospitals or other clinical facilities.

Caring behavior is the basis of nursing services in helping patients meet their needs for health services. However, the caring behavior of nurses in Indonesia is still considered to need improvement<sup>23</sup>. Based on Sukesi's research it described that as many as 55.8% of nurses behaved in a less caring manner<sup>24</sup>. The results of this study were reinforced by the results of research by Lestari and Fahmi, which was conducted to evaluate the caring behavior of nurses in hospitals, showing that as many as 62.5% of nurses had poor caring behavior and as many as 37.5% of nurses had high caring behavior<sup>25</sup>. Nurse caring behavior is also related to patient satisfaction become one of the indicators of service quality in hospitals<sup>26</sup>. This is reinforced by the results of a study conducted by Mony at PKU Muhammadiyah Yogyakarta Hospital, which showed that there was a significant relationship ( $p < 0.05$ ) with a moderate positive value ( $r = 0.622$ ) between nurses' caring behavior and patient satisfaction<sup>27</sup>. The results of research from Mailani and Nera showed that as many as 46.4% of nurses had bad caring behavior, and as many as 59.5% of patients stated that they were dissatisfied with the caring behavior of nurses<sup>28</sup>.

Based on some of these studies, it can be seen that the caring behavior carried out by students of the nursing profession is very complex. There are internal factors and external factors, such as emotional exhaustion, that can influence this behavior. So the purpose of this study is to see an increase in caring based on an analysis of the causes of emotional fatigue in students who are pursuing the nursing profession.

## METHOD

The design used in this study is descriptive quantitative with a cross-sectional approach. The population in this study were all

students of the nursing profession who were studying at Jember Regency institutions. The sample in this study was 150 students in the nursing profession in Jember Regency institutions and had undergone professional practice for at least 1 month in the Hospital. The sampling technique in this study used accidental sampling, which was carried out for 1 week. The inclusion criteria used in this study were active nursing students who took up the profession and were not on leave. The research instrument used a questionnaire about individual factors of self-efficacy, social support, workload, and emotional exhaustion and a questionnaire about caring. All questionnaires in the study used validity and reliability tests with alpha cronbach with a significance level of 0.05 and a validity value above 0.6330 and a reliability level of >0.7. Statistical analysis of the relationship between self-efficacy, social support, and workload with emotional fatigue using multiple linear regression analysis with a meaning level of  $p < 0.05$ . If the calculation result is  $p < 0.05$ , it means that the hypothesis is accepted. Emotional fatigue by caring using spearman rho with a level of meaning  $p < 0.05$ . If the calculation result is  $p < 0.05$ , it means that the hypothesis is accepted

## RESULTS

In this study, the research results were obtained through self-efficacy, social support, workload, emotional exhaustion, and care data. In addition, there are also the results of hypothesis testing of the variables to be tested.

**Table 1. Research variable data.**

Data	Min	Max	Mean
self-efficacy	10	20	15,66
Social Support	26	65	49,37
Workload	6	26	17,93
Emotional exhaustion	0	42	19,02
Caring	43	70	59,66

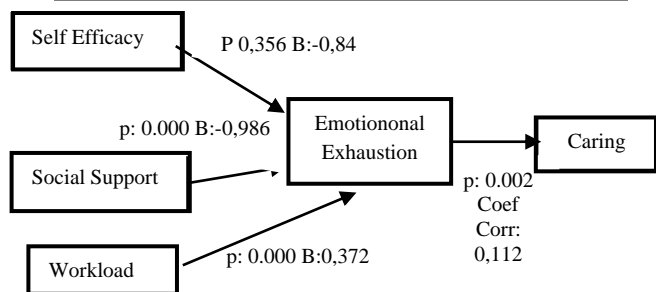
The self-efficacy data obtained an average value of 15.66 from a minimum value of 10 and a maximum value of 20. This means that most of the respondents' results are closer to the maximum value than the minimum value. The support data also obtained an average value of 49.37, similar to before that the value of the majority of respondents is also close to the maximum value so that it can be

interpreted that many get maximum support.

In the workload indicator, an average value of 17.93 is obtained, which means that the workload of most respondents is close to the maximum, which means the workload or in this case, can be interpreted as workload during practice. The emotional exhaustion indicator obtained an average value of 19.02 from a minimum value of 0 and a maximum value of 42. This means that the emotional exhaustion of the respondents is in the range they have experienced but not too often. In the last indicator, namely caring, an average value of 59.66 was obtained, meaning that most respondents applied caring to the maximum according to what was measured in the measuring instrument.

**Table 2. Research Hypothesis test results**

	.Sig	
Efficacy with emotional exhaustion	0.356,	B: -0,384
Social Support with emotional exhaustion	0.000,	B: -0,986
Workload with emotional exhaustion	0.000,	B: 0,372
Emotional exhaustion with Caring	0,002.	Coeff Corr: -0,112



**Pict 1. Causative relationships, emotional exhaustion, and caring.**

The statistical test results found that most results had a relationship except for self-efficacy with emotional exhaustion, which scored above the p-value. So that it can be concluded that the majority have a correlation between the variables measured.

## DISCUSSION

The study found that self-efficacy has no relationship with emotional exhaustion. This means that self-efficacy and emotional exhaustion do not affect each other. In other studies, it was also found that high self-

efficacy does not contribute to the emotional exhaustion of employees at work. So it can be concluded that good or bad self-efficacy cannot affect emotional exhaustion, other factors can influence this<sup>29</sup>. In research conducted by Hu Xiu, it was found that the role of self-efficacy in students who are doing tasks that experience high emotional exhaustion is not optimal<sup>30</sup>. High self-efficacy uses different and more effective coping strategies than low self-efficacy<sup>31</sup>. High self-efficacy faces challenges and difficult goals, and exerts great effort to achieve the set targets.

Workload has a relationship with emotional fatigue, where the more workload the more emotional exhaustion. This is in accordance with the results of other's research which states workload has a close correlation with emotional fatigue. Emotional exhaustion due to the work overload and the lack of individual

capability would be easily overcome if all the students and clinical instructions are motivated to help each other<sup>32,33,34</sup>. This is following the premise that every workload received must be appropriate and balanced with the physical, cognitive abilities, and limitations of the person who receives the burden<sup>35</sup>. This research is in line with research Tsoulopas, his findings conclude that teachers and lecturers with so much teaching work demand influence increasing emotional exhaustion in the students they teach<sup>36</sup>. In this case point of view, after sharing beliefs about values contained in hospitals and educational institutions the vision and mission will become a driving force for students of the nursing profession to strive together in troubleshoot problems.

Statistical results show that social support and emotional exhaustion have a relationship, where the higher the social support, the less risk of experiencing emotional exhaustion. These results explain that social support has a significant effect on emotional exhaustion. Positive support can reduce the level of emotional exhaustion in students<sup>37</sup>. In addition, support for students also directly influences student satisfaction when meeting learning outcomes<sup>38</sup>. Support creates a work environment in which individuals are motivated, inspired, challenged, and feel successful. In addition, optimal support contributes to resource allocation decisions and

is experienced in reducing emotional exhaustion. Conversely, when lecturers face variable demands and see their lack of influence over resource allocation, they become frustrated, disappointed, and dissatisfied<sup>39</sup>. This shows that support has a direct and indirect impact on job satisfaction, and the emotional exhaustion of each individual reflects its indirect impact.

The study's results found that emotional exhaustion had a relationship with the application of caring. As a result of the emotional exhaustion experienced by a person, the person is not responsive to the people they serve and also feels that his work is torture because he thinks that he is unable to bear the following days and always feels tense<sup>40</sup>. Several things ultimately affect the emergence of emotional exhaustion in a person; there are four dimensions that are believed to make it easier to measure emotional exhaustion, namely workload, time pressure, lack of social support, and role stress<sup>41</sup>. So it is important to ensure that in the application of caring to patients, one must look at the condition of the caregiver because if the condition is in emotional exhaustion, it can impact the services to be provided.

## CONCLUSION

High workloads and low social support can leave students emotionally exhausted. This emotional exhaustion can reduce the caring of students of the Ners profession in patients and families. This decrease in caring can be demonstrated by means of support from both student families, educational institutions and places of practice and calculating the workload experienced by students when carrying out practice.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.



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## ***Increased Levels of The Hormone Prolactin Through Complementary Treatments (Breast Care) and Spiritual Approaches (Qur'anic Murottal)***

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### **ABSTRACT**

*Breast milk is the best natural nutrition for babies and is needed during the first six months of a baby's life. Breast care and Al-Quran Murottal are methods for increasing prolactin hormone levels, and can also reduce the release of stress hormones, which are very important when mothers are breastfeeding. Quasi-experimental (quasi-experiment) with the approach used is a pre-test post test control group design, namely, research that uses a control group to be used as a comparison between pretest and posttest. The sample was obtained using a purposive sampling technique with a total of 39 postpartum mothers divided into (13 postpartum mothers in the breast care group, 13 postpartum mothers in the Murottal Al-Quran group, and 13 postpartum mothers in the control group). Prolactin hormone levels were measured before and after treatment. Data were analyzed using paired t-test and linear regression. The results showed that the breast care group had a value of  $p=0.007<0.05$ , the Al-Quran mental group had a value of  $p=0.011<0.05$ , and the control group had a value of  $p=0.154>0.05$ . showed that the breast care group and Al-Quran murottal had an influence on prolactin hormone levels, whereas the control group had no influence on prolactin hormone levels. In conclusion, Breast Care and Murottal Al-Quran can be used to increase prolactin hormone levels in postpartum mothers so that postpartum mothers do not need to be confused about how to increase breast milk production.*

**Keywords:** Prolactin Hormone Levels, Breast Care, Murottal Al-Quran, Complementary Treatments

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## **INTRODUCTION**

Mother's milk is a natural food that a mother can provide to her child immediately after birth at the beginning of life. Breast milk is an emulsion of fat and a solution of protein, lactose, and organic salts secreted by both the mother's breast glands as the main food for the baby. Breast milk is the most suitable milk

available for human babies because it is uniquely adapted to its needs. To obtain maximum benefits, breast milk must be given as soon as possible after birth (within 30 min after birth because the baby's sucking power is strongest at that time to stimulate further milk production)<sup>1,2,3</sup>.

The factor that influences breast milk is the hormone prolactin, which is a lactogenic

hormone that stimulates the mammary glands to produce breast milk<sup>4</sup>. A decrease in breast milk production during the postpartum period after giving birth can be caused by a lack of stimulation of prolactin and oxytocin, which play a very important role in the smooth production of breast milk<sup>5,6</sup>. The release of prolactin is stimulated by the sensory nerves, which are then sent via the anterior pituitary. The anterior pituitary then reacts to release the hormone prolactin to the breasts and stimulates the milk-making cells to function<sup>7</sup>. Prolactin levels in breastfeeding mothers will become normal three months after giving birth until the child is weaned, and there will be no increase in prolactin even though the baby sucks, but milk production continues<sup>8,2,9</sup>.

Breast milk production can increase or decrease depending on the stimulation of the breast glands. Apart from that, other factors that can influence breast milk production are frequency of breastfeeding, breast care, maternal psychology, use of birth control and maternal health as well as support from family and health workers<sup>10,11,12,13,9</sup>. Due to the importance of breastfeeding for babies, various methods are used to increase breast milk production, both pharmacologically and non-pharmacologically. Pharmacology is the use of drugs and special formula milk for breastfeeding mothers<sup>14,15,16</sup>. The non-pharmacological ones can be done with a balanced nutritional diet for breastfeeding mothers, early mobilization, oxytocin massage, breast care, and listening to chanting of the holy verses of the Koran<sup>17,18,19,20</sup>.

One effort to increase breast milk production is by providing special care, namely by stimulating the breast muscles. Breast care is an action to care for the breasts, especially during the postpartum period (breastfeeding period), to facilitate the release of breast milk<sup>21</sup>. Breast care is breast care after a mother gives birth and breastfeeding, which is a method used to care for the breasts so that milk comes out smoothly<sup>22</sup>. Breast care is useful in influencing the pituitary gland to release prolactin and oxytocin. The hormone prolactin influences the amount of breast milk produced and the hormone influences the release of breast milk (Hendriyani). One of the problems that occur due to a lack of breast care is a decrease in breast milk production (Piccolo). The production and release of breast milk is influenced by prolactin, oxytocin, and

Pudjiastuti. Prolactin influences the amount of breast milk produced, whereas oxytocin influences the production of breast milk<sup>23</sup>.

Murottal is a sound recording of the Koran sung by a Qori (reader of the Koran), which can also be interpreted as the chanting of the holy verses of the Koran sung by a Qori, recorded, and played at a slow and harmonious tempo. Murottal is a type of music that positively influences listeners. Listening to the verses of the Koran that are read tartly and correctly brings peace to the soul. With a slow and harmonious tempo, chanting the Qur'an can reduce stress hormones, activate natural endorphins, increase feelings of relaxation, and divert attention from fear, anxiety, and tension, thereby improving the body's chemical system and lowering blood pressure and slowing breathing. A deeper or slower breathing rate is very good for causing calm, emotional control, the resulting effect is a very good effect, especially for breastfeeding mothers<sup>24</sup>.

Murottal Al-Quran can increase endorphin levels, endorphin hormones increase the production of the hormone oxytocin which plays a role in increasing breast milk volume (let down reflex). In addition, endorphins cause feelings of relaxation and comfort in postpartum mothers, reducing stress and anxiety. Stress and anxiety are factors that inhibit oxytocin secretion. Because endorphin hormones increase the response of the posterior pituitary to produce oxytocin, the release of breast milk from the ductus becomes smooth, increasing levels of the hormone oxytocin will also increase levels of the hormone prolactin. Because those who work are bound together<sup>25,26</sup>.

This study aimed to examine the effect of breast care and Al-Quran murottal on prolactin hormone levels in postpartum mothers. To determine whether there is an increase in prolactin hormone levels before and after breast care and the Al-Quran murottal. It is hoped that the research results can contribute to the world of health, especially health workers, in this case midwives, postpartum mothers, and breastfeeding mothers. If breast care and Al-Quran murottal can increase prolactin hormone levels, these two treatments can be administered to postpartum mothers or breastfeeding mothers who experience problems expressing breast milk as a treatment in the non-pharmacological category.

## METHOD

This study was conducted in the working area of the Tilango Health Center, Gorontalo Regency. The sample in this study comprised 39 postpartum mothers who were divided into 3 delivery groups. The first group was given breast care, totaling 13 respondents; the second group was given murottal Al-Quran, totaling 13 respondents; and the third group was not given treatment or was used as a control group, totaling 13 respondents. The criteria were as follows: first-day postpartum mother with normal delivery, no nipple abnormalities, good psychological condition of the mother, baby who received early initiation of breastfeeding, baby born at term (>37 weeks) and birth weight (>2500), and mother being willing to be a respondent. The following is a specific procedure for breast care. Clean the nipples gently without using soap or shampoo until clean. Do not apply alcohol, lotion, or perfume to your nipples. Use antibacterial ointment to treat cracked nipples. Let the nipples dry by themselves without needing to be wiped. Apply a moisturizing ointment containing lanolin to the nipples after each feeding. This will reduce pain or soreness and prevent the nipples from drying out and cracking. Change breast pads frequently. If your breasts hurt while breastfeeding, stop breastfeeding immediately and use a breast pump for a few days. If you feel your nipples are flat or inverted, consult a doctor immediately. After each feeding, apply a few drops of breast milk to your nipples and let it dry. Breast milk moisturizes and protects the nipples from infection. Always handle your breasts with clean hands.

This research received ethical recommendations from the Hasanuddin University RSPTN Health Research Ethics Committee (protocol number UH21050307). Data related to the sample in this study were collected using a questionnaire through a direct interview with the respondents. For the ELISA examination, 3 cc of blood was collected from the medina cubital vein and placed into a 3 ml EDTA tube. The researcher was assisted by laboratory health workers under the supervision of the midwives in charge of each village. The blood sample was centrifuged for 5 min at 3000 rpm, and the plasma was transferred into a special plasma tube and stored in a refrigerator at -20°C. After all the samples were collected, prolactin hormone levels were examined using

the Hasanuddin University Medical Research ELISA Kit (HUM-RC Laboratory).

## RESULTS AND DISCUSSIONS

Based on the analysis that has been carried out in Table 1, the characteristics of the respondents obtained from the education of respondents in the breast care group were that the majority had a high school education, numbering six people (46.2%), as well as in the Al-Quran murottal group; it was found that the majority of mothers had a high school education, numbering six (46, 2%), but for the control group, the majority of mothers had junior high school education, numbering six (46.2%). Furthermore, for work, it was found that in the breast care group, the majority of mothers had jobs, numbering seven (53.8%), and for the Murottal Al-Quran group, the majority of mothers did not have jobs, eight (61.5%), and in the control group, it was found that the majority of mothers did not have a job, nine (69.3%). For parity, it was found that in the breast care group the majority of mothers were primiparous, 7 people (53.8%) and for the Al-Quran murottal group, the majority were multiparous mothers, 9 people (69.3%) and in the control group, the majority were multiparous mothers, 7 people ( 53.8%)

**Table 1. Characteristics of Breast Group Respondents.**

Variable	Breast Care n (%)	Murottal Al-Quran n (%)	Control Group n (%)
<b>Education</b>			
Elementary Schools	3 (23,1%)	4 (30,7%)	2 (15,3)
Junior High Schools	1 (7,6%)	2 (15,3%)	6 (46,2%)
Senior High Schools	6 (46,2%)	6 (46,2%)	2 (15,3%)
University	3 (23,1%)	1 (7,6%)	3 (23,1%)
<b>Working Status</b>			
Working	7 (53,8%)	5 (38,5%)	4 (30,7%)
Not Working	6 (46,2%)	8 (61,5%)	9 (69,3%)
<b>Parity</b>			
Primipara	7 (53,8%)	4 (30,7%)	6 (46,2%)
Multipara	6 (46,2%)	9 (69,3%)	7 (53,8%)

Based on the analysis carried out in

Table 2 of the characteristics for the age of the respondents, it was found that the lowest mean value was in the control group  $25.3 \pm 4.5$ ), and the highest mean value was in the Al-Quran murottal group  $27.1 \pm 6.1$ ). Furthermore, for the postpartum period, it was found that the lowest mean value was in the breast care group ( $17 \pm 11$ ) and the highest mean value was in the Al-Quran murottal group ( $21 \pm 9.8$ ). For body weight, the lowest mean value was in the control group  $63.7 \pm 12.4$ ) and the highest was in the Al-Quran murottal group ( $69 \pm 11.1$ ). Furthermore, for height, it was found that the lowest mean value was in the Al-Quran murottal group  $155.2 \pm 7.6$  and the highest mean value was in the breast care group  $157.8 \pm 6.6$

**Table 2. Characteristics of Murottal Al-Quran Group Respondents**

Variable	Breast Care	Murottal Al-Quran	Control Group
	Mean±SD	Mean±SD	Mean±SD
Age	27±7,4	27,1±6,1	25,3±4,5
Postpartum period	17±11	21±9,8	18,9±9,6
Weight	66,8±10,6	69±11,1	63,7±12,4
Height	157,8±6,6	155,2±7,6	156,5±7

In the previous breast care group, the data was tested for normality and it was found that the data was not normally distributed, so the Wilcoxon test was carried out, based on the results obtained the mean pre test value was 205.6ng/ml (SD  $\pm$  143.6) and the mean post test value was 233.2ng/ml (SD  $\pm$  162.0), with P value = 0.007 which means  $P < 0.05$ , it can be concluded that there is an influence of breast care on breast milk production (Prolactin Hormone Levels) in postpartum mothers.

In the Murottal Al-Quran group, the paired T test was carried out because the data was normally distributed, with the results obtained that the pre-test mean value was 141.9 ng/ml (SD  $\pm$  81.9) and the post-test value was 215.6ng/ml (SD  $\pm$  85.1), there was an increase between the Pre test and Post test values. In addition, based on the P-value, it was found to be 0.011, which means  $P < 0.05$ , so it can be concluded that there is an influence of Murottal Al-Qur'an on breast milk production (Prolactin Hormone Levels) in postpartum mothers.

Control group Using the paired T test it was found that there was a decrease between the pre test mean value of 144.5 ng/ml (SD  $\pm$  96.7) and the post test value of 109.8 ng/ml (SD  $\pm$

52.5) besides the P value obtained 0.154 which means  $P > 0.05$  or it can be concluded that there is no influence of the control group on breast milk production (prolactin hormone levels) in postpartum mothers.

**Table 3. Effect of Breast Care and Murottal Al-Quran on Increasing Prolactin Hormone Levels.**

Intervention	n	Mean±SD	p-value
<b>Breast Care</b>			
Pre-test	13	205,6±143,6	0,007
Post-test	13	233,2±162,0	
<b>Murottal Al-Quran</b>			
Pre-test	13	141,9±81,9	0,011
Post-test	13	215,6±85,1	
<b>Control Group</b>			
Pre test	13	144,5±96,7	0,154
Post test	13	109,8±52,5	

The results of the independent T test were obtained from comparing the post breast care scores and the Al-Qur'an murottal. The mean value of breast care was 233.2 ng/ml (SD  $\pm$  162.0), and the Al-Quran Murottal was 215.6 ng./ml (SD  $\pm$  85.1). With a P value of 0.731 or  $P > 0.05$ , there was no significant difference between breast care and Al-Quran murottal in terms of increasing prolactin levels.

**Table 4. Comparison of Prolactin Hormone Levels in the Breast Care and Murottal Al-Qur'an groups**

Intervention	Mean±SD	Sig.
Breast Care	233,2±162,0	0.731
Murottal Al-Qur'an	215,6±85,1	

Based on the analysis, it was determined that the calculated t-value for breast care was -0.399, with a significant value of 0.697. The t value in this study was 2.228. Therefore, it can be concluded that a sig value  $> 0.05$ ,  $0.697 > 0.05$ , t count  $<$  t table, or  $-0.399 < -2.228$  indicates that there is no effect of breast care on prolactin hormone levels. For the Al-Quran murottal group, it was found that the calculated t value was -3.025 with a significance value of 0.012; therefore, it can be concluded that the sig value was  $< 0.05$ , or  $0.012 < 0.05$ . and calculated t-value  $>$  t-table or  $-3.025 > -2.228$ . This means that the Al-Quran murottal has an influence on prolactin hormone levels.

Based on the calculated f obtained, which is 9.517 and the f table is 3.98 with a significant value of 0.005, it can be concluded

that the sig value is.  $0.005 < 0.05$ , and  $f$  count  $> f$  table or  $9.517 > 3.98$ , which means that there is an influence of breast care and Al-Quran murottal simultaneously (together) on prolactin hormone levels. With an R square value for breast care of 0.014, this shows that the effect of breast care on prolactin hormone levels was only 1.4%, whereas for Al-Quran Murottal the R square value was found to be 0.454 or the effect of Al-Quran Murottal on prolactin hormone levels was 45.4%. In addition, supported by the results of the correlation coefficient test, it was found that the Al-Quran murottal was 0.674, which means that the level of relationship between Al-Quran murottal and increasing prolactin hormone levels was stronger than breast care.

**Table 5. The Relationship between Breast Care and Al-Quran Murottal on Increasing Prolactin Hormone Levels**

Variable	T count	Sig.	R. square	F count	Sig.	Correlation coefficient (r)
Breast Care	-0,399	0.697	0,014	9,517	0.005	-0.119
Murottal Al-Quran	-3,025	0.012	0,454			-0.674

Based on the results of research on 39 respondents at the Tilango Community Health Center, Gorontalo Regency, breast care can be analyzed. The results of statistical tests showed that there was an effect of breast care on increasing breast milk production, as seen from the increase in prolactin levels before and after treatment with ( $p = 0.007$ ), which means  $p < 0.05$ . This research is in accordance with the research conducted by <sup>27</sup>, which states that there is a difference in the flow of breast milk before and after breast care in postpartum mothers ( $p = 0.031$ ).

Providing breast care during the postpartum period can improve blood flow to the breasts, which can then reduce intraductal pressure caused by breast milk collection in the lactiferous ducts <sup>28,29</sup>. Pulling on the nipple can flex and open the lactiferous ducts, making it easier for the baby to suckle breast milk<sup>30</sup>. Pulling the nipple can also stimulate sensory nerve endings around the nipple, so that this stimulation is transmitted to the hypothalamus via the spinal cord and mesencephalon<sup>31</sup>. The hypothalamus will suppress the release of factors that inhibit prolactin secretion and vice versa will stimulate the release of factors that

stimulate prolactin secretion<sup>32</sup>. Factors that stimulate prolactin secretion stimulate the anterior pituitary gland to produce prolactin. This prolactin hormone will then stimulate alveoli cells to make milk <sup>33</sup>.

Likewise, with the Murottal Al-Quran research results obtained by researchers there was an increase in prolactin hormone levels before and after treatment where the previous mean value was 141.9ng/ml (SD  $\pm$  81.9) increasing to 215.6ng/ml (SD  $\pm$ 85.1), and based on the  $p$  value = 0.011 ( $p < 0.05$ ), which means that there is an influence of Murottal Al-Quran on breast milk production in postpartum mothers. Therefore, it can be concluded that Al-Quran Murottal can affect breast milk production (prolactin hormone levels), and that mothers who undergo Al-Quran Murottal have absolutely no information or knowledge regarding breast care, so it is certain that they do not carry out breast care themselves during research.

In accordance with research conducted by <sup>34</sup> which states that there is a difference in breast milk production before being given Al-Qur'an murottal therapy and after being given Al-Qur'an murottal therapy, namely the result of  $p$  value = 0.000. The results of the analysis show that there is an effect of giving Al-Qur'an murottal therapy on production Breast milk in breastfeeding mothers in the working area of Bandar Khalifah Community Health Center in 2019. This is because Murottal Al-Qur'an is a sound of a certain frequency and length. These waves produce a string of lilting melodies that influence brain cells and restore balance in the body, can reduce stress hormones, activate natural endorphins, increase feelings of relaxation, and divert attention from fear, anxiety, and tension; by activating endorphin hormones, it will cause a vasodilation response, which increases the smooth flow of the body's blood so that the body becomes relaxed and calm, thus triggering the release of oxytocin, which plays a role in the let-down reflex mechanism (breast milk release) and influences the release of prolactin (prolactin reflex) <sup>35,36</sup>.

Breast care is very important, one of which is maintaining breast cleanliness, especially the cleanliness of the nipples to avoid infection, softening and improving the shape of the nipples so that the baby can breastfeed well, stimulating the glands and the hormones prolactin and oxytocin to increase smooth breast milk production and detect early nipple



abnormalities and making efforts to overcome them<sup>37,38</sup>. In addition to breast care, another effort that can increase prolactin hormone levels is Murottal Al-Quran Murottal, a voice recording of the Koran sung by a Qori (reader of the Koran), which can also be interpreted as the chanting of the holy verses of the Koran. A song sung by a Qori was recorded and played at a slow and harmonious tempo<sup>39</sup>. Murottal is a type of music that positively influences listeners. Listening to the verses of the Qur'an which are read tartly and correctly will bring peace to the soul.

## CONCLUSION

Breast Care and Murottal Al-Quran can increase prolactin hormone levels in postpartum mothers. Therefore, it is hoped that these two methods can be used as alternatives for breastfeeding mothers with a history of insufficient breast milk.

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## ***The Role of Schools in Improving Abilities Disaster Preparedness: Nursing Perspective***

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### **ABSTRACT**

*Earthquake disasters can occur at any time and humans are not yet able to detect when they can occur. Children are included in a group that is vulnerable to the impact of disasters because of their lack of knowledge regarding disaster mitigation. To minimize the impact of disaster events, education on disaster mitigation is needed. To determine the influence of the school's role in increasing students' disaster preparedness abilities in junior high schools in Ternate City. Quasi-experimental research type with a one-group pre-post test design. Data were analyzed using the non-parametric Wilcoxon signed-rank test. The research subjects consisted of teachers (seven respondents) and students (90 respondents). The data were processed using the non-parametric Wilcoxon signed-rank test. The analysis results showed that asymp. sign. (2-tailed) The teacher's score is 0.018 and the student's score is 0.000, where the value of 0.000 is smaller than  $p$  value = 0.05, so it can be concluded that there is an increase in disaster preparedness abilities among schoolteachers and students. The role of schools is very important in disseminating disaster mitigation education as basic knowledge that requires learning as early as possible, so that a culture of disaster mitigation grows both before, during, and after a disaster. There was an increase in the ability of teachers and students at school after a disaster preparedness simulation was carried out at a junior high school in Ternate City.*

**Keywords:** Role of Schools, Disaster Mitigation, Disaster Preparedness, Capacity Building

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## **INTRODUCTION**

Man-made disasters have serious impacts, including disruption to communities, many casualties, and financial, environmental, social, and economic losses<sup>1</sup>. The number of disasters and their destructive effects are increasing worldwide. Acquiring and using knowledge is considered the most effective way to prevent disasters or reduce impacts by relying on technological advances<sup>2</sup>. Disasters cannot be avoided; however, their impact can be reduced by changing the system and disaster

management<sup>3,4,5</sup>.

There is evidence that most injuries, damage, and deaths from disasters are preventable and that disaster preparedness measures, such as adapting housing to risks, reduce losses resulting from disasters. It will be more effective if people in a community have good cooperation in allocating resources and carrying out appropriate recovery after a disaster<sup>6,7,8</sup>. Officials and policymakers have focused on developing new approaches to persuade the public and make a leap in disaster risk reduction as training for children, the general public, and especially vulnerable

groups, considering the increasing disaster risk and vulnerability due to climate change, development, increasing income inequality, and low level of readiness of housewives<sup>3,9,10,11,12</sup>. Education for vulnerable groups aims to provide knowledge, skills, and motivation to individuals and groups to take action to reduce their vulnerability to disaster. Educating vulnerable communities will result in effective action for other people or communities<sup>13</sup>. Over the decades, several studies have shown that trained people can prepare for disasters and respond well to them. Additionally, others have reported that disaster education is a functional, operational, and cost-effective tool for risk management<sup>14</sup>. Furthermore, some people confirmed that low awareness and inadequate understanding of risks negatively impact community preparedness, response to hazard warnings, personal protection actions, and recovery<sup>15</sup>.

Data from the BMKG Ternate states that almost every time an earthquake occurs in several areas, it is just a small scale, so it does not have much of an impact on damage and loss of life. Earthquake data for the last four years. In 2018, North Maluku experienced 970 tectonic earthquakes. In 2017, there were 852 tectonic earthquakes and 2,809 cluster earthquakes in West Halmahera. In 2016, there were 862 earthquakes; in 2015, there were 964 tectonic earthquakes and 1,164 cluster earthquakes in West Halmahera<sup>16</sup>. The impact of an earthquake is not only physically damaging, such as cracking or collapsing buildings, but can also have a psychological impact on children in the form of trauma. Shortly after a disaster occurs, children generally show physical symptoms, emotions, thoughts, and disturbing behaviors. Physical symptoms include difficulty sleeping, not feeling well, and being easily startled. Emotional symptoms appear in the form of fear or anxiety, sadness, feeling guilty. For example, mental symptoms include confusion, difficulty in concentrating, frequent flashbacks to events, and nightmares. Meanwhile, behavioral symptoms include crying easily, withdrawing from social interactions, fear of being separated from parents, and getting angry easily<sup>17</sup>. Children are included in a group that is vulnerable to the impact of disasters because of their lack of knowledge regarding disaster mitigation. To minimize the impact of disaster events, education on disaster mitigation is

needed.

Mitigation is a series of efforts to reduce disaster risks, both through physical development and awareness, and by increasing the capacity to face disaster threats. Disaster mitigation needs to be provided to all people, including children, who have the potential to become disaster victims. Children are members of a society that is still unstable. Therefore, every time they experience a psychological disaster, children experience a downturn<sup>18</sup>.

Many children spend their time at school. This requires special attention from schools and other policymakers to minimize the negative impact of disasters. A school's ability to implement disaster preparedness will certainly have a tremendous impact on school residents, including the ability to minimize casualties among schoolchildren. Efforts to increase students' disaster preparedness abilities can also be carried out by empowering school components. From the statement above, researchers are interested in conducting research on " the role of schools in increasing students ' disaster preparedness capabilities in junior high schools in Ternate City".

## METHOD

The research subjects consisted of seven teachers and 90 students at Albina IT Middle School in Ternate City. The type of research is a quasi-experiment with a one-group pre-post test design. The research procedures received recommendations from the Health Research Ethics Commission of the Health Polytechnic of the Ministry of Health of Ternate (No.UM.02.03/6/358/2023. Analysis of the research results was carried out using the non-parametric Wilcoxon signed-rank statistical test. The research was carried out from August to October 2023, covering three stages (Pre, Intra and Post-disaster) at the Integrated Islamic Junior High School (SMP-IT) Albina, Ternate City. The research stages started with research location exploration activities, meetings with teachers regarding the school's preparedness for earthquake disasters, the learning curriculum, learning methods and strategies, and the process of evaluating learning outcomes. Next, together with the teacher, efforts to increase school preparedness through safety briefing activities at the start of every lesson or meeting, providing acrylic information boards in the form of disaster management, including pre-disaster,

intra- and post-disaster, installing evacuation routes and gathering points, providing light fire extinguishers (APAR), provision of first aid kits, and hand washing facilities without water/hand sanitizers. All research requirements were installed in the school environment by researchers, and then simulation activities and post-test assessments were scheduled. The research target was 90 SMPT IT albina-level students and 7 teachers.

The implementation of the research began with an explanation of the procedures and research information. In the first stage (pre-test), an assessment was conducted regarding disaster preparedness capabilities in the school environment for both teachers and students. Next, treatment is carried out by installing disaster mitigation in the school environment, including disaster preparedness education, including pre-, intra-, and post-disasters in all classrooms and teachers. Installation of evacuation routes, gathering point locations, first aid equipment and materials for accidents, fire extinguishers, and waterless hand washing equipment (Hand Sanitizer). An introduction to mitigation was conveyed to schoolteachers and students, including strengthening the safety briefing activities carried out at the start of every teaching and learning activity. In the lead up to the final assessment of research activities, a simulation was carried out by students regarding the management of earthquake disasters, including how students were able to save themselves when an earthquake occurred by taking shelter under a hard table or chair during strong earthquake shaking, and then leaving the classroom following the evacuation route. which have been installed in every room while still protecting their heads with school bags to the designated gathering point, students are also trained to help friends who are victims of the earthquake to be evacuated to more adequate health facilities. Subsequently, teachers and students were assessed regarding disaster preparedness capabilities in the school environment after being given treatment (post-test).

## RESULTS AND DISCUSSIONS

Based on Table 1, the gender characteristics of the teacher respondents are 4

respondents female (57.1%) and three male respondents (42.9%). Meanwhile, there were 71 female respondents (78.9%) and 19 male respondents (21.1%). characteristics of respondents who had attended earthquake disaster management training, 5 respondents (71.4%) had never attended training and 2 respondents (28.6%) had attended training. Meanwhile, 62 respondents (68.9%) had never attended disaster management training and 28 respondents (31.1%) had never attended training.

**Table 1. Frequency distribution based on gender of respondents**

Respondent	Sex	N	%
Teacher	Male	3	42,9%
	Female	4	57,1%
	Total	7	100
Student	Male	19	21,1%
	Female	71	78,9%
	Total	90	100
Responden	Disaster Management Training	N	%
Teacher	Never	5	71,4%
	Ever	2	28,6%
	Total	7	100
Student	Never	62	68,9%
	Ever	28	31,1%
	Total	90	100

From Table 2, the Wilcoxon signed-rank test results show the pre- and post-test scores for both students and teachers. The data found in the form of student scores whose post-test results were smaller than the pre-test (negative ranks) were from 14 respondents. The post-test results were greater than the pre-test results (positive ranks) for the 71 respondents. The post-test results were the same as the pre-test scores (Ties) for five respondents, so the total number of respondents was 90. Meanwhile, there were 0 respondents whose post-test scores were lower than the pre-test (negative ranks). The post-test results were greater than the pre-test results (positive ranks) for the seven respondents. The post test results were the same as the pre test scores (Ties) for 0 respondents so that the total number of respondents was 7 people.

**Table 2. Distribution of respondents based on treatment results**

Respondent	Value	Ranks	N	Mean Rank	Sum of Rank
Teacher Student	Post test-Pre test	Negative Ranks	14 <sup>a</sup>	24,82	347,50
		Positive Ranks	71 <sup>b</sup>	46,58	3307,50
		Ties	5 <sup>c</sup>		
		Total	90		
Teacher	Post test-Pre test	Negative Ranks	0 <sup>d</sup>	.00	.00
		Positive Ranks	7 <sup>e</sup>	4.00	28.00
		Ties	0 <sup>f</sup>		
		Total	7		

Based on Table 3, where the results of the Wilcoxon Signed Rank Test calculation, the Z value obtained from the student's post test score minus the pre test score is -6.495 with a p value (asymptotic, 2-tailed) of 0.000 which is less than the critical limit of the research 0.05 so the hypothetical decision is to accept H1. Meanwhile, the Z value obtained from the teacher's post-test score minus the pre-test score was -2.371 with a p-value (asymptotic, 2-tailed)

of 0.018, which is less than the critical research limit of 0.05; thus, H1 is accepted. Thus, the results of the statistical tests show a significant difference between the pre-test and post-test scores for students and teachers at Albina IT Middle School, Ternate City. Therefore, it can be concluded that schools play a role in increasing disaster preparedness capabilities in the Albina IT Middle School environment in Ternate City.

**Table 3. The role of schools in increasing disaster preparedness capabilities**

	Post Test Student Scores – Pre Test Student Scores	Post Test Teacher Scores – Pre Test Teacher Scores
Z Asymp. Sig. (2-tailed)	-6.495 <sup>b</sup> .000	-2.371 <sup>b</sup> .018
<i>Wilcoxon Signed Rank Test</i>		
<i>Based on negative ranks</i>		

Natural disasters are events that have detrimental impacts, such as economic losses, building damage, and loss of life, one of which is an earthquake. An earthquake is a shock that occurs on the surface of the earth owing to the sudden release of energy, which causes shifts<sup>19</sup>. Earthquakes in mechanical patterns are one of the natural disasters that will continue to repeat itself in a certain cycle<sup>20</sup>. To reduce losses due to disasters, awareness and holistic action are needed from all parties involved in disaster mitigation efforts<sup>21</sup>. According to<sup>21</sup>, as a country that is very vulnerable to natural disasters, Indonesia still has major problems, namely low performance in disaster management, low attention to disaster mitigation, and the weak role of schools in introducing disaster mitigation education.

Based on the data found during the research, 71.4% and 68.9% of the teachers had never attended disaster management training.

To provide real experience and hopefully attract training participants because it is something new and designed to resemble real conditions, a simulation of earthquake disaster management was carried out at school. One solution to minimize disaster risk is that schools can play a role in disaster mitigation education to build students' understanding and skills in disaster mitigation in the school and community environments<sup>22</sup>. When facing earthquake disasters that can occur suddenly, preparedness is the key to safety. It is hoped that having a preparedness plan in the face of earthquakes can minimize the losses that will occur<sup>23</sup>.

Based on the research results, it was found that the scores of students and teachers after receiving treatment (post-test) were higher than the pre-test scores (positive ranks) for disaster management in the school environment. Earthquake disaster simulation can provide students with an experience that can

be directly felt because it is designed with a situation that is similar to actual disaster conditions and involves active participation by participants. This is in accordance with research conducted by <sup>24</sup> that disaster preparedness simulation activities, which were enthusiastically and actively participated in by the students, provided significant benefits and results. The simulation method is very effective in improving students' preparedness behavior during disasters <sup>25</sup>.

In the Wilcoxon Signed Rank Test calculation, the student's post-test Z score minus the pre-test score was -6.495 with a p-value (asymptotic, sig 2 tailed) of 0.000. The same applies to the teacher's post-test Z score minus the pre-test score, which is -2.371 with a p-value (asymptotic, sig 2 tailed) of 0.018. From these data, the p-value is <0.05, for both students and teachers, so it can be stated that there is an influence of earthquake disaster management simulations on these two respondents. The results of this research are in line with research conducted by <sup>26</sup> among Soropia 1 Middle School students, Konawe Regency, Southeast Sulawesi Province, where as many as 91.9% of respondents with a p-value of 0.000 < 0.05, disaster simulation was effective for disaster preparedness in schools.

The influence of simulation on the disaster preparedness of teachers and students in this research shows that they have been able to carry out earthquake disaster management at the stages of prevention, mitigation, and preparedness pre-, intra-, and post-disaster. The involvement of teachers and students in disaster management simulations in schools is part of the school's role in efforts to raise awareness and increase the capacity of teachers and students as early as possible to deal with the impacts of disasters <sup>27,28</sup>.

Increasing disaster preparedness capabilities in schools through teachers and students cannot be separated from the simulation methods used. Before conducting the simulation, disaster preparedness information boards were provided in each class, disaster mitigation in the form of evacuation routes and gathering points, provision of first aid kits, and fire extinguishers. Simulation activities carried out regularly with complete disaster mitigation provisions will be able to

direct and bring participants to real situations, and will provide the ability to think and act effectively when an earthquake occurs. This is in accordance with opinion <sup>29</sup>. The importance of implementing disaster mitigation education in schools needs to be carried out from an early age, in order to provide deeper knowledge and readiness for actions that need to be taken before and during an unexpected natural disaster to minimize all impacts that will occur. This finding is in line with this opinion <sup>28</sup>. Currently, there is a change in the paradigm of disaster management in Indonesia, including the fact that disaster management no longer emphasizes the emergency response aspect, but emphasizes overall risk management, protecting society from the threat of disaster, and is not solely the government's responsibility. The role of schools is very important in disseminating disaster mitigation education as basic knowledge that requires learning as early as possible, so that a culture of disaster mitigation grows both before, during, and after a disaster.

## CONCLUSION

There was an increase in the ability of teachers and students at school after a disaster preparedness simulation was conducted at a junior high school in Ternate City. The role of schools is very important to provide dissemination of disaster mitigation education as a basic knowledge that requires learning as early as possible, so that a culture of disaster mitigation grows both before, during a disaster and after a disaster.

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## ***Related Factors, Causes and Stress Respons of Hypertension Patients in Coastal Communities: Mixed Method***

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### **ABSTRACT**

*Hypertension is a non-communicable disease (NCD) that is now a health problem that is difficult to control in number and is the cause of high mortality and morbidity rates globally. In addition to the prevalence of events that are increasing over time, hypertension is also known to be dangerous because it is a risk for other chronic diseases such as heart disease and stroke disease. This study aims to analyze the incidence and related factors of hypertension in coastal communities in Motui District, North Konawe Regency, Southeast Sulawesi Province. The research design uses a mix of quantitative and qualitative methods. Quantitative methods use cross-sectional while qualitative methods by determining themes. The sample in the study was 60 people with hypertension. Sampling technique with non probability sampling with consecutive sampling method. The results showed that 44 people (73.3%) experienced severe stress and 16 people (26.7%) experienced moderate stress. Some factors that cause stressful events are gender ( $p = 0.002$ ), and occupation ( $p = 0.000$ ). The cause of stress experienced is due to the heavy workload, economic difficulties and personal problems. While the response of hypertension patients who experience stress is anger, anxiety and pressure and crying. The conclusion of this study is that people with hypertension experience severe stress caused by workload, economic and personal problems.*

**Keywords:** *Hypertension, Stress, Causes of Stress, Stress Respons, Mixed Method*

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## **INTRODUCTION**

Hypertension is one of the non-communicable diseases (NCDs) which is currently a health problem that is difficult to control in number and is the cause of high mortality and morbidity rates globally. In addition to the increasing prevalence of events over time, hypertension is also known to be dangerous because it is a risk for other chronic diseases such as heart disease and stroke disease<sup>1</sup>. Hypertension is a condition where blood pressure increases beyond the normal threshold, where systolic is more than 140

mmHg and diastolic is more than 90 mmHg at rest<sup>2</sup>.

People with hypertension continue to increase globally, along with the increasing population. Although preventive, curative and rehabilitative efforts have been made, it has not reduced the incidence of hypertension. It is estimated that as many as 1.3 billion people in the world suffer from hypertension and are dominated by people who have lower middle income<sup>3</sup>. Basic Health Research (RISKESDAS) in 2018 gave results that the incidence of hypertension in Indonesia (aged >18 years, through blood pressure measurement) was 34.1%. This presentation

has increased when compared to hypertension data in Riskesdas in 2013 which was 25.8%. Hypertension disease is the ten most common major diseases in Southeast Sulawesi with a prevalence of 33.62%<sup>4</sup>. In Motui District, hypertension is also the top ten diseases with a total of 204 patients.

Hypertension is experienced by the population with an average age of >40 years, more at risk in those who are obese, aggravated by unhealthy lifestyles such as smoking and lack of activity, high-salt diets, frequent experience of stress or stress, and a family history of hypertension<sup>5</sup>. Patients who experience hypertension complain of various symptoms and there are also patients who do not show symptoms. People with hypertension generally experience mild to moderate headache, heaviness in the nape, complain of fatigue, blurred vision, heart palpitations, ringing ears and vertigo<sup>6</sup>.

Hypertension is a chronic disease that is difficult to cure with a high recurrence rate. Because it is difficult to cure, this disease becomes an unpleasant psychological experience for the sufferer. Fear and worry about the recurrence of the disease, the possibility of hypertension getting worse and causing complications, long treatment time and the amount of costs spent in the long treatment process. Not only afraid and worried about disease, people with hypertension also experience an increase in financial burdens and the emergence of problems in family relationships<sup>7</sup>. This condition will trigger the emergence of stress in people with hypertension.

Stress is an emotional condition in the form of feelings of tension triggered by physical, emotional, social, economic, work or circumstance, difficult events and experiences that make it difficult for a person to endure. Stress conditions experienced by a person affect their performance, both emotional conditions and performance at work. Stress makes it difficult for a person to concentrate so that it decreases productivity at work. Stress also affects emotions so that it has an impact on a person's relationship with others. Stress triggered by load demands<sup>8</sup>.

When experiencing stress, arteries that function to channel blood to the organs of the body will vasoconstriction which causes blood pressure in the arteries to increase. When the body experiences stress, the sympathetic

nervous system will be stimulated. As a result, the body will give a response such as heart rate will become faster and blood vessels will experience vasoconstriction resulting in an increase in blood pressure<sup>9</sup>. The stress experienced by hypertensive patients will aggravate the condition of the disease where blood pressure will be difficult to control.

This study aims to analyze the incidence and related factors of hypertension events in coastal communities in Motui District, North Konawe Regency, Southeast Sulawesi Province.

## METHOD

This study uses a mix method design, which is a combination of quantitative methods and qualitative methods to analyze stress events. A mix method design is used in research so that researchers can obtain a more complete and in-depth picture of the phenomena that will be explored in this research. In this study, an analysis was carried out of several factors that influence stress in hypertension sufferers through quantitative analysis. Then the researchers explored the phenomenon that causes stress in hypertension sufferers through qualitative analysis

The research was carried out in the coastal area of Motui District, North Konawe Regency, Southeast Sulawesi Province, from June – August 2023. The population in this study is people with hypertension in the coastal area of Motui District. The sample in this study was 60 people. Sampling technique with consecutive sampling. This method was chosen because the samples to be taken must comply with the sample selection criteria, namely samples that are hypertension and experiencing stress. Determining strict criteria can avoid the possibility of bias in this study.

Before collecting data, researchers have obtained ethical feasibility to conduct research. Ethical eligibility is obtained from the Ethics Committee with number DP.03.04/100/2023 according to 7 WHO 2011 Standards referring to the 2016 CIOMS Guidelines. There are no ethical violations in the research process, because this research does not cause harm and does not harm the sample, guaranteeing confidentiality and privacy of the sample.

Quantitative collection, namely the level of stress, was carried out using a Perceived Stress Scale (PSS) questionnaire consisting of

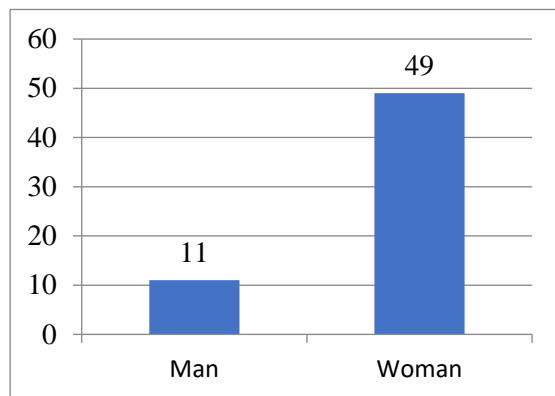
10 question items that had been valid, reliable. Qualitative data collection was conducted through in-depth interviews with 10 samples with severe stress categories using phenomenological stages according to Spielberg in exploring the causes of stress and responses in response to stress experienced.

Quantitative data analysis using univariate and bivariate analysis with the help of SPSS V.24. While qualitative data is analyzed to find themes

## RESULTS

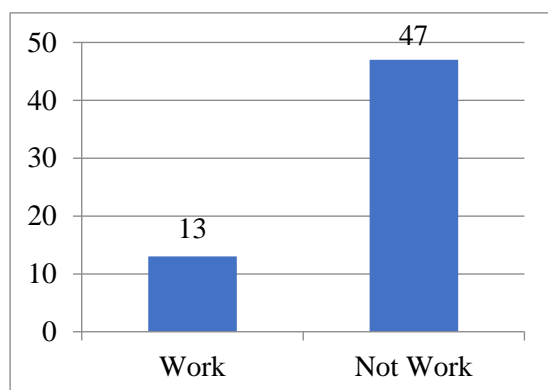
### Quantitative Analysis

This section describes age, gender, education, and occupation. All data in categorical form is depicted in proportion. The results of univariate analysis for variables with categorical data types are shown in the table below:



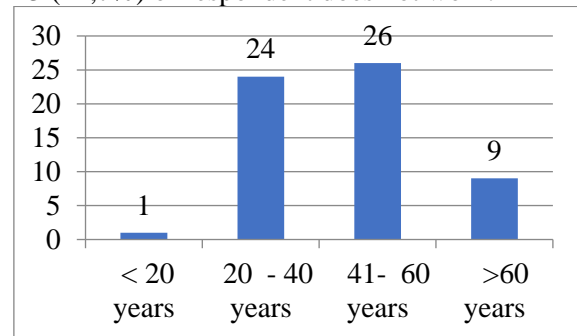
**Chart 1. Distribution of respondent frequency based on respondent gender (n = 60)**

Based on chart 1 above, it is known that there are 49 (81,6%) Woman and 11 (18,4%) Man of respondent.



**Chart 2. Distribution of respondent frequency based on respondent working (n = 60)**

Based on chart 2 above, it is known that there are 47 (78,3%) of respondent work and 13 (21,7%) of respondent does not work.



**Table 1. Distribution of respondent frequency based on respondents' stress level (n= 60)**

Stress Level	Frequency	%
Severe stress	44	73.3
Moderate stress	16	26.7
Sum	60	100.0

Based on table 1 above, it is known that the average respondent was in the severe stress range of 44 respondents (73.3%)

**Table 2. Analysis of the Relationship between Sex and Respondents' Stress Levels**

Gender	Stress Level		Total	p-value
	Moderate	Severe		
Man	7 (11,6%)	4 (6,7%)	11 (18,3%)	0.002
Woman	9 (15%)	40 (66,7%)	49 (81,7%)	
Total	16 (26,6%)	44 (73,4%)	100 (100%)	

Based on table 2 above, it is known that the average respondents with female sex are in the range of severe stress category while men are generally in the moderate stress range. From the results of the analysis it is known that there is a relationship between sex and stress level marked by a value of  $P = 0.002$  ( $p\text{-value} < 0.05$ ).

**Table 3. Analysis of the Relationship of Work with Respondents' Stress Levels**

Work	Stress Level		Stress Level	p-value
	Moderate	Severe		
Work	8 (13,3%)	3 (5%)	11 (18,3%)	0.000
Not Work				

Dose Not Work	8 (13,3%)	41 (68,4%)	49 (81,7%)
Total	16 (26,3 %)	44 (73,4%)	100 (100%)

Based on table 3 above, it is known that the average respondents who did not work were in the range of severe stress category as many as 41 respondents (68.4%). From the results of the analysis it is known that there is a relationship between work and stress levels marked by P value = 0.000 (p value < 0.05).

**Table 4. Analysis of the Relationship between Age and Respondents' Stress Levels**

Age	Stress Level		Total	p-value
	Moderate	Moderate		
< 20 years	0 (0 %)	1 (1,6%)	1 (1,6%)	0.17
20-40 years	6 (10%)	18 (30%)	24 (40%)	
41-60 years	5 (8,3%)	21 (35%)	26 (43,3%)	
< 60 years	5 (8,3%)	4 (6,7%)	9 (15%)	
Total	16 (26,7 %)	44 (73,3%)	100 (100%)	

Based on table 4 it is known that the results of the analysis are known to have no relationship between age and stress level marked by P value = 0.174 (p value > 0.05).

### Qualitative Analysis

In this section, researchers will explain the overall theme based on respondents' answers to several questions that refer to the specific objectives of the study

### Causes Analysis of stress with hypertension patients

#### Theme 1: Workload

Four participants in the study said the problems faced were more work-related. Participant statements are expressed as follows :

" ..... berat sekali kerja ditambang, sa stress karena tiap hari masuk dan hanya libur 1 kali sebulan.." (p1)

" ..... It's very hard to work in mining, i'm stress because every day comes in and only takes 1 time a month off." (P1)

"... banyak maunya bos dan sa ditegur terus....." (p3)

"... the boss so demands a lots and I'm to be reprimanded continuously....." (P3)

".... sa cape kerja dengan shift apalagi sy masih

baru " (p6)

".... I'm so exhausted by work with shifts moreover i'm is still new worker" (p6)

"..... berat kerjaku ditambang, tidak kerja , ndak ada uang kasian....." (p10)

"..... work at mining is too hard, not work, there is no cash..." (P10)

#### Theme 2: Difficult economy

Three participants in the study said the problems faced were more related to family economics. Participant statements are expressed as follows:

"..... Susah kasian uang di jaman sekarang, mana banyaknya kebutuhan..." (p2)

"..... It's hard to spend money nowadays, where there are so many needs..." (P2)

"..... puuu sulit hidup,suami barupi masuk tambang jadi belumpi terima gaji..." (p4)

"..... Puuu has a hard time living, my husband is a new worker at mining so he hasn't received a salary..." (P4)

"... nda susah sekali ji hidup,, cuman sulit kasian dapat uang. Sa stress hmm .." (p8)

"... It's very hard for you to live,, it's just hard to get money. I'm so stress out hmm.." (P8)

"... suamiku adaji kerjanya, tapi banyak juga cicilan kasian..." (p5)

"... My husband has work, but there are also many installments..." (P5)

#### Theme 3: Personal issues

Two participants in this study said the problems faced were more related to personal problems. Participant statements are expressed as follows:

"... hmm.. sa hidup bertiga dengan anakku.. suami suda meninggal...berat hidup deela..." (p7)

"... hmm.. i live with three sons.. my husband passed away... my life is so hard and poor..." (P7)

"... bapaknya anak-anak menikah lagi, dia ndak pernah mi lagi kasi uang..." (p9)

"... The father of the children remarried, he never noodle money anymore..." (p9)

### Analysis of the response of participants with hypertension to stress experienced

#### Theme 1: Anger

Six participants in this study said the participants' response to the problem at hand was anger. Participant statements are expressed as follows:

“... saya kecewa, marah dengan suami karena dia pergi dengan itu janda...” (p9)  
 “... I was disappointed, angry with my husband because he went with that widow...” (P9)  
 “... hmmm, pernah mi itu sa marah sama bosku... kita kerja tapi ndak pernah dihargai...” (p3)  
 “... hmmm, I ever get angry with my boss... our hard work never appreciated...” (P3)  
 “...kadang sa marah juga, kenapa kasian ini hidup susah terus... tapi mau diapami...” (p1)  
 “... Sometimes I get angry too, why is this living too hard to continue... but want to be apathy...” (P1)  
 “... puu ma sa marah sama suami, kita mau makan apami klo ndak ada uang...” (p4)  
 “... puu I get angry with my husband, there is no meal we don't hane any money...” ( P4)  
 “... marah karena hidup ndak berubah.. susah terus...” (p8)  
 “... angry because life hasn't changed. it's hard to continue...” (P8)  
 “... marah sama diri sendiri, karena ndak bisa merubah nasib...” (p6)  
 “... angry with myself, because i can't change my fate...” (P6)

#### Theme 2: Restlessness and stress

One participant in this study said the participants' response to the problems faced was anxiety and distress. Participant statements are expressed as follows:  
 “... bagaimana kah itu kalo ndak adami uang, tertekan kasian.. gelisah jangan sampe tidak bisami makan...” (p2)  
 “... How is it if you don't have money, I'm so depressed... so stressed there is nothing for meal...” (P2)

#### Theme 3: Alone

One participant in this study said the participant's response to the problem at hand was solitude. Participant statements are expressed as follows:  
 “... waktu suami meninggal, ada 1 minggu sy dikamar saja.. sa bingung bagaimana mi kasian hidupku sama anak-anak...” (p7)  
 “... When my husband passed away, I stay at bedroom for one week.. I'am confused how poor my life with the children...” (P7)

#### Theme 4: Crying

Two participants in this study said the participants' response to the problem was crying. Participant statements are expressed as follows:

“...sa pernah mi menangis .. sulit juga kerja ditambah..berat...” (p10)  
 “...i cried a lot.. too hard work at mining.....” (p10)  
 “...pernah mi itu sa menangis karena ndak ada uang... stress kasian...” (p5)  
 “...i've cried because there was no money... I'm so stressed...” (P5)

### DISCUSSION

Stress occurs due to various pressures in a person's life. Stress can cause body changes both physically and psychologically. Stress can trigger an increase in blood pressure or vice versa. Stress in people with hypertension if not overcome can be a trigger factor for the emergence of other diseases that lead to complications of the disease<sup>10</sup>.

#### Related Factors to Stress of Hypertension Patients

The results showed that as many as 49 respondents were female. Previous research obtained results that stated that the incidence of hypertension in women and men had a proportion of 4% and 10%. Some causes of hypertension in women are identified as being influenced by sex hormones and chromosomal differences<sup>11</sup>.

In this study, it is known that hypertensive patients experience severe stress. Stress conditions found in people with hypertension are usually caused by sudden changes in activities that are often carried out by patients, difficulties in adjusting to sick conditions, and the existence of a treatment process that can be a stressor for patients with hypertension<sup>11</sup>.

According to the results of the analysis, it is known that factors related to stress in people with hypertension are gender (p value = 0.002) and occupation (p value = 0.000). As many as 667% of female respondents who experience severe stress. The results of this study are supported by previous research that there are risk factors that have been studied that may explain sex differences in stress

prevalence. In women, there are differences in sexual hormone levels, differences in dealing with problems between men and women, differences in socialization, differences in frequency and reactions to stress in life where women are known to have more stressors, differences in social roles Where women take care of more household problems and cultural influences, namely patriarchy<sup>12</sup>.

### **Causes and Stress Respons of Hypertension Patients**

Factors causing stress in hypertensive patients is various. In this study, it is known through in-depth interviews that the causes of stress experienced are due to workload, difficult economy and problems in personal life. Work environments with heavy workloads cause respondents to experience stress. Similarly, it was found in previous studies that job demands cause stress (p value = 0.001)<sup>8</sup>. Economic problems can be the cause of stress. Poverty is one of the causes of stress in people's lives. Difficult socio-economics puts people in a threatening situation that triggers stress<sup>13</sup>. The presence of various personal problems in the family can contribute to causing stress. Family problems that are not harmonious, uneven distribution of duties and responsibilities, even lack of family income are also problems in the family<sup>14</sup>.

People who experience stress will show different responses or reactions. The results of the study illustrate that the response of hypertensive patients to stress experienced in the form of angry, restless and depressed responses, solitude and overflowing by crying. The same thing was stated in a study that the stress experienced responds to psychological so that feelings of tension, feelings of pressure, and sadness appear. If this condition continues without treatment, it will stimulate the child's kidneys to produce the hormone adrenaline. The excitation of the hormone adrenaline makes the heart spurred to increase contractility so that the blood pump becomes faster and stronger. As a result, blood pressure in the vascular will increase<sup>15</sup>.

Stress is strongly associated with the incidence of hypertension. Stress is a trigger factor for hypertension. If you experience stress, sympathetic nerve activity will occur so that blood pressure increases intermittently. Stress that occurs continuously without

treatment, can result in high persistent blood pressure. Of course this cannot be left for a long time because it will have a pathological impact on the body<sup>16</sup>.

### **CONCLUSION**

The conclusion of this study is that people with hypertension in coastal areas experience severe stress influenced by gender and occupation. Analyze the causes of stress due to work, difficult economics and personal problems. Responses to stress include anger, anxiety and distress, solitude and crying. It is important to examine the stress response experienced by hypertension sufferers to provide more appropriate treatment. There should be specific stress management according to the response shown by hypertension sufferers for further research.

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### **CONFLICTS OF INTEREST**

There is no conflict of interest in this research.

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## ***Spiritual Emotional Freedom Technique Intervention on Anxiety Level of Hypertensive Heart Disease Patients***

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### **ABSTRACT**

*Hypertension is one of the leading causes of various heart diseases. In patients with Hypertensive Heart Disease (HHD), anxiety symptoms can continue to increase, which can affect the treatment and healing process and can cause various complications. This study aims to determine the effect of Spiritual Emotional Freedom Technique (SEFT) therapy on anxiety levels in HHD patients in the ICCU room of Kendari City Hospital. This type of research is a pre-experiment with a one-group pretest-posttest design. The population in this study were all HHD patients treated in the ICCU room of Kendari City Hospital. The sampling technique used was purposive sampling, with a total sample size of 22 respondents. This research instrument uses the Anxiety Visual Analog Scale (VAS-A) questionnaire sheet to measure anxiety levels. The analysis method uses a paired-sample t-test. The results showed that the level of anxiety before and after SEFT therapy decreased. This can be seen from the statistical test  $p\text{-value} = 0.000 < \alpha = 0.05$ , which shows a significant difference. It can be concluded that SEFT therapy influences reducing anxiety levels in HHD patients. It is expected for service institutions and other institutions to provide training for health workers to perform SEFT therapy to help reduce patient anxiety levels.*

**Keywords:** Anxiety, SEFT Therapy, Hypertensive Heart Disease (HHD)

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## **INTRODUCTION**

Health development is an effort carried out by all components of the Indonesian nation that aims to increase awareness, willingness, and ability to live healthily for everyone to achieve the highest level of public health. Currently, Indonesia is experiencing a change in disease patterns, which is often called an epidemiological transition, which is characterized by increasing deaths and morbidity due to non-communicable diseases

(NCDs). One of these non-communicable diseases (NCDs) is hypertension<sup>1</sup>.

Hypertension is when the blood vessels have persistent high blood pressure (systolic blood pressure  $\geq 140$  mmHg or diastolic blood pressure  $\geq 90$  mmHg). Blood pressure is the force of blood against the pressure of the artery walls when the blood is pumped by the heart throughout the body. The higher the blood pressure, the more complex the heart works<sup>1</sup>.

2015 WHO data shows that around 1.13 billion people in the world suffer from

hypertension. This means that 1 in 3 people in the world are diagnosed with hypertension, and only 36.8% of them take medication. The number of hypertension sufferers in the world continues to increase every year. It is estimated that by 2025, there will be 1.5 billion people affected by hypertension. It is also estimated that every year, 9.4 million people die from hypertension and complications<sup>2</sup>.

In Indonesia, hypertension is still a disease that is a big challenge. This is because hypertension is often found in primary health care. According to basic health research data (RISKESDAS), in 2018, hypertension is a health problem with a moderately increasing prevalence. Namely, in the 2013 Riskesdas, it was 25.8%, rising to 34.1% in the 2018 Riskesdas. Southeast Sulawesi Province is one of the regions with the prevalence of hypertension also increasing quite significantly. In the 2013 Riskesda results, the majority of hypertension in Southeast Sulawesi was 22.5%, and in the 2018 Riskesda, it rose to 30.2%.

Cardiovascular disease, or heart and blood vessel disease, is one of the leading health problems in developed and developing countries. This disease is the number one cause of death in the world every year. Since 2008, it is estimated that 17.3 million deaths have been caused by cardiovascular disease, which is predicted to continue to increase to reach 23.3 million deaths in 2030. In Indonesia, heart and blood vessel disease continues to grow and will cause a burden of pain, disability, and socio-economic disadvantage. For the sufferer's family, society, and the country<sup>3</sup>.

Several factors that influence the development of hypertension and cardiovascular disease from a psychosocial aspect include anxiety, anger, social isolation, depression, and stress. Heart disease patients often experience anxiety factors and can have severe consequences if not treated, but this is rarely studied and given attention. Assessment and treatment of anxiety should be part of care in cardiac patients aimed at recovery and reducing the risk of subsequent attacks. Heart patients who experience stress have a greater chance of complications. Further complications that may occur include recurrent infarction, prolonged ischemia, ventricular fibrillation, and ventricular tachycardia<sup>4</sup>. Heart patients with anxiety have a longer length of stay compared to heart patients without anxiety<sup>5</sup>.

One intervention that can be done to

deal with anxiety is the Spiritual Emotional Freedom Technique (SEFT). The spiritual Emotional Freedom Technique (SEFT) is a non-pharmacological therapy that develops the emotional freedom technique (EFT). Emotional freedom technique (EFT) intervention is a technique for dealing with emotions that is done by lightly tapping the fingertips to stimulate specific meridian points on the individual's body while feeling the problem being faced. Seft therapy can be done alone and without the use of special equipment, so that this therapy can be done at any time.

SEFT intervention research to reduce the anxiety of families of patients treated in the ICU room at Bau-Bau City Regional Hospital. The results of the study show that, clinically, SEFT therapy affects reducing anxiety levels in the families of patients treated in the ICU room at Bau-Bau City Regional Hospital<sup>6</sup>.

The results of a preliminary survey conducted on April 18, 2019, showed that the number of patients being treated in the ICU room at the Kendari City Regional Hospital was five people, and four of them suffered from Hypertensive Heart Disease (HHD). When assessing anxiety in patients with HHD using VAS-A, three of them experienced severe anxiety, and one experienced moderate pressure. The stress experienced is related to the patient's illness and fear of death. Anxiety can stimulate the release of epinephrine and norepinephrine, which affects the work of the sympathetic and parasympathetic nerves. An increase in blood pressure and pulse rate is an impact that can cause further complications. This will also make the length of treatment longer. Based on this description, this study aims to assess the effect of the Spiritual Emotional Freedom Technique (SEFT) therapy intervention on anxiety levels in Hypertensive Heart Disease (HHD) patients in the ICU room at Kendari City Regional Hospital.

## METHOD

This quantitative research uses a pre-experimental design using a one-group pretest-posttest design approach. In this design, an examination of the disease or condition under study is carried out on a group of research subjects, and then the SEFT intervention is carried out. After a period deemed sufficient, a re-examination of the disease or condition is carried out. This research used a one-group

pretest-posttest design approach due to limited research time, so it was feared that the number of samples obtained needed to be more significant to be divided into intervention and control groups.

This research was carried out in the ICCU room at the Kendari City Regional General Hospital. This research was carried out from May 2 to June 22, 2019.

The population in this study were all Hypertensive Heart Disease (HHD) patients treated in the ICCU room at the Kendari City Regional Hospital. The sample in this study was HHD patients who were treated in the ICCU room at Kendari City Regional Hospital and met the inclusion and exclusion criteria, totaling 22 people. The sampling technique used in this research was purposive, quantitative analysis with a pre-experimental design using a one-group pretest-posttest design approach. In this design, an examination of the disease or condition under study is carried out on a group of research subjects, and then the SEFT intervention is carried out. After a period deemed sufficient, a re-examination of the disease or condition is carried out. This research used a one-group pretest-posttest design approach due to limited research time, so it was feared that the number of samples obtained was too small to be divided into intervention groups and control groups.

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The population in this study were all Hypertensive Heart Disease (HHD) patients treated in the ICCU room at the Kendari City Regional Hospital. The sample in this study was HHD patients who were treated in the ICCU room at Kendari City Regional Hospital and met the inclusion and exclusion criteria, totaling 22 people. The sampling technique used in this research was purposive sampling.

## RESULTS

Changes in the anxiety scale between respondents who know about SEFT therapy and those who do not know about SEFT therapy can be seen in the table below:

**Table 1. Changes in Respondents' Anxiety Scale**

Category	Changes in Anxiety Scale		Total (n)	%
	Yes	No		
Know about SEFT	2	1	3	13,64
Don't know about SEFT	19	0	19	86,36
Total	21	1	22	100

Table 1 above shows that of the 22 respondents, 3 (13.64%) knew about SEFT therapy. Of these respondents, 2 of them experienced a change in the anxiety scale value, and one respondent did not experience a difference in the anxiety scale. In contrast, 19 (86.36%) respondents had never known about SEFT therapy, and all of them experienced changes in anxiety scale scores.

The research results showed that anxiety levels before and after SEFT therapy decreased. This can be seen from the statistical test  $p\text{-value} = 0.000 < \alpha = 0.05$ , which offers a significant difference. It can be concluded that SEFT therapy reduces anxiety levels in HHD patients.

The research results show that the largest age group of respondents was between 54 and 65. Namely, from 22 respondents, there were 12 (54.5%) respondents. This shows that age is a risk factor for HHD. Apart from the age factor, there is also a gender factor where men are more at risk than women. The number of male respondents was 13 (59.1%) and 9 (40.9%) female. Men aged 35-50 years and menopausal women are at high risk of developing hypertension. As age increases, blood pressure rises, this factor cannot be controlled, and men's gender is more elevated than women's<sup>7</sup>.

The research results show that of the 22 respondents before SEFT therapy was given categorically, there were 14 (63.6%) respondents with moderate levels of anxiety and 8 (36.4%) respondents who experienced severe levels of stress. This anxiety is caused by the presence of a disease that is considered a health threat. This is based on the statements of the majority of respondents, who revealed that they felt anxious because of their illness. Apart from that, the fear of recurrence and loss of livelihood due to not being able to work also adds to the feelings of anxiety experienced. Anxiety in the patient and his family while the patient is in

hospital, one of which is due to worry that the patient's condition will get worse and even threaten the patient's life<sup>8</sup>.

Judging from the average blood pressure in the intervention group after being given treatment, hypertensive respondents in the intervention group who were given spiritual, emotional freedom technique (SEFT) treatment experienced changes in blood pressure reduction, while those in the control group or groups that were not given spiritual, emotional freedom technique therapy treatment technique (SEFT) experienced an insignificant decrease in blood pressure<sup>9</sup>. One of the reasons for this is that giving spiritual, emotional freedom technique (SEFT) therapy for 15 minutes a day can help lower blood pressure because it is relaxing and suppresses the production of stress hormones such as epinephrine and cortisol, which will reduce heart function and output heart<sup>10</sup>.

The goal of treating hypertension is not only to reduce blood pressure but also to reduce and prevent complications due to hypertension. Non-pharmacological management is treatment without drugs applied to hypertension<sup>11</sup>. The first step in non-pharmacological treatment of hypertension is to live a healthy lifestyle, including controlling body weight, controlling diet, physical activity (exercise), stopping smoking and alcohol, and managing stress<sup>12</sup>. Anxiety, fear, pain, and emotional stress can result in sympathetic stimulation, which increases heart rate, cardiac output, and vascular resistance. This sympathetic effect increases blood pressure. Anxiety increases blood pressure by 30 mmHg<sup>13</sup>.

Anxiety can affect the respondent's health condition by stimulating the sympathetic and parasympathetic nervous system, which can be seen by increasing the respondent's pulse frequency and patient breathing. The mean value of the respondents' pulse frequency before SEFT was 102.91, and the mean value of respiratory frequency before SEFT was 25.55.

Based on the results of research from 22 respondents, 21 (95.45%) respondents experienced a decrease in the anxiety scale score (decrease in the VAS-A scale >8) after SEFT therapy; namely, the average anxiety score before SEFT therapy was 67.95 (SD = 19.091) fell to 48.86 (SD=17.45) after SEFT therapy so that the mean decrease was 19.091 (SD=7.964) while 1 (4.55%) other respondent did not experience a decrease at all in the

anxiety scale value.

There was no change in the value on the respondent's anxiety scale because the respondent did not follow SEFT therapy properly, namely at the setup and tune-in stages, where the respondent was not devoted and did not believe in SEFT therapy.

The respondent's disbelief was because the respondent had seen SEFT therapy before via social media and tried it, but there was no change in his complaints at that time. Patients who have reasonable beliefs about vulnerability are 6 (six) times more likely to comply than patients who have poor beliefs<sup>14</sup>. Compliance is an essential factor that influences therapy results. Compliance can be interpreted as a patient cognitively/intellectually complying with all advice and instructions recommended by medical personnel. Compliance is an important factor that influences therapy results. Compliance can be interpreted as a patient cognitively/intellectually complying with all advice and instructions recommended by medical personnel<sup>15</sup>.

## DISCUSSION

SEFT reduces adrenaline and cortisol so that heart rate, high blood pressure, and muscle tension decrease<sup>16</sup>. This is confirmed by Faridah's research, which stated that there was a decrease in systolic and diastolic blood pressure in hypertensive sufferers aged 45-59 years at RSUD dr. Soegiri Lamongan<sup>17</sup>.

SEFT can improve the state of mind, emotions, and human behavior by tapping techniques at 18 critical points along the body's 12 energy meridians. As explained, if the body's energy flow is disturbed because it is triggered by memories, trauma, or wrong learning processes stored in the subconscious, then emotions become chaotic, ranging from mild ones such as bad mood, laziness, and unmotivated to do something, to the severe conditions such as acute depression, phobias, excessive anxiety, and prolonged stress<sup>18</sup>. All of this is caused by disrupting the body's energy system. Therefore, to overcome this by neutralizing the energy disturbance again through SEFT therapy. SEFT balances psychological resistance in the form of negative thoughts in the patient. These negative thoughts are changed into positive reviews by being neutralized with a prayer of surrender. The power of prayer accompanied by sincerity and

sacrifice can strengthen the effects of SEFT therapy.

The benefits of SEFT therapy include overcoming emotional and physical problems that can trigger the release of stress hormones such as cortisol and epinephrine, which can trigger heart function and increase cardiac output<sup>19</sup>. The heart is a pump system that pumps blood throughout the body. Because it is a pump system that requires pressure, the amount of pressure depends on two main factors: cardiac output (cardiac output) and peripheral resistance or tone of the arteries (peripheral resistance). Increased CO causes hypertension through increased fluid volume (preload) and contractility. Both of these result from overactivity of the sympathetic nerves, which causes an increase in heart rate and blood volume redistribution due to vasoconstriction. Under normal circumstances, an increase in CO will be required to meet the increasing metabolic needs of body tissues. Peripheral pressure will decrease. This situation is always in balance so that it does not cause hypertension<sup>20</sup>.

In the concept of psychoneuroimmunology, anxiety or stress as a stressor will influence stress perception and stress responses that occur in the human body. Stress response occurs through the regulation of the nervous and endocrine systems in producing neurotransmitters and hormones that will modulate the body's immune system, one of which is through the HPA axis. Controlled emotions from the amygdala influence hypothalamus activity in reducing CRH secretion, then the decrease in CRH will be responded to by the adrenal glands to reduce ACTH secretion so that the ACTH hormone will reduce cortisol secretion by the adrenal cortex, which causes a person's emotional state (anxiety) which can be observed from fluctuations in adrenal hormones<sup>21</sup>.

Spiritual in SEFT is a prayer that is affirmed by the patient from the therapy session until the end of the therapy session, namely in the set-up, tune-in, and tapping Zainuddin AF phases. 2009, and Sumiati 2010 states in her book that prayer is part of worship. It is a recognition that a person depends on the only God who created humans and the universe. With this recognition, a feeling of security arises in the human soul that there is a close life supporter who will not make him sad. The value of worship is significant in reducing emotional

stress so that it influences the process of hypertension and its prognosis. By increasing the motivation to worship and the attitude of prayer, a person's mental and psychological strength will be strengthened, and they will gain peace. By remembering Allah, your day will be calm and peaceful<sup>18,22</sup>.

Research conducted by 6 outlined the results of his study that there was a significant difference in measuring the anxiety levels of families of critical patients before and after being given SEFT. Changes in anxiety levels are characterized by a decrease in anxiety levels from severe to moderate levels, so it can be seen that SEFT given to families of critical patients is effective in reducing anxiety.

SEFT intervention can help patients to accept and surrender the condition or illness they are experiencing by using a spiritual approach and providing calm to the patient, which will cause a relaxation response. Halm (2009) in Rahmadania WO 2021 stated that the relaxation response can be characterized by a decrease in respiration (breathing becomes slower in rhythm), heart rate (slow pulse), a drop in blood pressure, and a reduction in oxygen demand in the heart muscle. This also happened in this study. The results of measuring pulse frequency and respiratory frequency decreased after SEFT therapy<sup>23</sup>.

## CONCLUSION

This study concluded that there was an influence before and after receiving the Spiritual Emotional Freedom Technique (SEFT) therapy intervention on anxiety levels in Hypertensive Heart Disease (HHD) patients. In addition, this study recommends that service institutions and other institutions provide training for health workers to carry out SEFT therapy to help reduce patient anxiety levels.

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Original Article

## Nutritional Contribution of *Awaous sp* Small Indigenous Fish Powder Important for the First 1000 Days of Life

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### ABSTRACT

Research facts prove that small-sized fish are essential nutrition during the first 1000 days of life. Central Sulawesi Province has an endemic small-sized marine fish species locally known as duo or penja fish (*Awaous sp*), which has not been studied for its bio-mineral content. This study aimed to analyze the moisture, ash, protein, calcium, iron, and zinc content in *Awaous sp* protein flour. This research was a descriptive laboratory study conducted at the Ilmu Bahan Makanan Laboratory Department of Nutrition Poltekkes Kemenkes Palu and PT. Saraswanti Indo Genetech Laboratory, Bogor, West Java, from January to September 2023. The sampling technique used purposive sampling, which involved purchasing fish from the local market in Palu city. *Awaous sp* protein flour had a moisture, ash, protein, Ca, Fe, and Zn content of 3.89%, 9.71%, 73.53%, 2316.88 mg/100g, 24.54 mg/100g, and 8.97 mg/100g, respectively. The contribution per serving of 145 grams of *Awaous sp* fish flour met the nutritional requirements (Recommended Dietary Allowances - RDA) for protein, Ca, Fe, and Zn per person per day for infants aged 6-11 months, children aged 1-3 years, pregnant women, and lactating women. *Awaous sp* protein flour had higher protein and Fe content compared to other small fish and had the potential to meet RDA requirements. Therefore, consuming *Awaous sp* protein flour as part of the daily diet can be a suitable strategy to address nutritional deficiencies during the first 1000 days of life for residents in Central Sulawesi.

**Keywords:** *Awaous sp*, Small Indigenous Fish, Fish Protein Powder, Bio-Mineral

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## INTRODUCTION

Improving nutritional status is focused on the first 1000 days of life as an effort to accelerate the reduction of stunting and address malnutrition during this period. Stunting remains a significant challenge in Central Sulawesi Province. Therefore, local resources with high nutritional potential, both from terrestrial and aquatic sources, need further exploration of their nutritional content through research. According to Gowele et al., 2021, micro-nutrient deficiencies such as calcium, iron, zinc, phosphorus, and vitamin A are of concern because some studies have shown their close association with stunting<sup>1</sup>. Protein-rich aquatic sources, especially small-sized fish, are known to be rich in mineral content. Byrd et al.,

2021 therefore, state that small-sized fish are essential nutrition during the first 1000 days of life<sup>2</sup>.

Several studies indicate that whole consumption of small fish species significantly contains higher micro-nutrient nutrition such as calcium, iron, zinc, manganese, vitamin A, vitamin D, E, K, EPA, and DHA compared to fish consumed as meat only<sup>3,4</sup>. Additionally, as noted by Abbey et al., 2017, small-sized fish have the potential to meet the nutritional needs of communities, especially those with limited economic resources<sup>5</sup>. Similar phenomena are also demonstrated by small-sized endemic fish species with high iron and vitamin A content<sup>6,7</sup>. Central Sulawesi Province has an endemic small-sized fish known as *Awaous sp*, which requires further study of its bio-mineral content



in the form of fish protein powder. Based on Shaviklo's review in 2015, fish flour is a stable fish product with higher protein content than the original fish meat.

*Awaous sp* fish can serve as raw material for fish flour production, which can be used as a fortifying ingredient in the food sector due to its presumed high bio-mineral content. However, research related to the mineral content of *Awaous sp* fish has never been conducted. Meanwhile, studies on the nutritional content of small-sized endemic fish flour have been widely conducted, including research conducted by Kasozi et al. in 2018 using small fish (*Brycinus nurse*) from Lake Albert, Uganda<sup>6</sup>. Nevertheless, minerals from supplements are difficult to be directly absorbed by the body because they form insoluble mineral salt deposits in the intestine<sup>8</sup>. Therefore, some research focuses on discovering bio-mineral supplements that can be effectively absorbed, by utilizing food protein to solubilize minerals for subsequent mineral absorption<sup>9</sup>. Recent research shows that mineral complexation with amino acids as chelators can improve mineral absorption and bioavailability<sup>10,11,12</sup>. Peptides can be derived from whey protein<sup>13</sup>, soy protein<sup>14</sup>, clam meat<sup>15</sup>, tilapia protein<sup>16</sup>, fish bones and fish meat<sup>9</sup> as calcium-binding peptides. Research utilizing small fish as iron-binding peptides was conducted by Wu et al., 2012<sup>17</sup>, Miao et al., 2020<sup>18</sup>, and Lin et al., 2021<sup>19</sup>. Fish proteins as zinc-binding peptides have also been successfully employed in the study by Chen et al., 2020<sup>20</sup>.

The fish flour production process, involving high heat and exposure to ultraviolet light, can damage peptide or protein content, resulting in poor solubility of mineral-amino acid complexes in the digestive tract and lower bioavailability<sup>21</sup>. Therefore, this study aims to develop method for *Awaous sp* fish flour production that preserves its peptide content. The objective of this research is to analyze the protein, calcium (Ca), iron (Fe), and zinc (Zn) content of *Awaous sp* fish protein flour.

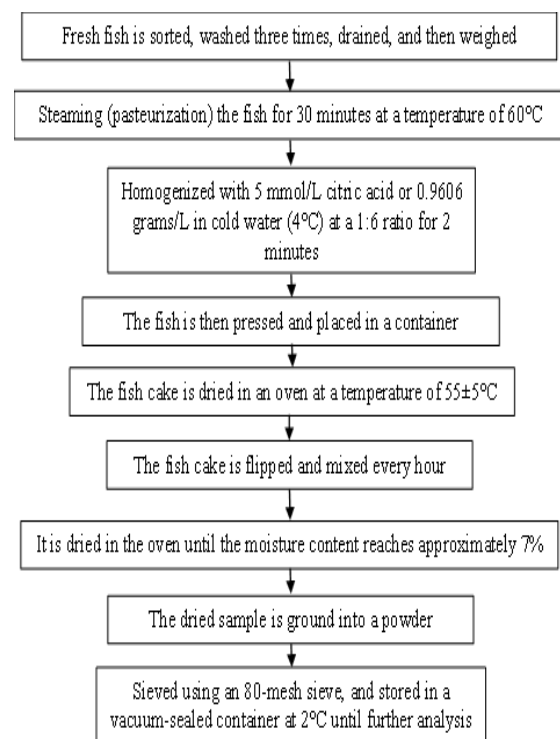
## METHOD

The research design is an experimental laboratory study, and the sampling technique used purposive sampling, which involved purchasing *Awaous sp* fish from the local market in Palu city. The research was conducted

from January to September 2023.

The production process of fish protein flour was carried out at the Ilmu Bahan Makanan Laboratory Department of Nutrition Poltekkes Kemenkes Palu. The analysis of moisture, ash, protein, as well as the analysis of calcium, iron, and zinc content of fish protein flour was conducted at the PT. Saraswanti Indo Genetech Laboratory in Bogor, West Java.

The production process of fish protein flour is carried out by applying a heating process using an oven method with slight modifications<sup>22</sup>. To reduce the fat content, the fish is homogenized with citric acid<sup>23</sup>. The flowchart of fish protein flour production is presented as Figure 1.



**Figure 1. Flow chart for fish protein flour production**

The analysis methods employed for testing moisture and ash content are gravimetric, following the SNI 01-2891-1992 standard. Protein content analysis is conducted using titrimetry, while the analysis of Ca, Fe, and Zn content is performed using ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometry). The analysis procedures are carried out in triplicate (three repetitions).

## RESULTS

The results of anthropometric

measurements of fresh *Awaous sp* fish can be seen in Table 1.

**Table 1. Anthropometric of fresh *Awaous sp* fish**

	Length (cm)	Width (cm)	Weight (g)
Replicate 1	2,3	0,1	0,1186
Replicate 2	2,4	0,1	0,1347
Replicate 3	2,1	0,1	0,1038
Average	2,26	0,1	0,1190

The results of testing the quality of *Awaous sp* fish flour can be seen in Table 2.

**Table 2. Quality of *Awaous sp* fish flour**

	Moisture (%)	Ash (%)	Protein (%)
Replicate 1	3,91	9,73	73,17
Replicate 2	3,87	9,68	73,88
Replicate 3	3,89	9,72	73,54
Average	3,89	9,71	73,53

The results of testing mineral content of *Awaous sp* fish flour can be seen in Table 3.

**Table 3. Mineral content of *Awaous sp* fish flour**

	Ca (mg/100g)	Fe (mg/100g)	Zn (mg/100g)
Replicate 1	2318,82	24,73	8,97
Replicate 2	2319,14	24,38	8,96
Replicate 3	2312,68	24,52	8,98
Average	2316,88	24,54	8,97

## DISCUSSION

Anthropometric measurements and taxonomic of fresh *Awaous sp* fish, including length, width, and weight, categorize *Awaous sp* as a small-indigenous fish species (SIS) <sup>24</sup>. The animal protein food originating from the waters of Central Sulawesi is locally known as “duo” or “penja”. In traditional markets, there are two types of penja available, namely black penja and white penja. White penja and black penja are the same species but differ in their harvest times, with black penja being more mature than white penja <sup>25</sup>.

The amount of moisture (3,89%), ash (9,71%), and protein (73,53%) content in the *Awaous sp* fish flour are similar to Mahmud, et al., 2019 (1), who reported the moisture, ash, and protein contents of scribbled goby (*Awaous grammepomus*), puntio barb (*Puntius puntio*), and spotted snakehead (*Channa punctata*) as 6.84%, 9,19%, and 73.36%. The moisture, ash, and protein content vary depending on the species and drying method <sup>26</sup>.

Based on SNI 01-2715-1996/Rev.92

(2), the minimum protein content for fish flour falls into Quality I, II, and III categories, which are 65%, 55%, and 45%, respectively. The protein content in *Awaous sp* fish flour, at 73.53%, meets the Quality I standard.

The recommended daily protein intake for infants/children varies, with 15 grams for ages 6-11 months and 20 grams for ages 1-3 years. For pregnant women and lactating women, it is 73.7 grams and 77.5 grams, respectively <sup>27</sup>. To meet the daily protein intake, the recommended consumption of *Awaous sp* fish flour is 20.4 grams for ages 6-11 months, 27.2 grams for ages 1-3 years, 100.23 grams for pregnant women, and 105.4 grams for lactating women.

Although the calcium content in *Awaous sp* fish flour is 2316.88 mg/100g, which is lower than *Brachydeuterus auratus* fish in a study by Abbey et al., 2017 <sup>5</sup>, it is higher than *Glossogobius giuris* fish in a study by Akther et al., 2018 <sup>28</sup>, and *Labeo rohita* fish in a study by Mahmud et al., 2019 <sup>29</sup>. The recommended daily calcium intake for infants/children varies, with 270 mg for ages 6-11 months and 650 mg for ages 1-3 years. For pregnant women and lactating women, it is 1200 mg <sup>27</sup>. To meet the daily calcium intake, the recommended consumption of *Awaous sp* fish flour is 11.6 grams for ages 6-11 months, 28 grams for ages 1-3 years, 51.8 grams for pregnant women, and 51.8 grams for lactating women.

The iron content in *Awaous sp* fish flour, at 24.54 mg/100g, is higher than the iron content in *Hypophthalmichthys molitrix* fish in a study by Mahmud et al., 2019 <sup>29</sup>, and *Brachydeuterus auratus* fish in a study by Abbey et al., 2017 <sup>5</sup>. The recommended daily iron intake for infants/children varies, with 11 mg for ages 6-11 months and 7 mg for ages 1-3 years. For pregnant women and lactating women, it is 24 mg and 18 mg, respectively <sup>27</sup>. To meet the daily iron intake to prevent iron deficiency, the recommended consumption of *Awaous sp* fish flour is 44.8 grams for ages 6-11 months, 28.5 grams for ages 1-3 years, 97.8 grams for pregnant women, and 73.3 grams for lactating women.

The zinc content in *Awaous sp* fish flour, at 8.97 mg/100g, is higher than that in *Engraulis encrasicolus* fish in a study by Hasselberg et al., 2020 <sup>30</sup>. The recommended daily zinc intake for infants/children varies, with 3 mg for ages 6-11 months and 1-3 years.

For pregnant women and lactating women, it is 11,3 mg and 13 mg, respectively<sup>27</sup>. To meet the daily zinc intake to prevent zinc deficiency, the recommended consumption of *Awaous sp* fish flour is 33,4 grams for ages 6-11 months and 1-3 years, 126 grams for pregnant women, and 145 grams for lactating women.

The Recommended Dietary Allowance (RDA) for Indonesia, known as AKG, provides the average daily nutritional requirements for most individuals, based on characteristics such as age, gender, physical activity level, and physiological condition, for a healthy life<sup>27</sup>. In this study, AKG was used to determine the adequacy of protein, calcium (Ca), iron (Fe), and zinc (Zn) intake for the age groups of 6-11 months, 1-3 years, pregnant women, and lactating women, as these age groups are the focus of efforts to accelerate the reduction of stunting and combat malnutrition during the first 1000 days of life.

## CONCLUSION

Drying in an oven at a temperature of 60°C is a viable method for producing protein flour from the small-indigenous fish species *Awaous sp*. We found that the protein, calcium (Ca), iron (Fe), and zinc (Zn) content of *Awaous sp* fish protein flour is relatively high compared to other small-fish species, making it a potential candidate for the development of bio-mineral fortification ingredients in food. The results of the AKG (nutrient adequacy ratio) indicate that *Awaous sp* fish protein flour can contribute to nutrition, especially for infants aged 6-11 months, children aged 1-2 years, pregnant women, and lactating women, who are in the crucial first 1000 days of life. Therefore, consuming *Awaous sp* fish protein flour as part of the daily diet can be an appropriate strategy to address stunting in Central Sulawesi.

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## CONFLICTS OF INTEREST

The authors declare that they have no known competing financial interests or personal

relationships that could have appeared to influence the work reported in this paper.

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## *Analysis of the Use of Website-based Couple Therapy Module in TB Patients in Coastal Areas*

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### ABSTRACT

*The Couple Therapy module is based on the website as a form of intervention for TB patients in dealing with sexual needs. Key components of this web-based couple therapy module include programme content, use of multimedia, interactive online activities, and provision of feedback support. This study aimed to analyze the use of a website-based Couple Therapy Module on Pulmonary TB patients in the Coastal Area of Nambo District. The method used in this study is a combined research/combination of quantitative and qualitative (mixed-method), namely concurrent triangulation design (a balanced mixture of quantitative and qualitative) with a total of 20 respondents. The results of the study quantitatively showed that the couples therapy website had a positive impact marked by 90% of respondents stating that the website is easily accessible, has an attractive appearance, updated information and is interactive because it provides online consultation features. This is confirmed by participants' expressions regarding participants' perceptions of this website. Positive perception shows the expression of participants stating that the website is easily accessible, attractive display, fast access to information and interesting information. Negative perceptions show the expression of participants stating that it is difficult to open the website. The conclusion of this study is that website-based educational media is one of the right solutions in transferring health information to pulmonary TB patients.*

**Keywords:** *Couple Therapy Module, Website, Pulmonary TB*

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## INTRODUCTION

Tuberculosis (TB) is an infectious disease that until now is still the leading cause of illness and death worldwide. Indonesia is one of the countries contributing to the second highest incidence of pulmonary TB in the world<sup>1</sup>. By *Global Tuberculosis Report* In 2021, the number of newly diagnosed and reported TB patients worldwide was 5.7 million cases, with a death rate of 1.3 million cases<sup>2</sup>. In Indonesia, there are an estimated 824,000 TB cases with 13,110 deaths from TB.

The Kendari City Health Office of Southeast Sulawesi in 2022 reported 1,181 cases with 25 deaths<sup>3</sup>. The coastal area of Nambo is an area in the city of Kendari with a large number of TB cases. Data from the Nambo Health Center TB program states that in 2022 there were 24 cases, and in the January-September 2023 period there have been 23 TB cases<sup>3</sup>.

The diagnosis, treatment and treatment undertaken by TB patients have had an impact on meeting basic human needs as a whole, one of which is the occurrence of sexual needs disorders<sup>4,5</sup>. Interventions that can address the problem of sexual needs are by *Couple*

*Therapy*. Research conducted by Rini, Wijayati & Muhsinah (2023) on TB patients who experience sexual needs fulfillment disorders shows that intervention Couples therapy has significantly had a positive impact on patients' sexual needs<sup>6</sup>.

Couples therapy provided includes printed modules as a learning medium and health promotion to increase knowledge and change the behavior of TB patients. However, the use of print modules has many disadvantages, including limited information available, impractical, information cannot be updated, there is no interactive process between nurses / therapists, and expensive printing costs as well. The current reality is that people cannot be separated from gadgets, not only as a means of communication but also a means of managing health through applications or health information systems<sup>7</sup>.

Globally there has been a movement towards the use of digital technology in mental health care or psychotherapy, including the development of an increasing number of website-based therapy programs. Reasons for using these web-based interventions typically include accessibility, flexibility (in terms of when and where they can be accessed), lack of mental health care professionals to meet the need as well as cost considerations. The use of web-based therapies showed hope, reported efficacy similar to face-to-face interventions<sup>8</sup>.

Module *Couple Therapy* website-based as a form of intervention in TB patients in dealing with sexual needs disorders. Key components of this web-based couple therapy module include programme content, use of multimedia, interactive online activities, and provision of feedback support. Self-referral to self-help modules improves ease of access for patients and keeps patients motivated to engage with treatment Research on referral and use of web-based therapies in routine care is limited, particularly in sexual needs interventions for TB patients and their partners. So it becomes a challenge in providing adequate professional services, especially for challenging tasks<sup>9,10</sup>.

Module creation *couple therapy* Based *website* trying to answer the shortcomings of the print module, namely by providing modules that can be accessed quickly and practically, presenting the latest information about TB, interesting images and videos are available, and consultation columns are

available. Base usage *website* As a medium of learning, intervention, and health promotion shows an increase in knowledge, attitudes and behaviors when compared to conventional educational media<sup>11</sup>.

Therefore, this study aims to analyze the perception of the use of *website-based couple therapy* modules in TB patients.

## METHOD

The method used in this study is a combined research/combination of quantitative and qualitative (mixed-method), namely concurrent triangulation design (a balanced mixture of quantitative and qualitative). Quantitative research in this study to identify the perception of research subjects about the website-based couple therapy module using an instrument, namely a questionnaire. The use of this measuring instrument aims to determine the point of view of the subject of the module user in this case is pulmonary TB patients and their partners. Of course, the use of this measuring tool needs reinforcement through in-depth interviews with user subjects through qualitative methods. In qualitative research, researchers follow the phenomenological stages according to Spielberg in exploring the perception of research subjects on the feasibility of using website-based couple therapy modules, namely: the first stage is bracketing, which is the stage carried out by researchers and participants. Researchers carried out the following stages: 1). identify participants' perceptions related to the use of website-based therapy modules, 2). researchers read repeatedly transcripts compiled based on in-depth interviews with participants. 3). the researcher analyzes records that are meaningful and in accordance with the research objectives, 4). Assign categories based on keywords, 5). Composing the theme grid, 6). Write down the theme of research results<sup>12</sup>.

## RESULT

### 1. Quantitative a. Characteristics of Respondents

The results of the study in the Nambo coastal area of Kendari City during August – September 2023, the number of pulmonary TB patients as many as 20 people obtained the

following results:

**Table 1. Frequency Distribution Based on Respondent Characteristics (n=20)**

Variable	f (n=20)	percentage%
<b>Gender</b>		
Male	17	85
Female	3	15
<b>Age</b>		
31 -44	11	55
45-59	5	25
>60	4	20
<b>Education</b>		
Primary school	4	20
Junior High School	6	30
High School	9	45
Bachelor	1	5
<b>Work</b>		
Self employed	4	20
Fisherman	9	45
Farmer	2	10
Laborer	1	5
IRT	4	20

Table 1, it is known that respondents are mostly male, which is as many as 17 people (85%). The most respondents aged 31-44 years were 11 people (55%). Most respondents have a high school education of 9 people (45%), and most of the respondents are fishermen who are 9 people (45%).

**Table 2. Respondents Perception of Website Ease of Use**

Perceptual Indicators	Likert scale							
	Strongly Disagree		Disagree		Agree		Totally Agree	
	n	%	n	%	n	%	n	%
Easy to access the web	0	0	1	5	15	75	4	20
Easy to access menus & links within the web	0	0	0	0	18	90	2	10
Easily find the information needed on the web.	1	5	0	0	17	85	2	10
This web display can adjust when accessed via mobile phone or computer	0	0	1	5	15	75	4	20

Based on table 2, it shows that TB patients' perceptions of the ease of use of

web-based *couple therapy* modules are mostly agreed, including ease of accessing the web (75%) and links (90%), easy to find the information needed (85%), and easily accessible via *mobile phone* (75%).

**Table 3. Respondents Perception of Website Display**

Perceptual Indicators	Likert scale							
	Strongly Disagree		Disagree		Agree		Totally Agree	
	n	%	n	%	n	%	n	%
This website is quite interesting and not boring.	0	0	0	0	15	75	5	25
The division of the position of information presented on the web is easily recognizable.	0	0	0	0	18	90	2	10
The text displayed in this web is easy to read clearly	0	0	1	5	14	70	5	25

Based on table 3, it shows that TB patients perceptions of the appearance of web-based *couple therapy* modules are mostly agreed, including interesting (75%), easily recognizable information (90%). TB patients strongly agree with the readable and clear display of text (70%).

**Table 4. Respondents Perceptions of the Website Information Download Process**

Perceptual Indicators	Likert scale							
	Strongly Disagree		Disagree		Agree		Totally Agree	
	n	%	n	%	n	%	n	%
Every page on this website is displayed quickly after clicking on an existing link. Users are easy to access information on every page on the website	0	0	1	5	14	70	5	25
Overall, this website component does not experience errors.	0	0	0	0	18	90	2	10

Based on table 4, TB patients perceptions of the process of downloading information on the *couple therapy* module



website mostly agree, including the display of pages that appear quickly after clicking (75%), users easily access information on each page 75%, and (70%), components that do not experience errors (90%).

**Table 5. Respondents Perception of Website Content**

Perceptual Indicators	Likert scale							
	Strongly Disagree		Disagree		Agree		Totally Agree	
	n	%	n	%	n	%	n	%
Information presented according to user needs.	0	0	0	0	18	90	2	10
The diversity of information presented is quite interesting.	0	0	1	5	16	80	3	15
The displayed image can be seen clearly.	0	0	1	5	16	80	3	15
Information presented is up to date	0	0	0	0	18	90	2	10

Based on table 5, TB patients' perceptions of the content of the *couple therapy* module website mostly agree, including information presented as needed (90%), the diversity of information is quite interesting (90%), the images displayed can be seen clearly (80%), the latest information presented (90%).

**Table 6. Respondents Perception of Convenience in Using the Website**

Perceptual Indicators	Likert scale							
	Strongly Disagree		Disagree		Agree		Totally Agree	
	n	%	n	%	n	%	n	%
Users feel comfortable using the website	0	0	0	0	16	80	4	20
Users will continuously access the website	0	0	1	5	17	85	2	10
The website is in accordance with the needs of users	0	0	1	5	19	95	0	0
Users feel happy with the overall look and content of the website	0	0	1	5	16	80	3	15

Table 6 shows that TB patients perceptions of the convenience of using the couple therapy

module website are mostly agreed, including the convenience of using the website (80%), the sustainability of accessing information (85%), the website according to user needs (95%), users feel happy with the overall appearance of the website content (80%).

## b. Qualitative Analysis

### Analysis of participants perceptions of the use of website-based modules

#### a. Positive perception:

##### Theme 1: easy website access

The perception of four participants said that this website is easy to access. The participants' statements were expressed as follows:

"... This module is easy to open using a cellphone, moreover, my internet package has fast access...." (p1)

"The website can be opened using a cellphone" (p3)

"I can open the web via cellphone and quickly accessed" (P5)

"Easy to open and access (P6)

##### Theme 2: attractive website appearance

The perception of three participants said that the appearance of the website was attractive. The statement of the party is expressed as follows:

"This web front view is good...." (P2)

"When this web is opened, there are pictures of couples therapy. I think this is good" (P4)

"When I opened it, many of the explanations were easy to understand. It's also good how it's explained" (P7)

##### Theme 3: quick information access

The perception of three participants said that access to information through this website was fast. Participant statements are expressed as follows:

"The web never errors when opened...." (p10)

"When opening a feature on the web, there are no bottlenecks" (p8)

"I search for TB information through the web, quickly open and easy I read the information" (p9)

##### Theme 4: pulling the information

Two participants stated that this website provides information of interest to participants. Participant statements are expressed as follows:

"I am interested in partner therapy, obviously also the therapeutic steps..." (P1)

" The information about TB is complete, easy to read... " (P3).

#### **b. Negative perception:**

##### **Theme 1: difficult to open the web**

Two participants gave statements that it was difficult to open the website. Participant statements are expressed as follows:

"I don't know how to use the internet... I can't open the website" (P11)

"I can't open the website, I've been taught but I'm confused, maybe because I'm old. hehe" (p12).

## **DISCUSSION**

The development of technology changes human behavior in seeking information. The demands of technology produce new innovations in educational media, especially health education. In this study, website-based educational media equipped with online consultation features gave a new color in pulmonary TB education, especially in couples with pulmonary TB. The results of this study show that this website-based educational media makes it easy for pulmonary TB patients to get information and also conduct online consultations with researchers.

Research conducted by Gusti Kumala (2022) shows that electronic education media has a significant influence in changing people's knowledge and attitudes. Growing technology requires health workers to innovate in providing health education to the public, one of which is by using electronic educational media that is able to disseminate information quickly compared to conventional educational methods that have been used by health workers<sup>13</sup>.

The increasingly rapid flow of information with various educational media innovations along with the development of technology has a positive impact on health promotion, including: making it easier for people to find information about health, quickly accessing information and new innovations in health promotion so as to improve the degree of public health<sup>14</sup>.

Online educational media has advantages compared to conventional methods because educational media are more interesting, interactive, easy to remember by the public because they are accompanied by information presented with a combination of

audio and visual<sup>15,16</sup>.

The development of technology requires people to go hand in hand so that they are not left behind (technology stuttering). One obstacle that usually becomes an obstacle in the process of transferring information using website-based educational media is the ability of people to use the internet. Therefore, the importance of families who accompany pulmonary TB patients in finding information through website media so that information transfer continues to run<sup>14,17</sup>.

## **CONCLUSION**

The use of website media as an interactive information tool for couples with pulmonary TB has a positive impact marked by 90% of respondents easily accessing websites, attractive website displays, interesting website information and *updates*. Researchers hope that this website can be used as an educational medium by health workers within the puskesmas to the community in the coastal area of Nambo.

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Original Article

***The Effect of a Combination of Brisk Walking Exercise and Bay Leaf Decoction on Changes in Blood Sugar Levels in Diabetes Mellitus Patients***

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**ABSTRACT**

*Diabetes mellitus is a clinical condition of metabolic disease characterized by an increase in blood sugar levels or called hyperglycemia due to failure of insulin secretion, insulin performance or both. Management of diabetes mellitus can be helped non-pharmacologically in the form of brisk walking exercises and boiled bay leaves. This research aims to determine the effect of a combination of brisk walking exercise and boiled bay leaves on reducing blood sugar levels in people with type 2 diabetes mellitus. This type of research is quasi-experimental with pretest - posttest with control group. The instruments used were an observation sheet and a glucometer set. Sampling used probability sampling with purposive sampling consisting of 38 respondents for the intervention group and 38 respondents for the control group. The data analysis used was the Wilcoxon test and the Mann-Whitney test. The results showed a significant reduction in blood sugar levels in the intervention and control groups. However, there was a significant reduction in blood sugar levels in the intervention group with a p-value of 0.000. This study concluded that there was an effect of the combination of brisk walking exercise and boiled bay leaves on reducing blood sugar levels in people with type 2 diabetes mellitus.*

**Keywords:** Brisk Walking Exercise, Salam Leaf Decoction, Blood Sugars Levels, Diabetes Mellitus

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**INTRODUCTION**

Diabetes mellitus (DM) is a clinical condition of metabolic disease characterized by increased blood sugar levels or hyperglycemia caused by failure of insulin secretion, insulin performance or both. Diabetes mellitus is divided into 2 types, namely type 1 and type 2 diabetes mellitus. In type 2 diabetes mellitus, the insulin produced by the pancreas does not function properly, and type 2 diabetes mellitus sufferers are known as Non-Insulin Dependent Diabetes Mellitus (NIDDM) namely the

condition of cells not depending on insulin from outside the body <sup>1</sup>. Type 2 diabetes mellitus can cause death and acute even chronic complications such as coronary heart disease, microvascular disease down to small blood cells, macrovascular disease, sensory nerve neuropathy and can even affect the extremities <sup>1</sup>.

According to the World Health Organization (WHO) in 2018, the incidence of diabetes mellitus sufferers worldwide was 422 million people, in that year there was an increase in sufferers of the disease with a

percentage of 8.5% with the proportion of type 2 diabetes mellitus being 93%. , with a majority adult population and estimates that deaths from diabetes mellitus will be around 2.2 million people, which will even continue to increase until around 600 million people in 2035. Based on this data, Indonesia is ranked 4th after China, India and the United States. The World Health Organization estimates that diabetes mellitus sufferers in Indonesia will increase by 2030 by 21.3 million people <sup>2</sup>. Of the sufferers of type 2 diabetes mellitus, the majority are women compared to men<sup>7</sup>. Diabetes mellitus is spreading in various regions of Indonesia, one of which is West Java province with 73,285 people. Tasikmalaya is one of the cities in West Java Province, the number of diabetes mellitus sufferers in Tasikmalaya City in 2022 will be 7,438 people, in the working area of the Kersanagara Community Health Center, Cibereum District there are 422 people with it ranking 5th in Tasikmalaya City <sup>3</sup>. Apart from that, there are an increase in the number of cases of elderly diabetes mellitus sufferers from 313 people in 2013 to 570 in 2014 at RSUD dr. Soekardjo, Tasikmalaya City <sup>4</sup>.

Based on preliminary studies conducted by researchers and several studies, one of the factors that supports the increase in diabetes mellitus sufferers is economic factors. In line with research conducted by (Musdalifah, 2020) in his research, economic level can be protective against diabetes mellitus<sup>5</sup>.

Based on this phenomenon, with the increase in diabetes mellitus sufferers, efforts are needed to control and control blood sugar by implementing the 4 pillars of diabetes mellitus management, one of which is physical activity<sup>6</sup>. Physical activity is one of the efforts that is easier for society in general, because physical activity does not require financial expenditure, which is one of the factors in the increase in diabetes mellitus sufferers.

By practicing physical activity, blood sugar will more easily enter the cells and cause the HbA1c concentration to decrease, this can anticipate and reduce the risk of complications. Physical activity training is said to be good if it meets the requirements, namely continuous, rhythm, interval, progressive, endurance (CRIPE). One physical activity that meets these requirements is the Brisk Walking Exercise, this physical activity is walking with an increased speed compared to normal walking and there is the same rhythm in each step<sup>7</sup>.

Regarding exercise, physical activity or exercise is very important in increasing muscle sensitivity to insulin so that it can reduce the occurrence of insulin resistance<sup>8</sup>.

Brisk Walking Exercise can reduce blood sugar levels in people with type 2 diabetes mellitus by walking for 1 week 3 times with a duration of 25 - 20 minutes in each exercise, this physical activity was given to 21 people who had blood sugar levels > 200 mg /dl and after doing these activities there was a decrease in 14 people with blood sugar < 200 mg/dl and 7 people > 200 mg/dl<sup>7</sup>.

Another appropriate study, namely by (Amrullah, 2017), showed a decrease in blood sugar levels after walking exercise intervention for 2 weeks in the treatment group with an average of 201.17 compared to the control group<sup>9</sup>. To control and control blood sugar levels, apart from physical activity, you can also consume boiled bay leaves. Someone who drinks boiled bay leaves with 5 bay leaves and 300 cc of water can lower blood sugar levels. The bay leaf decoction was given to 18 people and after being given the bay leaf decoction there was a decline in 12 people<sup>1</sup>.

The results of a preliminary study in the Working Area of the Kersanagara Community Health Center, Cibereum District, Tasikmalaya City, the therapy given to type 2 diabetes mellitus sufferers was by participating in prolanis activities only with education, checking blood sugar levels, diabetes exercises and pharmacological therapy, but the results of these checks were still many sufferers. diabetes mellitus with high blood sugar levels, and the results of interviews with several people who participated in the prolanis program showed that the cause of the high blood sugar levels was that they rarely did physical activity.

Based on the above phenomenon, the author took the study title "The Effect of the Combination of Brisk Walking Exercise and Boiled Bay Leaves on Reducing Blood Sugar Levels in Type 2 Diabetes Mellitus Sufferers" with the research formulation whether there is an effect of the combination of Brisk Walking Exercise and Boiled Bay Leaves on reducing blood sugar levels. in people with type 2 diabetes mellitus? The aim of the research is to analyze the effect of the combination of Brisk Walking Exercise and Bay Leaf Boil on reducing blood sugar levels in people with type 2 diabetes mellitus.

## METHOD

This type of research is quasi experimental by conducting a pretest - posttest with a control group. The research was conducted in the Kersanagara Community Health Center Working Area, Cibereum District, Tasikmalaya City and the research period was 2 weeks starting from 9 – 24 May 2023. The population in this study was 422 people suffering from type 2 diabetes mellitus. The sample was determined using the Lemeshow formula and the results obtained were 34 respondents for each group. In anticipation of dropout, 10% was added so that the number of respondents in this study was 38 in the intervention group and 38 in the control group, with a total of 76 respondents.

The sampling technique used in this study was Probability Sampling with the Purposive Sampling method based on predetermined inclusion criteria, namely people who suffer from type 2 diabetes mellitus and are adults (25 – 59 years old), people who have blood sugar levels above the normal limit (140 mg/dl)<sup>10</sup>. The data collection technique used by the author in this research is observation techniques and using a glucometer set. During the preliminary study, observation and interview techniques were used, the pre-test used an observation sheet and a glucometer set, during the intervention, a measuring cup, bay leaves were used, and during the post-test, an observation sheet and a glucometer set were used. Data analysis uses univariate and bivariate. In univariate analysis uses the Wilcoxon test and bivariate uses the Mann – Whitney test.

This study has obtained a letter of ethical test from the ethics committee of the Tasikmalaya Poltekkes with no. DP.04.03/16/95/2023. Ethical implementation has been carried out during the study by giving respondents the freedom to be involved or not in this study by providing an informed consent sheet. The researcher also guarantees the confidentiality of the respondent's identity and the data collection results and that the actions taken in this study are not harmful to respondents.

## RESULTS

**Table 1. Characteristics of Respondents Based on Age, Gender, Education, Economic Status and Length of Suffering from Type 2 Diabetes Mellitus.**

Variable	Intervention Group (n=38)	Control Group (n=38)
Age	26–30 Year	-
	31–35 Year	3
	36–40 Year	1
	41–45 Year	6
	46–50 Year	8
	51–55 Year	8
	56–60 Year	12
Gender	Male	9
	Female	29
Education	Elementary School	15
	Junior High School	11
	Senior High School	12
Economic status	Low	19
	Middle	18
	Upper	1
Duration of DM	< 1 Year	19
	1 – 2 Year	7
	> 3 Year	12

Based on the table above, in both groups the majority of respondents were aged 56 – 60 years and the majority were female with elementary school education, and had a monthly income or low economic status (<Rp. 1,500,000) and the majority had a history of diabetes mellitus. type 2 less than 1 year. A person with low income or economic income can influence their lifestyle in controlling blood sugar in terms of the food consumed, because a higher income can be a protection against diabetes mellitus.

**Table 2. Comparison of reduction in blood sugar levels in the control group and intervention group**

	Blood Sugar Value Min.	Blood Sugar Value Max.	Mean	Std. Dev.
<b>Intervention Group</b>				
Pre Test	168	482	256.32	70.627
Post Test	133	359	219.89	70.627
<b>Control Group</b>				
Pre Test	101	168	142.68	17.757
Post Test	109	175	138.03	16.182

Based on table 2 above, it appears that there was a decrease in blood sugar levels in both the intervention and control groups, however there was a significant decrease in the intervention group with an average decrease of 36.43 mg/dl.

**Table 3. Analysis of the Effect of Applying a Combination of Brisk Wlaking Exercise and Bay Leaf Boil in the Intervention Group**

Variable	<i>p.value</i>	Conclusion
Pretest – Posttest Intervention Group	0.000	There is an Influence

*\*Wilcoxon*

The Wilcoxon test results show a p-value of 0.000, which shows that there is a significant effect of the combination of brisk walking exercise and boiled bay leaves on reducing blood sugar levels.

**Table 4. Analysis of Decrease in Posttest Blood Sugar Levels for Control Group and Intervention Group with the Application of a Combination of Brisk Wlaking Exercise and Bay Leaf Boil**

Variable	<i>p.value</i>	Conclusion
Posttest of Control Group and Intervention Group	0.000	There was a Significant Decrease in the Intervention Group

*\*Mann-Whitney*

The table above regarding the analysis of the reduction in posttest blood sugar levels in the control group and intervention group using the Mann-Whitney test, obtained a p-value of 0.000. in the Mann-Whitney test, if the p-value is <0.005, then the hypothesis is accepted or there is a significant decrease between the intervention group and the control group.

## DISCUSSION

### 1. Characteristics of Respondents Based on Age, Gender, Education, Economic Status and Length of Suffering from Type 2 Diabetes Mellitus

In this study, the majority of respondents were elderly. A person who has reached adulthood or is more than 40 years old will experience several diseases with age risk factors, one of which is diabetes mellitus. Because at that age the body will begin to be

susceptible to diseases known as degenerative, degenerative in diabetes mellitus, namely a decrease in the function of beta cells in the pancreas which produce insulin and reduced performance of insulin in the body<sup>11</sup>. In line with several studies that have been carried out regarding "reducing sugar levels blood in type 2 diabetes mellitus patients with physical activity", in his research showed that most of the respondents were early elderly (53 - 65 years), according to him, at that age they had entered a degenerative stage which could affect body function, these changes were related to a decrease in the value of mass muscle, vascular changes, and reduced activity<sup>12</sup>. In the elderly it is also a factor in health problems, one of which is diabetes mellitus<sup>13</sup>. This research is in line with research conducted by Gunawan in 2019 that those over 45 years old have an 8 times risk are more affected by diabetes mellitus than people aged less than 45 years<sup>14</sup>.

The majority of respondents in this study were female. Gender is one of the factors that causes a person to experience diabetes mellitus. According to him, women are more at risk of developing diabetes mellitus because women are prone to weight gain, rarely do physical activity, and women experience a period of monthly cycle syndrome, after a woman experiences menopause which can cause the distribution of fat in the body to accumulate, so that they can be at risk of developing diabetes mellitus<sup>15</sup>. This research is in accordance with what was conducted by A-Hadi in 2020, that the prevalence of diabetes mellitus sufferers is women compared to men with a ratio of 58 people and 23 people<sup>16</sup>.

Regarding the education that the respondents in this study had completed, it was elementary school. Experts say that diabetes mellitus sufferers have low levels of education, this could be due to a lack of broad and specific knowledge about health, so that people cannot maintain their health well. This research is in line with research conducted by Silalahi et al., (2019), education is an important factor in living life, both health and other aspects. Someone who is highly educated will have more extensive knowledge. Based on this education, it can raise awareness of healthy behavior and be more aware of the risk factors for various diseases, one of which is diabetes mellitus<sup>17</sup>.

Regarding the economic status of the respondents, the majority had low economic

status. In line with research conducted by Ramadhani et al., (2019) regarding "the influence of Self-Care on reducing blood sugar levels in type 2 diabetes mellitus patients", in their research it was found that respondents with low economic status were 41.7% of people with low economic status. Low levels can cause a person to have uncontrolled blood sugar. This can happen due to the inability to buy healthy and nutritious food, apart from that, someone with a low economic status can cause someone stress which can lead to weight gain and so on. Thus causing the impact of diabetes mellitus<sup>18</sup>. This is in line with research by Musdalifah in 2019 that people with low economic status can be a risk factor for developing diabetes mellitus<sup>5</sup>. This is in accordance with research that has been carried out previously and suggests that low economic status will influence lifestyle that increases the risk of developing diabetes mellitus<sup>19</sup>.

The history of diabetes mellitus in most of the respondents in this study was less than 1 year, this occurred due to uncontrolled health by not paying attention to lifestyle and diet. This is in line with research conducted by Hati et al., (2021), in his research the majority were less than 5 years old and revealed that someone who had just experienced and been diagnosed with diabetes mellitus was due to a lack of knowledge regarding controlling and reducing blood sugar levels<sup>20</sup>.

## **2. Comparison of the reduction in blood sugar levels in the control group and the intervention group**

The results of the research carried out by the author, in the control group and intervention group, there was a decrease in blood sugar levels, in the intervention group the average decrease was 36.43 mg/dl, while in the control group the average decrease was 4.65 mg/dl. In line with research conducted by Irmawati et al., (2022), in their research they used a control group and an intervention group with the application of boiled bay leaves. In the intervention group, more respondents experienced a decrease in blood sugar levels compared to the number of respondents who experienced a decrease in the control group<sup>1</sup>.

## **3. Analysis of the Effect of Applying a Combination of Brisk Walking Exercise and Bay Leaf Boil in the Intervention Group**

In the intervention group there was a

significant reduction because they had been given a combination of Brisk Walking Exercise which was carried out for 2 weeks, every week the exercise was carried out 3 times and boiled bay leaves for 14 consecutive days with 5 bay leaves boiled in 900 cc to 300 cc of water. , drink 1 time in 1 day.

This is in line with research conducted by Irmawati et al., (2022). Revealed that consuming 5 bay leaf decoctions totaling 300 cc could reduce blood sugar levels which was carried out on 36 people, 18 people in each group. In the pretest, 9 people found high blood sugar values in the intervention group and 12 people in the control group. After being given bay leaf decoction in the intervention group, there was a decrease in blood sugar levels in 17 people. From these results, it was concluded that the intervention group experienced a decrease in blood sugar levels, while in the control group there were still high blood sugar levels as many as 14 people<sup>1</sup>.

From the results of this research, in accordance with research conducted by Hayati (2021), her research revealed that doing physical activity in the form of walking or known as Brisk Walking Exercise can reduce blood sugar levels in people with type 2 diabetes mellitus. In her research, activity This physical exercise was carried out for 2 weeks with 3 exercises each week with a duration of 15 – 20 minutes carried out on 21 people. The value of blood sugar levels before the intervention was given was blood sugar levels above 200 mg/dl and after the intervention there was a decrease in blood sugar levels in 14 people (66.7%) with blood sugar levels < 200 mg/dl, and 7 people (33.3%) still have blood sugar levels > 200 mg/dl<sup>7</sup>.

## **4. Analysis of the decrease in posttest blood sugar levels in the control group and intervention group using a combination of brisk walking exercise and bay leaf decoction**

In the intervention group, apart from a decrease in blood sugar levels, there was a change in the signs and symptoms of diabetes mellitus, namely polyuria. Several respondents from the intervention group said that apart from feeling fitter, there was a reduction in the intensity of urination at night, which was usually 4-6 times, reduced to 3-4 times.



## CONCLUSION

The majority of respondents in this study were aged 56 - 60 years, and most were female. The education attained by the majority of respondents was elementary school, most of them had low economic status, the duration of suffering for the majority of respondents was less than 1 year. There was a decrease in blood sugar levels in the control group and intervention group by applying a combination of Brisk Walking Exercise and boiled bay leaves. And there was a significant reduction in the intervention group with the application of the combination of Brisk Walking Exercise and boiled bay leaves compared to the reduction in the control group in sufferers of type 2 diabetes mellitus.

Physical activity training in the form of the Brisk Walking Exercise and boiled bay leaves can be used as additional recommendations in the management of type 2 diabetes mellitus, and used as reading reference material to increase knowledge.

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## ***The Relationship Between Levels of Anxiety and Family Support with the Selection of Birth Attendants***

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### **ABSTRACT**

*One of the psychological problems experienced by many pregnant women is their anxiety about choosing a birth attendant. This study aimed to analyze the influence of anxiety levels and family support on the selection of birth attendants. This study used a quantitative observational design and a cross-sectional approach. This study was carried out from November to December 2021 at the Bontomarannu Community Health Center, Gowa Regency, with a sample size of 32 pregnant women. Purposive sampling was used. The results of the study using the chi-square test showed that the level of anxiety was  $p = 0.007$  and family support was  $p = 0.003 < \alpha = 0.05$ . twelve pregnant women received poor family support, four (33.3%) respondents were good, and eight (66.7%) pregnant women were not good at choosing birth attendants, of the 32 respondents, 22 were pregnant women with mild levels of anxiety, 15 (68.2%) were good at choosing birth attendants, and 7 (31.8%) were not good. This means that there is a relationship between the level of anxiety and family support, and the choice of birth attendant. It is hoped that pregnant women who are anxious about choosing a birth attendant will always receive more assistance, whether from the family or a midwife so that there is no prolonged anxiety. Midwives are advised that in carrying out any midwifery care, they can identify problems and take action quickly and precisely, especially in carrying out ANC examinations for patients who are preparing for childbirth*

**Keywords:** Family Support, Pregnant Women, Anxiety, Birth Attendant

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## **INTRODUCTION**

Maternal and neonatal mortality in Indonesia remain a major challenge <sup>1,2</sup>. Midwifery is a common practice. Midwives are synonymous with a profession that helps women to give birth. Midwives play an extraordinary role in a woman's life, starting from providing education to young women to regulate fertility after giving birth throughout their reproductive life cycle. The role of

midwives includes carrying out several innovative actions, providing education in breaking the chain of transmission by providing information about clean lifestyles, washing hands diligently, keeping one's distance, staying away from crowds, and spraying disinfectants. The role of midwives as frontline health workers is to provide quality midwifery care to mothers<sup>3</sup>.

When pregnant, women experience physical as well as psychological changes. One

of the psychological problems experienced by many pregnant women is anxiety about choosing a birth attendant <sup>4,5</sup>. An inappropriate selection of birth attendants will have a direct impact on the delivery process and the ability of health workers to handle emergencies during delivery. This is in accordance with the Ministry of Health's policy, which aims to reduce the maternal and infant mortality rates in Indonesia by encouraging every birth to be carried out by trained health personnel, such as specialist obstetricians and gynecologists (SpOG), general practitioners, and midwives. health services. The Ministry of Health's 2015-2019 Strategic Plan specifies childbirth assisted by health workers in health service facilities as an indicator of family health efforts, replacing the indicator of birth assistance by health workers outside health service facilities. In 2018, the percentage of births assisted by health workers reached 90.32%, whereas the percentage of pregnant women who underwent births assisted by health workers in health service facilities was 86.28% <sup>6-8</sup>.

The 2018 Riskesdas results showed that the most frequently used birthing places were hospitals (both government and private) at 32.7% and health workers (nakes) at 29.6%. However, home use is still quite high at 16.7%, making it the third highest place for giving birth <sup>9-11</sup>. Choosing a birth attendant is an effort made to seek help in dealing with the birth process. Choosing a birth attendant is one of an individual's reproductive rights in determining where to give birth and who will help with it. Safe delivery ensures that all birth attendants have the knowledge, skills, and tools to provide safe and clean assistance, as well as postpartum services to mothers and babies <sup>12,13</sup>. The choice of non-health care workers (TBAs) often has an impact that will cause morbidity for mothers and babies, birth complications, and even death for mothers and their babies. However, the quantity and quality of help are factors that cause maternal death. Birth assistance is still provided by traditional birth attendants using traditional methods. Therefore, all pregnant women should continue giving birth to health workers so that complications can be treated immediately.

Apart from factors within the pregnant woman, environmental factors can also influence the choice of birth attendants. One factor that has been widely researched is social support. Support from a woman's social

environment was found to be a predictor of anxiety in pregnant women choosing a birth attendant. Women who feel dissatisfied with support from the environment tend to be more anxious about facing childbirth <sup>14,15</sup>. Other research found that social support in general did not have a significant effect on the anxiety felt by women facing childbirth; husbands' support, in particular, was a significant predictor of reducing anxiety. However, there has also been recent research during the Covid-19 pandemic in which did not find husbands' support was not found to play a role in influencing pregnant women's anxiety <sup>16-18</sup>.

This shows that the influence of husbands' support factors on women's anxiety in choosing a birth attendant requires further research. Therefore, this study aimed to identify the relationship between the level of anxiety and husband's support and the choice of birth attendant.

## METHOD

This study used a quantitative observational design and a cross-sectional approach. The study location was the Bontomarannu Community Health Center, Gowa Regency, with a sample size of 32 pregnant women. Purposive sampling was used. The inclusion criteria were all pregnant women who visited the hospital, and the exclusion criteria were pregnant women who were not willing to be respondents. This study used the chi-squared test. The instrument used in this study was a questionnaire whose validity and reliability were tested. Before asking questions using a questionnaire, pregnant women must first provide informed consent signed by the pregnant woman. This is done so that there are no misunderstandings in the future after the completion of this research. The research results were also shown to pregnant women to provide the necessary input and suggestions. The scale used to measure anxiety is to use low, intermediate and hard levels.

Sampling procedures submitted a research permit letter to the head of the Bontomarannu Community Health Center. Researchers coordinated with all midwives at the Bontomarannu Community Health Center to convey information to pregnant women to gather at the KIA Polyclinic. The distribution of questionnaires to respondents was not carried out simultaneously but according to each

pregnant woman who came at that time. The researcher first introduced himself, explained the objectives and procedures for collecting research data, and asked for consent from the respondents. All pregnant women who met the inclusion criteria provided Informed Consent and then completed a questionnaire sheet. After all specified samples were met, the researcher processed the data for analysis using SPSS.

## RESULTS AND DISCUSSIONS

As shown in Table 1, of the 32 respondents, the majority of respondents aged 20-35 years were 23 (71.9%), had a high school education, 16 were pregnant women (50%), and worked as housewives (IRT) (25 respondents, 78.1. %).

**Table 1. Frequency Distribution of Pregnant Women's Characteristics in Choosing Birth Attendants**

Variable	Frequency	%	Total
Age			100% (32)
<20	3	9,3	
20-35	23	71,9	
>35	6	18,8	
Education			
Elementary School	4	12,5	100% (32)
Junior High School	10	31,25	
Senior High School	16	50	
University	2	6,25	
Job			
Housewife	25	78,1	100% (32)
Self-employed	3	9,4	
civil servants	4	12,5	

As shown in Table 2, of the 32 respondents, 22 were pregnant women with mild levels of anxiety, 15 (68.2%) were good at choosing birth attendants, and 7 (31.8%) were not good. Meanwhile, seven respondents experienced moderate anxiety; there were five (71.4%) pregnant women who were good at choosing birth attendants and two (28.6%) respondents were not good at choosing birth

attendants and the level of severe anxiety was three people, there were one (33.3%) pregnant women who were good at choosing birth attendants and two (66.7%) respondents were not good at choosing birth attendants. From the results of the chi-square test analysis, it was found that the value  $p = 0.000 < \alpha = 0.05$ , which means there is a relationship between the level of anxiety and the choice of birth attendant.

**Table 2. Frequency Distribution of the Relationship between Anxiety Level and Selection of Birth Attendant**

Anxiety Level	Selection of Helpers				Total		p-value
	Labor						
	Good	Poor	n	%	n	%	
Low	15	68,2	7	31,8	22	100,0	0.000
Intermediate	5	71,4	2	28,6	7	100,0	
Hard	1	33,3	2	66,7	3	100,0	
Total	21	65,6	11	34,4	32	100,0	

**Table 3. Frequency distribution of the relationship between family support and the choice of birth attendant**

Family support	Selection of Helpers				Total	p-value
	Labor					
	Good	Poor	N	%		
Good	17	85,0	3	15,0	20	100,0
Low	4	33,3	8	66,7	12	100,0
Total	21	65,6	11	34,4	32	100,0

Table 3 shows that of the 32 respondents used as samples, 20 mothers had good family support, 17 (85.0%) were good at choosing birth attendants, and 3 (15.0%) were poor. Good. Meanwhile, 12 people received poor family support, four (33.3%) respondents were good, and eight (66.7%) pregnant women who were not good at choosing birth attendants. From the results of the chi-square test analysis, it was found that the value of  $p=0.003 < \alpha=0.05$ , which means there is a relationship between the level of anxiety and the choice of birth attendant.

As shown in Table 2, of the 32 respondents, 22 were pregnant women with mild levels of anxiety, 15 (68.2%) were good at choosing birth attendants, and 7 (31.8%) were not good. Meanwhile, seven respondents experienced moderate anxiety; there were five (71.4%) pregnant women who were good at choosing birth attendants and two (28.6%) respondents were not good at choosing birth attendants and the level of severe anxiety was three people, there were one (33.3%) pregnant women who were good at choosing birth attendants and two (66.7%) respondents were not good at choosing birth attendants. From the results of the chi-square test analysis, it was found that the value  $p = 0.007 < \alpha = 0.05$ , which means there is a relationship between the level of anxiety and the choice of birth attendant.

There is an influence on the level of anxiety regarding the choice of birth attendants. During the Covid-19 pandemic, anxiety experienced by pregnant women can increase<sup>19,20</sup>. The fear of exposure causes most people to avoid contact with healthcare facilities. This is also true for pregnant women who tend to avoid routine pregnancy checks because of concerns about being exposed to the virus. Previous research found that pregnant women tend to be more protective during the pandemic; they reduce routine check-ups because they avoid

contact with health facilities, which results in minimal access to information and causes anxiety in pregnant women<sup>21</sup>.

Anxiety is a feeling of concern due to threats to a person's value system or security patterns. Individuals may be able to identify situations such as childbirth; however, in reality, the threat to the self is related to the worry and concern involved in the situation. The problems that emerge from negative stories about childbirth are something that pregnant women are very worried about in the third trimester, so they will affect the mother's psychology, which is characterized by difficulty concentrating<sup>22-24</sup>. The way to overcome anxiety is to avoid scary stories about childbirth; learn to relax, meditate, breathe deeply, yoga, and control fantasies; and provide support and companions during labor because their presence is stronger and more confident.

Factors that increase anxiety in pregnant women include education, income, social support, violence during pregnancy, concerns related to the health of the fetus, fear of giving birth to a disabled baby, first pregnancy, unplanned pregnancy, and a history of previous miscarriage are risk factors that influence intensity of worry of pregnant women<sup>25-27</sup>. Another source stated that parity and ANC visits were also factors that caused anxiety.

Researchers assume that a high level of anxiety is caused by mothers' lack of experience regarding childbirth and their negative perceptions about birth being scary. This can lead to anxiety, tension, and fear. A moderate level of anxiety is caused by concerns that childbirth is always accompanied by pain and physical tension in pregnant women. Mild levels of anxiety have almost the same response as moderate levels of anxiety<sup>28,29</sup>.

The results of the study showed that of the 32 people used as samples, 20 mothers had

good family support, 17 (85.0%) were good at choosing birth attendants, and 3 (15.0%) were not good at choosing birth attendants. labor. Meanwhile, 12 people received poor family support, four (33.3%) were good at choosing birth attendants, and eight (66.7%) were not good at choosing birth attendants. Based on the results of the chi-square test analysis, the value obtained is  $p = 0.003 < \alpha = 0.05$ , which means that  $H_0$  is rejected and  $H_a$  is accepted. Thus, there is a relationship between family support and the choice of birth attendants.

In line with the research conducted<sup>30</sup>, there is a relationship between husbands' support and the implementation of the Childbirth Planning and Complication Prevention Program, one of which is that the birth attendant will be assisted by a midwife or doctor. In this case, the husband plays an active role in motivating pregnant women to have their pregnancies checked by health workers to get services<sup>31</sup>.

Family or husband's support is a manifestation of attention and affection. Support can be provided, both physically and psychologically. Husbands play a significant role in determining the health status of mothers. Good husband support can motivate mothers to check their pregnancy<sup>16,17</sup>. The above is in accordance with the theory that husband's support is provided by the husband to his pregnant wife, which can be in the form of verbal or non-verbal advice, and real help in the form of behavior or presence can provide emotional benefits and influence behavior. His wife, who in this case, supported the ANC visit. The husband is part of the family, so the support is necessary in determining various policies in the family. Support is a reinforcing factor that can influence behavior<sup>32,33</sup>.

Researchers have assumed that environmental factors can also influence the choice of birth attendants. One factor that has been widely researched is social support. Support from a woman's social environment was found to be a predictor of anxiety in pregnant women choosing a birth attendant. Women who feel dissatisfied with the support from the environment tend to be more anxious about childbirth. Other research found that social support in general did not have a significant effect on the anxiety felt by women facing childbirth, but husbands' support, in particular, was a significant predictor of reducing anxiety.

## CONCLUSION

Based on the research results that have been described, a conclusion can be drawn, namely that based on the analysis, there is a relationship between the level of anxiety and the choice of birth attendant with a value of  $p=0.007$ . There was also a relationship between family support and the choice of birth attendant, with a value of  $p = 0.003$ . The limitation of this research is the lack of sample so this may result in bias in the research results. It is recommended that mothers who are anxious about choosing a birth attendant always receive more assistance, whether from the family or a midwife, to prevent prolonged anxiety. It is recommended that midwives provide midwifery care to identify problems and take action quickly and precisely, especially in carrying out ANC examinations for patients who are preparing for childbirth. Subsequent studies have used other methods with large samples.

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Article Review

## ***Development of Health Education Media About Cultural Practices of The Palu Indigenous Culture Related to Breastfeeding for Postpartum Women Who Have Been Caring at Home***

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### **ABSTRACT**

*The practice of providing appropriate breastfeeding for the first 6 months of life is the most important and cost-effective thing to reduce morbidity and mortality rate toward children. However, the obedience of exclusive breastfeeding in some of countries has not been satisfactory, so need the efforts to be done to increase its coverage. This study aims to develop and produces the health education media for cultural practices of the Palu indigenous culture related to breastfeeding for postpartum women who have been caring at home in Sigi Regency of Palu district in the form both of Kaili and Indonesian languages modules. This research is qualitative research with an ethnographic approach through two stages, namely: Phase I; Identification of cultural that influence the success of exclusive breastfeeding, Phase II; Development of health education media as a solution to the problem of an exclusive breastfeeding culture. The informants were taken by snowball method with a total seventeen of postpartum women, one informan key was from the community (Dukun), and one coordinator was the public health care nurse at the Biromaru Public Health Center. Data analysis in this ethnographic research is to find out the cultural themes, namely verbatim, keywords, and categories. The categories are the same and related to the sub-themes and the last step is to determine the theme itself. The research results is Phase I, Identifying both of myths and cultures that influence exclusive breastfeeding that still very well maintained, lack of womens' knowledge and womens' attitudes want to providing the exclusive breastfeeding. Phase II: development of health education media as a solution to the problem of exclusive reastfeeding culture based on the results of the phase I research. The conclusion is This study has developed a health education media related to the cultural practice of the Kaili tribe regarding exclusive breastfeeding to postpartum women who have been caring at home in Sigi Regency Palu district in the form both of Kaili and Indonesian language modules. In order to implement exclusive breastfeeding promotion media, by integrating it into the public health care program (Perkesmas), for maternal and child health programs and it need to involve community leaders by a cultural perspective.*

**Keywords:** Kaili Culture, Post Partum, Exclusive Breastfeeding

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## **INTRODUCTION**

Obediences of exclusive breastfeeding in some of countries have not been satisfactory, as evidenced by some research reports regarding exclusive breastfeeding mentioned that only 19% in Nigeria <sup>1</sup>, 5.3% in Iran <sup>2</sup>, 43.1% in Malaysia <sup>3</sup>, and 13.8% in Canada <sup>4</sup>.

This is still unreachabele of Exclusive Breastfeeding (EBF) target which is 90% as setting by WHO. Research in 2008 revealed that out of 36 babies aged 1-6 months, only 2 babies were exclusively breastfed<sup>5</sup>.

Another study conducted by researchers to the Kaili ethnic group in Taipa Palu in 2014, it identified that there are still faith

or myths including throwing away the breast after traveling milk before providing the breastfeeding, wrapping a towel around the neck, bathing pregnant women before giving birth, the culture of giving pagata bananas, honey, formula milk, and supplementary food is still maintained and carried out for generations by the Kaili tribe, and also most of the pregnant women of the Kaili tribe do not know about the concept of Early Initiation of Breastfeeding (EIB), colostrum, and exclusive breastfeeding<sup>6</sup>.

Based on the cultural background, a cross-cultural approach (Transcultural nursing) is important. Researchers will develop health education media related to the cultural practice of the Kaili tribe regarding exclusive breastfeeding for postpartum women who have been caring at home in Sigi Regency, Palu district in the form both of Kaili and Indonesian language modules.

## METHOD

### Phase I: Identification of Cultural Factors.

Qualitative research with an ethnographic approached and sequential exploratory strategies to identify the cultural factors in Sigi Regency, especially Kaili culture.

The participants of all pregnant women who lived in Biromaru Public Health Center authority, Kaili tribe, husbands, mothers, and mother and father in-laws of Kaili tribe and were willing to be participants. The number of participants in the first phase of this study (qualitative) depends on the saturation of the data when the research was conducted. The data collection method is in-depth interview with semi-structured<sup>7</sup>.

Data analysis techniques as verbatim, keywords, categories, and themes<sup>7</sup>.

### Phase II Media Development.

Phase II is the stage of media development based on the results of phase I (qualitative) analysis and literature study.

This research was conducted in Sigi Regency from October 6 till November 17, 2017. The data collection process used in-depth interviews by meeting directly with participants, using field notes, and observation sheets. The data collection tools are semi-structured in-depth interview guidelines, notes book, pencils, pens, stips, tip ex, and a tape

recorder. The Data Validity in Phase I (Qualitative) is credibility, dependability, confirmability, and transferability<sup>7</sup>.

## RESULTS

### Phase I: Identification of Cultural Factors Affecting the Success of Exclusive Breastfeeding

#### Characteristics of Participants

The participants phase I of research were seventeen pregnant women who have Kaili tribe. Participants who took part in this research were aged between 20 and 38 years old. The various of education level of the participants from not completing elementary school to a bachelor's degree. All participants are Moslem, the participants' occupations are housewives. The participants were the second pregnancy about fourteen people, the first pregnancy have one and the fourth pregnancy have two participants. All participants live in Pombewe.

#### Results of Theme Analysis in Ethnography

Based on the results of the thematic analysis of content, identified that have six themes. The themes are divided into three major parts such as have two themes are identified regarding the myth of pregnant women about exclusive breastfeeding, have three themes regarding the culture of pregnant women that affects for exclusive breastfeeding, and have one theme regarding knowledge and attitudes of pregnant women in the third trimester about exclusive breastfeeding. The details are:

#### 1. Myths of pregnant women that can affect to exclusive breastfeeding (2 Themes).

##### 1) Pregnancy-Related to Beliefs and Practices

This theme consists of three categories. that is:

##### a. Pregnancy-Related to Beliefs

Seventeen participants expressed a belief that they believe in both prohibitions and myths that apply in the Pombewe community, thirteen of Seventeen participants stated:

*"... while going out wearing the scarf, caring a small knife..." (P1, P3, P8, P10, P14, P15, P16, P17).*

*"... while going out caring the garlic, puts on a pin and sticks it on her shirt" (P: 2,4,5,6,7,).*

*"the husbands are not allowed to wrap a towel around their neck..." (IK).*

*"the husband is not allowed to slaughter the chicken ....." (IK).*

The results of participant observations that carried out by researchers concluded that have no participants who caring onion /garlic sticked with pins, but when participants were interviewed, they confirmed that pregnant women should caring onions/garlic sticked with pins and put on clothes, maybe the researcher did not see it due to the participant hides/inserts a safety pin inside of the their shirt. Based on observations, the researcher did not see/meet the husbands of the participants who wrapped a towel around their neck or slaught the chicken.

#### **b. Food taboos/prohibit during pregnancy**

The number of participants (seventeen people) revealed the prohibition of certain types of food during pregnancy so that the participants believed that violating of prohibition on these foods would cause bad things happended toward pregnant women and their unborn baby. One of participant stated that she did not believe in dietary restrictions during pregnancy. Four of seventeen participants stated that:

*"should not eat squid, the baby won't have bones like squid..." (P: 1, 2, 3).*

*"don't take spicy food, it like gas that could hurt your stomach..." (P6).*

The results of participant observations conducted by researchers concluded that almost all participants said they did not eat squid. There were only two participants who stated that they still eat squid but limited both frequency and amount, and the other participant said that they did not like squid since the first, so until now (pregnant) they did not consume squid even.

#### **c. Pregnancy Checkup Habits**

Almost all participants stated that if they missed their period (menstruation), they went to traditional birth attendan (dukun) for massaging. According to participants and their families that during pregnant, the uterus (womb) is drops so it needs to be raised up to its original position by being massaged of a traditional birth assisstant (dukun). The average gestational age of participants when they to be

massaged was in one, two, up to seven months. The clarification made by the researcher to the senior traditional birth attendan confirmed it. The participants' expressions are as follows:

*"Pregnancy check up by a traditional birth assistant (dukun)...." (P: 1, 2, 3, 4, 5, 7, 9, 8, 9, 10, 11, 15, 17).*

Based on participant observations when the researcher visited the traditional birth attendant (IK), the researcher did not find that pregnant women being massaged by the traditional birth attendant. According to traditional birth attendants, almost all pregnant women in Pombewe had been massaged by her (dukun). And participants also confirmed the words of the senior traditional birth attendant.

#### **2) Women's wrong perception about food become a problem of nutritional needs that will have an impact on health problems for both women and babies.**

This theme consists of two categories with details of this thematic as follows:

##### **a) The wrong perception about Breastfeeding time**

Fiveteen of seventeen participants have perception that after coming back from somewhere should not provide breastfeeding directly because according to elder people its hot and dirty/dusty, so it need to clean the mammae first, throw away a little bit only then give it to baby. By this the baby will not get sick. The participants expression such as:

*" After coming back, clean mammae first before breastfeeding providing...." (P: 2, 3, 8, 11, 14).*

*" go out for awhile, don't providing breastfeeding directly, but throwing a little bit...." (P:1, 4, 6, 9, 10).*

*" if going out, and the baby leave at home, mammae should clean with warm water first then pressure little bit and throw it....." (P: 5, 7, 12, 13, 17)*

Based on observation, the researcher did not find the women who throwing away the breast milk after coming home, but the researcher found the women who providing breastfeeding in the house of the 6<sup>th</sup> participant, it's the younger sister of the 6<sup>th</sup> participant who just 2 months before deliver. She provide direct breastfeeding without throw away a little bit

because she did not go out, like the expression of participant 1, 4, 6, 9, and 10.

#### **b) The prohibition for Breastfeeding women**

Based on *indepth* interview of participants, the researcher concluded that almost all participants said that have some prohibited food during breastfeeding and it the same answer of women's relatives and some participants. The researcher concluded that among of seventeen participants only one did not perform the prohibited food during breastfeeding time. Some of participants have expression regarding the prohibited food during breastfeeding time;

*" don't eat spicy food..." (P: 1, 2, 3, 5, 6).*

*" don't eat egg after deliver....." (P:7, 9, 10, 13, 15).*

*"in breastfeeding time only porridge , acid vegetables and clear vegetables are allowed....." (P:8,11,14,).*

*"in breastfeeding time don't eat hard food (pulut putih/ hitam)....." (P: 4,15, 16,17).*

## **2. Women's Culture in Providing the Exclusive Breastfeeding**

### **1) Habits for Seeking Help During Pregnancy, Inpartum & Post-Partum Care**

This theme is supported by three categories, such as the tradition of antenatal care, the tradition of intranatal and the tradition of caring for newborns. The details are as follows:

#### **a) The Tradition of Pregnancy Checking**

The expressions six of the seventeen participants about the tradition of as the tradition of antenatal care were as follows:

*"..... with dukun to adjust the womb" (P4).*

*"during pregnant had checked in three times by health worker." (P:1 & 2).*

*"...had been massaged by dukun to correct the position of the baby because it hurts and after massaging it is not hurt anymore"(P5).*

*"... had bleeding 3 times when pregnant of 5 months, after that I went to see an obstetrician" (P6).*

*".....when problem comes (ta'sala), just went to aunty in Loru for massaging ....." (P7).*

*"sometimes doing massage for pregnant women, none of pregnant women don't be massaged...."(IK).*

Based on the participant's observations, the researchers concluded that almost all pregnant women went to a traditional birth attendant for a pregnancy check-up with varying gestational ages.

#### **b. Inpartu Aid Traditions**

Some of the participants' expressions related to the category of inpartu aid traditions for pregnant women. The details of the participants' expressions are as follows:

*"My planning is to give birth at the Pustu or getting penalty if I give birth at home. my first born at home because not allow to give birth at the in-laws' house, that's what the custom said ...."(P1).*

*"my planning is to give birth in a hospital, because it's more safe....." (P:2, 4, 5, 6).*

*"my planning is to give birth in a Pustu with the health staff, but please also call a shaman....."(P3).*

*"... If the women want to give birth, usually I attend to the hospital and allow me to enter the labor room ....." (IK).*

*"...meposoa first within 1 month, then use hot facial powder to reduce swelling on the face" (P7).*

#### **c. Traditions of Newborn Baby Care**

There are still inappropriate habits regarding the care of babies after birth in the Pombewe community. As stated by several participants, related to the tradition of newborn care as follows:

*".....After giving birth, then within 3 days baby care managed by dukun." (P: 1, 2,5).*

*"My planning gave birth at the pustu with the midwife but also called the dukun. Coming home from the health center, I also called the shaman to take care of us with my son. Usually it takes 3 to 7 days for the traditional healer to*

*stay at home... ” (P: 3,4,7,9,10,13, 16,17).*

*“...After giving birth, I was brought to my mother's house, there was a dukun called to give my baby a bath for 3 days....” (P: 5,8,14).*

*“...mostly have called to give a bath for woman and her baby...”(IK).*

*“...After 3 days was born, the baby have to down on the ground to step the machete in front of the door. It was beaten a little bit by young coconut leafs...” (P: 5,11,12,15,17).*

*“The custom was not given to my parent-in-law first, and break the coconut at the door, rice sprinkled for 3 days, the old coconut was hung and it fell off on its own, no matter its kept behind the house, the coconut is peeled only the skin is just given a net rope like it's closed and hanged.....” (P6).*

*“the baby given down on the ground (nopasaki), read the pray and put the baby into a swing (owa owa) then break the coconut, I don't know why, I didn't ask my parents about nopasaki , as I knew the baby wouldn't be fussy, wouldn't be naughty, so that the baby will cheers... ..”(P7).*

## **2) Habits and Reasons for Feeding Newborn baby**

This theme consists of two categories, such as the breast milk has not come out and the habit of giving drinking to newborns, supported by the following categories:

### **a. Breast Milk Hasn't Come Out**

Some of the participants' expressions about the category of breast milk not released yet are:

*“The first child was given formula milk trough bottle for 1 hour, it was only a little milk was taken because the breast milk had not come out....”(P5).*

*“...my first child, after two days then the breast milk was available” (P6).*

*“ ..... after two to three days then breastmilk was out ”(P: 1,2,3,5,7).*

Observations of participants conducted by researchers, concluded that seventh participant with aterm pregnancy who were waiting for the birth of th baby said that her breast milk had not come out yet, but they had

prepared honey and eggs for women to consume it before giving birth.

### **b. Drinking Habits for Newborn baby**

Some of the participants' statements about the habit of giving drinking to newborns baby. The participant's statement is as follows:

*“..mostly newborn is given 2 drops of honey at once.. (P1)*

*“...A newborn baby is given by ship of honey to be smeared on lips, that's all for the first time. The first child is given bottled milk....” (P5).*

*“...it's just that baby was not satisfied, so bottled milk given...(P7).*

*“Honey is put in the mouth of the baby after birth, it mixed with turmeric, kept on the sheet and squeezed to clean the mucus and amniotic fluid. And being tilted the baby to evacuate the mucus and amniotic fluid that given once a day within 3 days” (IK).*

Observations of participants conducted by researchers concluded that the seventh participant had prepared a bottle of honey for delivery and it to be given after birth for the first sip of drinking.

## **3) Baby Feeding**

This theme is supported by five categories such as age, reason, method of baby's feeding, types of food other than banana, and a number of pagata banana has given. The wrong theme of giving food to the baby would have an impact for the health at the future baby with the following by categories:

### **a. Infant Feeding Age**

Several participants had revealed categories regarding the age of feeding infants, namely:

*“.....first giving birth, for 1 week we had fed the baby with banana (pagata) due to the baby continuously crying even breast milk had given.....”(P1).*

*“....3 days after discharge from the hospital, the baby had given the bananast....”(P2).*

*“....The first baby was given bottle milk for less than 1 hour, and supplementary food (SUN) was given 1 week after birth....”(P5).*

**b. The Reasons Of Feeding the Babies**  
Statements from some of participants are:

".....the baby *continuously crying* even breastmilk had given, so they feed him...."(P1).

"...The planning is when the baby birth and *uncomfortable*, will feed with only bananas ..."(P3).

"..... so that the baby will full, no fussy but breastmilk given too..." (P).

"..... The baby is not satisfied so bottled milk given too...."(P7).

Participant observations conducted by researchers mentioned that it did not find that the women of the participants made kepo' bananas as food for their babies because only pregnant women were interviewed.

**c. How to Feed a Baby**

Some of the participants' statements are as follows:

".....Honey, drop it on the tongue, 2 drops just once. The baby had fed with bananas by scratched the ripe banana and put it in a glass, poured with hot water and shake it, then tested by dripping a little bit (participant points to the back of his hand) if it is not hot anymore, give it to baby. After that the baby will not cry anymore, then just go to sleep....." (P1).

".....When baby just born, honey is given by smeared it on the lips....." (P1).

Based on researchers observations toward participant, found that the women of one participant made kepo' banana as a baby's food at the age of two days by peeling the kepo' bananas, and scratch it till up to black spots, putting it into half glass of hot water, then covered and leave it for five minutes, stirred with a spoon, discarded the water, and given to the baby.

**d. Types of Feeding Other Than Banana**

Statements from some participants regarding the types of food other than bananas that given to baby before six months of age as follows:

".....the baby fed SUN 1 week after birth....." (P5).

".....The first child was given bottle milk....." (P3).

".....A 6 month old baby feeds mixed porridge with side dishes and vegetables (filtered)..." (P4).

Participant observations that conducted by researchers concluded that the fifth participant told about the food had given to their babies with SUN but not banana kepo' like mostly women who gave banana kepo' to their babies.

**e. Amount of Pagata Bananas Have Given**

Statements by some participants regarding the number of pagata bananas that given to baby before six months, of age mentioned:

"..... the baby is getting bigger, the bananas that should be given also increasing....."(P11).

"..... The amount of pagata bananas have given ½ /day (when baby with 3 days old) ..."(P12).

Based on participant observations by researchers, it was concluded that when the baby getting old, the amount of pagata bananas have given also increasing. It begins with ½ /day when the baby's have 3 days after birth

**3. Knowledge, Attitudes, and Practices of Women in Exclusive Breastfeeding**

Knowledge, attitudes, and practices of women in exclusive breastfeeding were analyzed based on thematically that resulting into one theme with three categories. Those theme are learning problems about exclusive breastfeeding and the category is ignorance of Early Breastmilk Initiation (EBI), colostrum, and exclusive breastfeeding. Those categories that support the theme of learning regarding exclusive breastfeeding are:

**a. Unknowledgeable about of Early Breastmilk Initiation (EBI)**

Based on the in-depth interviews results that conducted by researchers, it was found that six of seventeen participants expressed that unknowledgeable about EBI.



Participants' statements regarding unknowledge about EBI's are:

" ..... we also don't know about EBI..."(P:1&2).

" ..... we don't know about EBI ..."(P:3,14,5,16 ).

Based on participant observations by the researcher concluded that almost all participants said they did not know about EBI. Only the seventh participants know about EBI by explaining the EBI and the process perfectly itself.

#### **b. Unknowledgeable about Colostrum**

Based on the in-depth interviews results that conducted by researchers toward participants was found that some participants expressed unknowledgeable about colostrum, is:

"...we don't know about colostrum. ...." (P1,2,3,4 and 15).

"..... we just heard about colostrum ...."(P6, 17).

Based on participant observations by researchers, it was concluded that almost all participants said they did not know about colostrum. Only the seventh participants know about colostrum by explaining the meaning, color, and how to give colostrum properly.

#### **c. Unknowledgeable about Exclusive Breastfeeding**

Based on the in-depth interviews results that conducted by researchers, it was found that almost all participants expressed unknowledgeable about exclusive breastfeeding, is:

"...we don't know about exclusive breastfeeding..."

(P:1,2,3,4,5,6,8,9,10,11,12,13,14, 15, 16,17 ).

Based on participant observations by researchers, Only the sixth and the seventeenth participants gave the correct answer.

### **Phase II: Development of Health Education Media as a Solution to the Problem of Exclusive Breastfeeding Culture**

The identified themes were integrated with Leinenger's transcultural theory. The design of transcultural/culture-based health education media for pregnant women about exclusive breastfeeding was then consulted with experts.

## **DISCUSSION**

### **1. Myths of Pregnant Women That Affecting the Providing of Exclusive Breastfeeding**

The people of Pombewe are still very strong in maintaining beliefs that cannot be scientifically proven, including myths during pregnancy, childbirth, postpartum, and breastfeeding. Myths, for example, carrying an onion stabbed with a safety pin or carrying a sharp object/small knife, pregnant women wrapping a towel around their neck or the father of the baby will cause the baby in the womb to experience the umbilical cord around the neck, is not true. The umbilical cord coil occurs allegedly because the umbilical cord is long, the baby is actively making movements, and the baby's body weight is still lacking, the uterine space is still wide for the baby to move.

The myth about eating squid (suntung) is believed to cause that babies will not have bones or the bones become soft. This assumption is not true because it has not been scientifically proven and there is no relationship between the shape and nature of the squid and the baby to be born. The correct evidence is that squid contains high protein and is very good for the formation, and growth of a baby's organs, so it is very good also to be consumed, especially for pregnant women, postpartum, and during breastfeeding. This myth about food also applies in Keruak, East Lombok, mentioned that pregnant women are prohibited to consume the squid and octopus that the same reason as in Pombewe <sup>3</sup>.

The myth about throwing out a little milk after the women travel and then breastfeeding her baby, it is believed that the breast milk has been contaminated with dust, the baby will feel that milk is hot due to sun exposure, so that it will cause the baby to get sick if he drinks the milk. According to the Transcultural theory, this myth needs to be modified by keeping a little milk out every time when breastfeed the baby, but applying it circularly from the inside to outside from the nipple to the areola of the mammae as a

disinfectant but not to be thrown away as they have done so far. The breast milk will not be polluted by dust because it is contained in a closed space (breast) which is unlikely to be contaminated by outside air. Breast milk also contains antibodies that can protect the babies from germs. Immune substances contained in breast milk by providing stimulation to the baby's immune system to produce its antibodies or known as active and passive immune substances, namely the baby's body obtains immune substances from the mother through the breast milk that consumed by the baby<sup>4</sup>.

The prohibited food after deliver with the reason that the uterus is still injured and it will affect for recovery of the uterus is incorrect because the food that consumed will be in the digestive tract system, not direct related to the uterus (reproductive system) which is still injured due to deliver. Recovery of the uterus is need of adequate nutritional intake from various types of food sources, so that a balanced menu can be met for postpartum women. The intake nutritional consume is not only for the recovery of postpartum women's health but also for supporting the production of breast milk<sup>8</sup>.

Based on the participants' statements about the myths during pregnancy, inpartu, postpartum, and breastfeeding, it is not scientifically proven but is still strongly maintained by the Pombewe community. If the myths do not interfere for both women's and babies health, it will be ignored, but if myths affect the health of both women and babies, then the transcultural theory is needed to eliminate, modify, and maintain if it benefits for health of both women and babies.

## **2. Culture of Pregnant Women That Affecting the Exclusive Breastfeeding Providing**

Some cultures related to pregnancy, inpartu, postpartum, and breastfeeding are still strongly maintained. Participants' expressions related to culture include when fertilization occurs and the woman is not getting menstruation, the first person they will visit the called dukun ask for confirmation whether she is pregnant or not. If she is pregnant, then the massage is carried out to correct the position of the descending uterus marked by signed such as frequent urination (BAK). According to the researcher's analysis, frequent urination in early pregnancy is caused by the bladder (vesika urinaria) being pressured by the uterus due to

presence of pregnancy, so this condition is normal for young pregnant women.

Other cultures, if compulsory to deliver at home, still call dukun and health workers. If the women deliver at home and is helped by dukun, but health worker came late, so she only give injections or care shortly for the women who gives birth, then automatically initiation of early breastfeeding is not carried out so it will be failure for exclusive breastfeeding providing. The local government has issued the regulations to give birth at the Public Health Center or in the Hospital. If you give birth at home, they will get pinalty, but there are still women will give birth at home due to compulsory reason. If the women and family have decided to give birth at the Public Health Center, but the habit of giving honey to newborn baby is maintained because the community considers it is obligatory to do even the breast milk is present or sufficient. The culture of giving honey to newborn baby is affected to baby's health. According to transcultural theory, this habit needs to be eliminated and replaced it with EBI/IMD and colostrum providing.

This study strengthens to previous research that conducted in A Hospital Palu which revealed that there were no women who providing the exclusive breastfeeding to their babies within three days of post partum or while hospitalized because breast milk had not come out yet, only a little bit the breastmilk came out, the tradition of giving honey before

The culture related to feeding babies, such as "pagata" bananas which started given when babies are 3 days and 1 week after birth, that become one of the causes not achieving the target of exclusive breastfeeding providing. This is also very concerning because the baby's digestive system still not ready to accept the solid foods such as bananas, so it is possible to cause indigestion and even death. Thus the providing of solid foods such as bananas can be a major contribution to neonatal mortality rate. The culture related to giving pagata bananas (kepo') to newborn baby is concerning and very sad. Research conducted by researchers in 2014 in Taipa was provided some information that during the research had three babies died, two of them were given pagata bananas which each have one and three days old, respectively. Researchers did not know well the cause of the baby's death but giving pagata bananas to newborn babies and three days after birth make more worsen for them if unhealthy condition

already. Based on transcultural theory, this culture need to be eliminated because it is detrimental to baby's health<sup>9</sup>.

Breast milk is the ideal food/drink to support optimal health, growth, and development of babies. Women need encouraged to provide the exclusive breastfeeding to their babies for the first six months of life and it continue with supplementary feeding, then breastfeeding to be continue till two years of life. The babies who taking the exclusive breastfeeding for the first six months has been shown that have a low risk to get various of infectious diseases and other diseases for the future life. The babies who breastfeed immediately after birth (early) are more likely to succeed in exclusive breastfeeding until the first six months of life<sup>10</sup>.

Breast milk is beneficial for humans to reduce infant morbidity and mortality, all women should receive education and support that can be used to make decisions about breast milk pumping and maintaining a milk supply during hospitalization. Nurses should assist and support the women's efforts to produce the milk volume for their infants, especially in premature infants and risky infants<sup>6</sup>.

Research conducted in Pakistan provides some information that exclusive breastfeeding was only 54% and 35% of women gave prelactal feed<sup>11</sup>. The research in Nias found exclusive breastfeeding until the age of six months was only 12%, and 74% of them gave additional fluids other than breast milk in the first seven days of life, and 14% of babies received complimentary fluids from seven days onwards until the age of six months. In addition, 79% of babies were given supplementary foods (solid, semi-solid, or soft foods) before of six months old<sup>12</sup>.

The research on socio-cultural beliefs that influence of breastfeeding practices among of primiparous postnatal women in urban slums, Delhi had identified that about 56.6% of primiparous women were giving sugar water before breastfeeding, about 42.5% breastfeeding providing only for five minutes because they think a longer duration causes pain of nipples. Their main cultural practice is avoiding colostrum, and food after delivery<sup>13</sup>.

Another tradition that can endanger the continuity of exclusive breastfeeding, namely food for postpartum mothers is porridge with clear vegetables and tamarind fish because it is considered that giving hard/solid food to

postpartum women could causes the uterine injuries become worse so that it can cause death to women. According to the analysis of researchers, porridge contains a lot of water with few carbohydrates as a source of energy. Postpartum women need adequate nutritional intake to replace the energy that has been expended during labor process, also adequate nutritional intake can help breastmilk production so that babies can get it as soon as possible. The porridge with clear vegetables and fish in tamarind sauce is Pombewe community believed could stimulate and increase the production of sufficient breast milk.

If the baby sucks milk through the breast as early as possible, it will also be beneficial for the women such as facilitate the involutio process. One of the benefits of breastfeeding for a women's health is that the baby's sucking during breastfeeding will stimulate the releasing of the hormone oxytocin that could help uterine involution and prevent postpartum hemorrhage. Another benefit for women is that the incidence of mammary carcinoma in breastfeeding women is lower than in non-breastfeeding<sup>14</sup>.

An article regarding cultural factors in human breastfeeding in London mentioned that the promotion of exclusive breastfeeding providing for baby is increasingly being demonstrated by medical and health researchers, but the majority of women around the world do not comply with the recommendations for infant feeding published by WHO. WHO suggests that it is necessary to consider the implications of breastfeeding culture in both nutritional and non-nutritive contexts. Exclusive breastfeeding providing to humans cannot be considered "natural", "traditional" or even the norm, but breastfeeding is considered physiological and cultural behavior has a considerable influence. Breastfeeding also contributes to the development of social relationships, including the psychological relationship between the baby and mother. Physicians and nutritionists have generally failed to appreciate that breastfeeding is only considered nutrition, and must improve the understanding of breastfeeding behavior if it is to achieve the goal of improving health for both mother and baby<sup>15</sup>.

The Association of Women's Health, Obstetrics and Neonatal Nurses (AWHONN) supports, protects and promotes that

breastfeeding as an ideal and normative method of babies feeding, including the providing of breast milk for premature newborns and other vulnerable babies. Women should be encouraged and supported to breastfeed exclusively for the first six months of a baby's life and continue to breastfeed through the first year onwards. AWHONN partners with other maternal and neonatal health organizations to improve cultural, institutional, and socioeconomic systems, so that more women and newborns can experience the physiological and psychosocial benefits of breastfeeding<sup>6</sup>.

The researcher's analysis is related to Kaili's cultural research, that all regions have habits of abstinence from food, speech, behavior during pregnancy, childbirth, postpartum, and giving nutrition to newborns, and this applies not only to wives but also to husbands. According to Swasono (1997), all regions (Krui, Kerinci, Simpar and Kosambi, Sangihe Thalaud Islands, Subang, Bajo Tribe in Lasolo, Kendari, Minangkabau, Bali) have a culture of prohibition during pregnancy, childbirth, postpartum care, feeding in babies<sup>16</sup>. Prohibitions or taboos do not only apply to the wife but some behaviors such as cutting animals, sticking wooden fences, hitting/torturing animals, shaving hair, cutting/burning trees when the wife is pregnant, should not be done by the husband. All these cultures aim for the safety of the women during pregnancy, childbirth, postpartum, and the baby born safely<sup>16</sup>.

### **3. Knowledge and attitudes of pregnant women about exclusive breastfeeding providing**

This research identified that participants' knowledge was very low by do not know about Early Breastfeeding Initiation (EBI), colosturm, and exclusive breastfeeding. The knowledge about breastfeeding was obtained from mothers, sisters, and aunts who had previously known and felt naturally about breastfeeding babies. The researcher's analysis shows that the women's lack of knowledge is in synergy with the myths and culture prevailing in the Pombewe community. Based on the results of this study, there was only one baby who was exclusively breastfed, and there was one baby who was not given pagata bananas at the age of six months because of the mother's education and beliefs, but the two mothers gave formula milk because the milk was late and

insufficient, despite the mother's job as a housewife who has a greater opportunity to give breast milk.

The concept of Proceed-Proceed theory is needed in this situation by not only encouraging but also enabling mothers to change behavior from not knowing to knowing and willing to change behavior from giving food or drinks other than breast milk to newborns to exclusive breastfeeding.

Another study conducted in Dhaka, Bangladesh identified about 88% of lack of knowledge about breastfeeding. Most of the respondents have very lack of knowledge about the benefits of exclusive breastfeeding (89%) and breastfeeding (100%). In contrast, the majority had good knowledge about the duration of exclusive breastfeeding 74% and breastfeeding 66%<sup>17</sup>.

There are so many choices of decisions about babies feeding that are being considered by women, couples, and families, so it is necessary to conduct health education to obtain accurate information. Formal breastfeeding education is breastfeeding information provided as part of standard antenatal care and includes individual or group education led by a peer counselor or health professional, home visits, lactation consultations, distribution of written/printed materials, demonstrations, videos, and inclusion of expectant fathers. in learning activities. The antenatal period provides an opportunity for pregnant women, their partners, and their families to obtain information about the benefits of breastfeeding<sup>18</sup>.

The research related to knowledge, attitudes, and barriers to exclusive breastfeeding providing toward women in Riyadh, Saudi, identified about 64.7% as having good knowledge about the benefits of breastfeeding for babies and maternal health, it found a significant correlation between attitudes towards babies feeding and maternal age ( $r = 0.33$ ), there is also have highly significant correlation between knowledge and women's attitudes. Several barriers to prevent Saudi's women from breastfeeding to their children despite having good knowledge of the importance of breastfeeding. Health care professionals must actively work with families to solve the barriers to breastfeeding<sup>19</sup>.

The research related to knowledge, attitudes, and practices of breastfeeding of primiparous women in India identified that

knowledge of primiparous women regarding inadequate breastfeeding and it reflected in the practice of breastfeeding, their attitudes were very favorable towards breastfeeding. Primary care providers need to implement strategies to educate primary women about breastfeeding to improve good breastfeeding practices to reduce the infant mortality and morbidity<sup>20</sup>.

The research related to knowledge, attitudes, and practices of exclusive breastfeeding in Saudi Arabia mentioned that the overall knowledge of breastfeeding women were good which is 55.3% and very good 30.7% and unsatisfactory 14%. women's positive attitude towards breastfeeding is 62.2%, negative attitude is 37.8%. The practice of breastfeeding toward women in the first six months about 24.7% and only about 7.3% have exclusive breastfeeding<sup>21</sup>.

The attitude of the participants in this study, to identify; almost all participants wanted to breastfeed, but the duration of breastfeeding have varied, it was also influenced by the culture of giving honey, which is obligatory even though have sufficient breast milk. If this culture is not eliminated then attitude change as a behavioral domain will not occur.

The unknowledgeable of the Minangkabau community about exclusive breastfeeding is implemented at the feeding ceremony by licking a pick of rice (halal haram), giving salt and chilies on the baby's tongue (spicy, salty life), followed by giving drops of honey on the baby's lips in the hope that it doesn't match the saying "ants die because of sweets"<sup>3</sup>.

Based on this research, it is necessary and very important for health education related to exclusive breastfeeding which is strongly influenced by myths, culture, and knowledge (learning needs) for pregnant women and their families. Involving the family, especially those living with pregnant women, is very important because the first information provider in the family. Suppose family knowledge about exclusive breastfeeding is more dominant in myths and cultures that have been passed down from generation to generation. In that case, it will automatically be very difficult to achieve the exclusive breastfeeding target that proclaimed by WHO, which 90% of life births must receive exclusive breastfeeding.

## CONCLUSION

This research resulted in health education media about exclusive breastfeeding in the form of a module with two languages, namely Indonesian and Kaili as the regional language of the indigenous Palu (Kaili) tribe. This module is based on the results of research using an ethnographic approach, such as: Identified that there are still beliefs or myths that are strongly maintained by pregnant women from the Kaili tribe, including throwing away breast milk before breastfeeding after traveling, wrapping a towel around the neck, and others.

The culture of giving pagata bananas, honey, formula milk, and additional food were still maintained and carried out for generations by the Kaili tribe. Most of the pregnant women of the Kaili tribe do not know about the concept of Early Initiation of Breastfeeding (EBI), colostrum, and exclusive breastfeeding. The attitude of pregnant women is that almost all want to breastfeed after giving birth depending on whether or not the milk comes out quickly after deliver.

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Original Article

## Formulation, Dosage, and Exposure Time of Natural Substances in Controlling *Aedes aegypti* Larvae

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### ABSTRACT

*The incidence of vector-borne diseases in Indonesia, particularly Dengue Hemorrhagic Fever (DHF), continues to escalate. This surge correlates with climate change, the extreme transition from hot to rainy seasons. The use of synthetic chemicals for control measures can also poses environmental risks; hence, there is a necessity to explore natural control methods by harnessing the biodiversity of plant species within the environment. This research aims to assess the effectiveness of botanical extract mixture on the mortality of *Aedes aegypti* larvae. Method: This study utilizes an experimental design with a complete factorial random arrangement, which aimed at elucidating the effectiveness of plant extract as a bio-larvacide against *Aedes aegypti* mosquitoes. The effectiveness is measured through larval mortality rates based on a formulated equation, with dosage and exposure time as the research variables. The research was conducted in the Environmental Health Departement Laboratory at Health Polytechnic of Tanjungkarang from March to July 2023. The observational sheet serves as the instrument The collected data are processed and analysed using ANOVA to discern variations in larva mortality based on the formula, linear regression is applied to explore the influence of dosage and exposure time on larva mortality. Result: The result of this study exhibits that the most efficacious formulations to terminate larvae were determined to be the 9th, 10th, and 11th formulations. Furthermore, an extended exposure time correlates with the escalating rate of larval demise. The statistical model prosperously accounts for 88,59% of the variability in the response pertaining to *Aedes* larval mortality. Conclusion: This study discerns that individually, the formula, dosage, and exposure time, also demonstrates an impact on larval death. This study unveils that an insecticidal formula derived from soursop leaves yields a higher mortality effect compared to formulations based on other materials.*

**Keywords:** *Aedes*, Natural Substances, Effectiveness, Larvacidal, Vector

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## INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is a condition caused by the dengue virus transmitted by the *Aedes aegypti* mosquito, serving as the main vector<sup>1</sup>. As of now, DHF remains a global health concern due to its high mortality rate, especially among children<sup>2</sup>. It is estimated that 3.6 million people are at risk, 230

million people are infected, and 21.000 deaths<sup>1-3</sup>. From 1968-2010, Indonesia maintained the highest number of DHF cases in Southeast Asia<sup>4</sup>. In 2015-2020, DHF cases exhibited fluctuations<sup>5</sup>. In Bandar Lampung, during the 2017 period, the incidence rate (per 100.000 population) was 103,97 (35,30-230,90), surpassing both the provincial rate of 42,37 (16,37 - 68,44) and the national rate of 54,21

(27,7 - 78,6) <sup>6</sup>. The stakes on DHF cases often coincide with the climate changes, transitioning from dry season to the rainy season.

Vector mosquito control programs have been implemented in Indonesia, encompassing activities directed at modifying the physical environment to prevent the creation of breeding grounds, including attempts such as draining stagnant water, sealing water storage containers, and burying discarded items. However, the efficacy of those attempts measures is deemed insufficient. Meanwhile, the practice of fogging which utilize chemical agents, remains prevalent among sanitation attempts. Sedangkan sanitarian masih mengandalkan *fogging*. Kegiatan *fogging* dilakukan dengan bahan kimia. The adverse environmental impacts resulting from the use of such chemicals are noteworthy. The development of natural insecticides is imperative given Indonesia's diverse plant species that can serve as natural insecticidal agents<sup>7</sup>. Within a plant extract, aside from several main active compounds, there exist other less active compounds that can enhance the overall extract activity through synergy. This characteristic reduces the probability of insects developing resistance. The ability of insects to develop defense mechanisms against multiple different compounds simultaneously is smaller than it against a singular insecticidal compound<sup>8</sup>.

The implementation of plant extract as insecticidal agent poses no adverse effects on the environment and human health, as they can be easily degraded, leaving no residues in soil, water, and air<sup>9</sup>. Based on a review of research conducted over the past decade, no studies have been identified that examine the formulation of various plants as bio-larvicides against mosquito larvae.

Mosquito control can be categorized into three methods, these are mechanic, biological, and chemical. Inappropriate application of insecticides for dengue infection prevention and control should be avoided. During periods of minimal or no dengue virus activity, the routine reduction of larval sources in the environment can be complemented by using larvicides in containers that cannot be discarded, sealed, filled, or handled in other specified ways<sup>10</sup>. Plants derived from nature with a potential as botanical insecticides, generally exhibit bitter taste (due to the presence of alkaloids and terpenes), a putrid

odor, and slightly pungent flavor. These plants, or botanicals, are seldom attacked by pests, making them widely utilized as extracts for organic pesticide applications in agriculture<sup>11</sup>. When considering insecticide use for control purposes, it is crucial to opt for environmentally friendly, natural insecticides. More than 24.000 plant series belonging to 255 families are reported to contain pesticide compounds. Certain plants emerge as promising insecticides due to the presence of diverse bioactive compounds, including saponins, flavonoids, alkaloids, tannins, and alkenyl phenols. These compounds are readily accessible and are prevalent in various plant parts, including root, stems, leaves, flowers, fruits, and seeds of green plants across the diverse region of Indonesia<sup>12</sup>. It has been proven that flavonoids and saponins possess biolarvicidal capabilities against adult flies, achieving 100% mortality rate at a concentration at 25% <sup>13</sup>.

Several studies have conducted efficacy tests of plants on larval mortality. The effectiveness of betel leaves against larvae has been demonstrated in trials <sup>14,15</sup>. In 2021, the study was undertaken to assess the capabilities of leaves from 14 plants species which identified as having potential as bio-larvicides. These plants were selected based on their highest content of flavonoids and saponins, as determined in prior research on bio-larvicidal properties. The purpose of this study is to evaluate the effectiveness of a mixture of plant extracts on the mortality of *Aedes* larvae.

## METHOD

The design of this study is experimental with the aim of investigating the impact of bio-larvicides on larval mortality. The approach utilized a complete factorial random design. The study subjects were self-cultivated *Aedes* mosquito larvae. The variables under examination include the bio-larvicide, dosage and exposure time concerning the mortality of *Aedes* larvae. These variables were chosen based on prior studies suggesting that the effectiveness of a substance on larval mortality can be measured through the formula, dosage, and duration of the exposure<sup>16-18</sup>. The formula consist of 6 levels, the concentration comprises of 66 levels, and exposure time is employed across 9 levels. The experimental design include two repetitions, following the Foreder formula replication in experimental research.



Stage I of the research commenced with the extraction of plant extracts. Leaves from the Soursop, Periwinkle Flower, Averrhoa Blimbi, and Guava plants were collected. These leaves were air-dried for 7 days and subsequently pulverized. Each set of leaves, weighing 1 kg, was soaked in 4 liters of 96% ethanol for 1x24 hours and filtered using a sieving device. The filtrate was then evaporated using a rotary evaporator at a temperature of 60 °C until 1 liter remained (100% concentration). Subsequently, six different combinations of plant extract mixtures were prepared (AB = Periwinkle Flower-Soursop leaf, AC = Periwinkle Flower-Guava leaf, AD = Periwinkle Flower- Averrhoa Blimbi, BC = Soursop-Guava leaf, BD = Soursop-Averrhoa Blimbi leaf, and CD = Averrhoa Blimbi-Guava leaf). Eleven dosage combinations were established based on the ratio of the first ingredients to the second ingredients. These combinations are as follows: 1 = 0% : 100%, 2 = 10% : 90%, 3 = 20% : 80%, 4 = 30% : 70%, 5 = 40% : 60%, 6 = 50% : 50%, 7 = 60% : 10%, 8 = 70 : 30%, 9 = 80% : 20%, 10 = 90% : 10%, 11 = 100% : 0%.

Stage II involved an inspection of the active ingredient in the mixture of extracts. A total 60 formulations were scrutinized at the Laboratory of Agricultural Technology at the Lampung State Polytechnic.

Stage III required the preparation of mosquito larvae. A total of 2.640 larvae were required (66 variations x 20 larvae x 2 replications). The larvae eggs were obtained from the Research and Development Center for Health in Baturaja, South Sumatera. The eggs were allowed to hatch for 3 days and identified as *Aedes aegypti* based on their siphon shape. The selected larvae were reared until reaching their adulthood and egg-laying maturity. Larvae were fed with finely ground fish feed, while adult mosquitoes were provided with marmot blood and sugar water. Hatched eggs were nurtured until reaching the third instar larvae stage.

Stage IV involved testing the susceptibility of the larvae. The vulnerability test procedure entailed exposing mosquito larvae to various concentration and control test to determine the activity range of the tested substance. After determining the larval mortality within a broad concentration range, the narrower range was employed to establish the LC50. Batches from 20 instar larvae were transferred through a sieve. Subsequently,

glasses (containers) with a height of 5 cm were prepared (deeper levels could induce unintended mortality)<sup>19</sup>. Alongside, add 3 ml of the insecticide to each glass. Observations began at 15 minutes, 30 minutes, 60 minutes, 120 minutes, and continued hourly until 48 hours. After period of time the research activity, the deceased larvae were in the soil, while the surviving larvae were utilized as fish feed. Environmental conditions for larval life were maintained at a temperature of 25°C and water pH of 7. Data were collected through hourly observation and recorded using observation instruments. Subsequently, the data were processed and analysed univariately to interpret the characteristics of each variable. Further analysis involved bivariate assessments using One-way Anova to examine variable effects, and multivariate analysis employing Two-Way Classification of Variance and linear regression to explore the combined variable on larval mortality. All analyses were conducted using computer applications.

The mortality of the treatment groups is adjusted using the formula:

$$\text{Mortality (\%)} = \frac{x-y}{x} \cdot 100$$

Annotation:

x = The percentage of the control group that did not receive any treatment

y = The percentage of sample group with treatment

Deceased larvae were examined under a microscope to observe the damage incurred due to the exposure to the biopesticide. The research findings are presented in the form of images and tables. This study has obtained ethical clearance certification from the Ethics Commission of the Tanjungkarang Health Polytechnic, Ministry of Health, with Certificate Number 259/KEPK-TJK/IV/2023.

## RESULTS

The examination of the active ingredients in plant revealed flavonoid concentrations in the extract as follows: Periwinkle Flower leaves extract at 22,07 Mg QE/g extract, Soursop leaves extract at 9,49 Mg QE/g, extract Guava leaves extract at 33,16 Mg QE/g, and extract Averrhoa Blimbi at 34,84 Mg QE/g.

The result in Figure 1 illustrate larval mortality based on formulas. In formulas AB and BC, across all mixtures, larvae exhibit

100% mortality at the 16-hour mark. For formulas AC, AD, BD, and CD, 100% mortality occurs at the 43rd hour. Figure 2 explains that formula 1 (Periwinkle Flower leaves – Soursop leaves) yields the highest mortality effect.

Figure 3 shows that dosage 9, 10, and 11 result in increasing mortality effects. Figure 4 indicates that as the exposure time lengthens, the mortality of larvae proportionally increases as well.

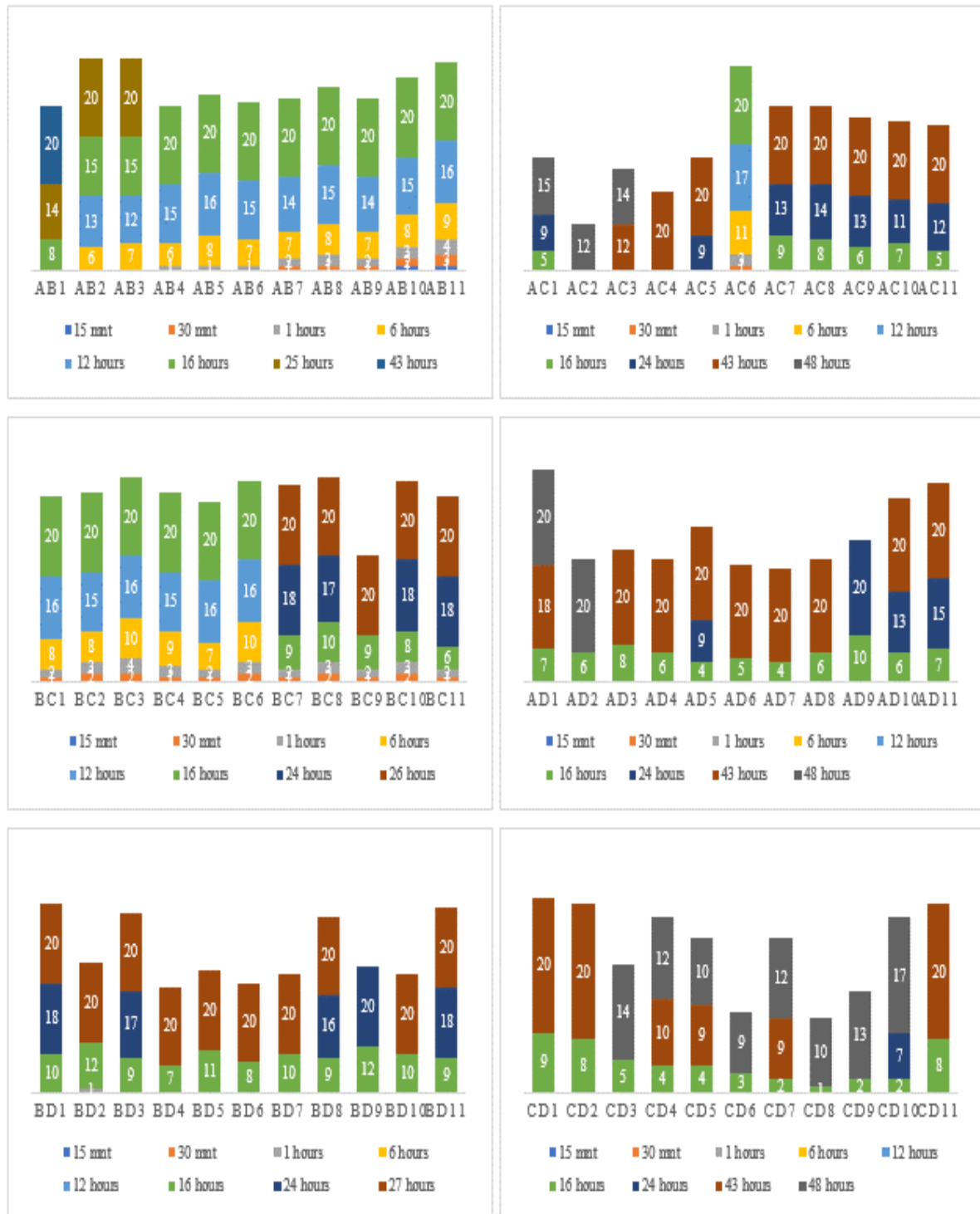


Figure 1. Mortality of Aedes Larvae Based on Observation Time

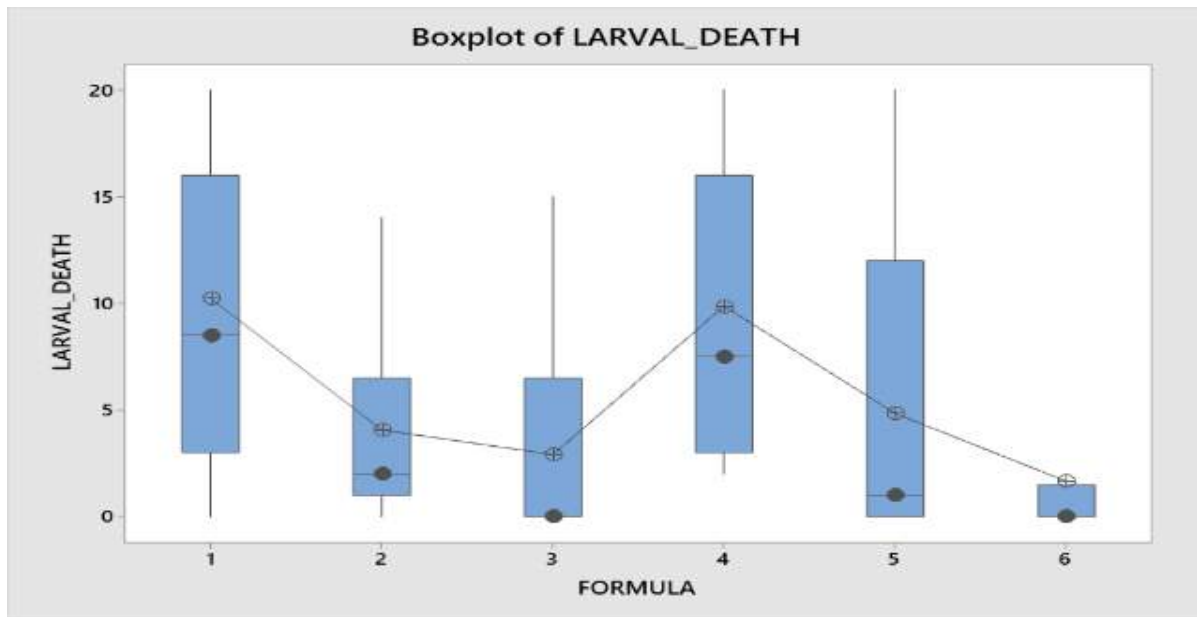


Figure 2. Mortality of Aedes Larvae Based on the Formula

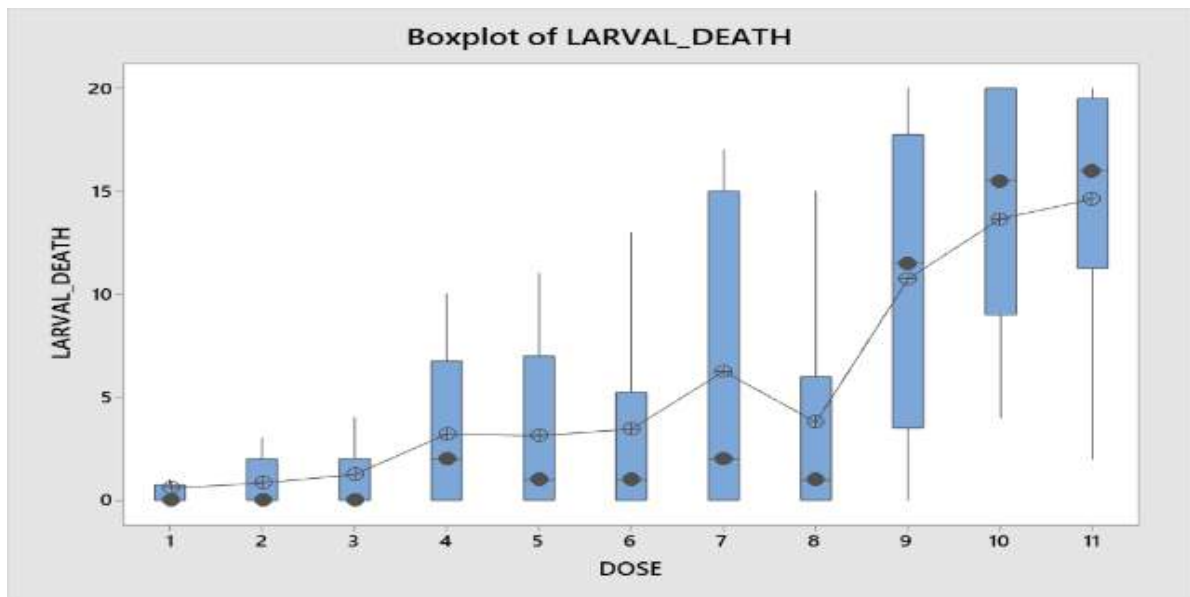


Figure 3. Mortality of Aedes Larvae Based on the Dosage Exposure

Table 1. Mortality of Aedes Larvae Based on Formula, Dosage, and Exposure Time

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Formula	5	2872.5	574.504	109.57	0.000
Dosage	10	6239.5	623.951	119.00	0.000
Time	3	112.7	37.580	7.17	0.000
Formula*Dosage	50	1523.9	30.477	5.81	0.000
Dosage*Time	30	471.9	15.730	3.00	0.000
Error	165	865.1	5.243		
Total	263	12085.6			
R Square (Adjusted)		88.59			

## DISCUSSION

### 1. Formula

Formula AB, consisting Periwinkle Flower leaves and Soursop leaves, exhibited a mortality effect at the 16<sup>th</sup> hour, as did formula BC, composed of Soursop leaves and Guava leaves. This could be attributed to the high concentration of active ingredients acting as toxins for the larvae. The study indicates that Soursop leaves contain 11,85 Mg QE/g extract of flavonoids while Guava leaves contain 9,49 Mg QE/g extract. It is also established that flavonoids possess toxic properties against insects<sup>20-22</sup>.

In formula AC (Periwinkle Flower leaves- Guava leaves), AD (Periwinkle Flower leaves –Averrhoa Blimbi leaves), and CD (Guava leaves-Averrhoa Blimbi leaves) 100 % mortality occurred at the 43<sup>rd</sup> hour. Prior studies has suggested that the suspected active ingredients as insecticide is Flavonoid<sup>23</sup>. Flavonoid compounds exhibit selective characteristics against pests, are non-harmful to human, environmentally degradable, leave no toxic residues on hosts that have developed resistance to insecticides, and are compatible with other pest control technologies<sup>20,24,25</sup>. Figure 2 has proved that formula 1 which consist of a blend of Periwinkle Flower leaves and Soursop leaves, yields the highest mortality effect. This could be attributed to the presence of flavonoids in the Periwinkle Flower leaves – Soursop leaves combination, coupled with the larvicidal role of alkaloid. The mechanisms involves acting as an antifeedant, inhibiting the larvae's ability to feed, which leads to larval death due to nutrient deficiency<sup>26-28</sup>.

### 2. Dosage

The 9<sup>th</sup> mixture has a first ingredient to second ingredients ratio of 80% to 20%, the 10<sup>th</sup> mixture consists of 90% to 10%, and the 11<sup>th</sup> mixture consist of 0% to 100%. All three mixtures exhibit an escalating trend in mortality rates (Figure 3). The finding is corroborated by the study conducted by Kusumawati, et al (2018), asserting that the average larval mortality increases with each dosage<sup>29</sup>. The high dosage correlate with a greater amount of larval deaths, assigned to the presence of chemicals in natural larvicide extracts containing compounds with high toxicity.

### 3. Exposure Time

The result of the statistical analysis indicates that the longer the exposure time, the higher the mortality rate of the larvae. Individually, the formula, dosage, and exposure time significantly influence larval mortality (p-value = 0,000). Despite exhibiting diverse outcome, all four plant species share the presence of Flavonoids, which play a crucial role as natural insecticides<sup>30-32</sup>. The toxic impact of Flavonoid that proceeds as an antifeedant against insects. Insect feeding activity diminishes after exposure to the insecticide, leading to larval body contraction and over time larval death<sup>33-35</sup>. Additionally, Flavonoids disrupt the nervoud system of larvae by inhibiting the respiratory tract. Oxygen limitation causes larvae to grow smaller than the larvae under normal conditions<sup>36,37</sup>. Larval growth ceases due to insufficient oxygen intake.

### 4. Formula, Dosage, and Exposure Time

This study has proven the correlation between formula and dosage, as well as dosage and exposure time, indicating an impact on larval mortality. The statistical test results model reveals an adjusted R square of 88,59%, signifying that the formula, dosage, exposure time, and their interactions collectivel contribute to an 88,59% influence on Aedes larvae mortality. The remaining percentage is influences by other factors.

The use of this larvacides in places serving as breeding grounds for Aedes larvae, such as bathubs, stored clean water for daily use, and areas outside the house flooded with water but not directlt connected to the soil, proves to be environmentally friendly. This, in addition to being safe for the environment, the application of this bio-larvicide is also harmless to other ecosystems. However, it is noted that the water may become discoloured and turbid. The introduction of water clarifying agents in natural insecticides is necessary to address this issue. This is intended to ensure the communities to not find the water inadmissible, considering that Aedes larvae thrive in clear water typically used for daily activities.

## CONCLUSION

This study reveals that insecticides formula derived from Soursop leaves elicits

higher mortality effect compared to formulations using other materials. This observation is attributed to the influence of the formula dosage, and exposure time on larval mortality. Similarly, the combination of formula with dosage, as well as dosage and the exposure time, demonstrated significant effects. The findings of this study propose potential recommendation for the formulation's utilization as an alternative bio-larvacide. Further investigations are suggested, particularly if the larvacide is intended for application in clean water reservoirs designated for cooking purposes.

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## ***Comparison of the Effectiveness of Counseling with Social Media, Animation and Short Films in Improving Perception and Motivation to Do Physical Activity in Adolescents***

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### **ABSTRACT**

*Physical activity is an essential component for health, low physical activity in Indonesia causes a high death rate, with 70% of all deaths among adults (including due to heart and lung disease). Therefore, efforts are needed to increase healthy lifestyles, especially physical activity, by providing health information through the media. The purpose of this study was to compare the effectiveness of counseling with social media, animation and short films as health promotion media to increase perceptions and motivation to do physical activity in adolescents. The design of this study is Quasi Experiment with a total sample of 180 people taken by total sampling. The data collection technique uses a physical activity questionnaire. Data analysis using the Anova test. The results of the analysis obtained that counseling with short films was more effective in increasing perceptions and motivation to carry out physical activities in adolescents at SMAN 3 Muaro Jambi indicated by a significance value at 0.000 ( $p < 0.05$ ) compared to social media and animation. There was a more significant increase in perception and motivation to do physical activity after counseling with short films compared to counseling using social media and animation for teenagers at SMAN 3 Muaro Jambi. Suggestions for further research are to examine the factors that influence perceptions and motivation for physical activity in adolescents.*

**Keywords:** Perception, Motivation, Physical Activity, Adolescents

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## **INTRODUCTION**

Non-communicable diseases (NCDs) are non-communicable chronic diseases consisting of cardiovascular disease, cancer, diabetes, respiratory diseases such as asthma and chronic obstructive pulmonary disease<sup>1</sup>. PTM is the biggest cause of death in the world and in 2012 the death rate due to PTM was 68% of the 56 million deaths worldwide. In Indonesia, the highest types of NCDs are

hypertension and stroke. The risk factors that cause PTM in Indonesia are the same as the risk factors (PTM) globally<sup>2</sup>. There are four risk factors that can cause NCDs, namely smoking, lack of physical activity, alcohol consumption, and unhealthy diet<sup>3</sup>.

Physical activity is an essential component for health, low physical activity in Indonesia causes a high death rate, where there are 70% of all deaths among adults (including due to heart and lung disease)<sup>4</sup>. Based on a



review of literature regarding the urgency of research, behavior that causes a person to be reluctant to engage in physical activity can cause various diseases (PTM) such as hypertension and stroke. This condition further accelerates various diseases if unhealthy diet habits, excessive drinking and smoking are followed<sup>5</sup>. Healthy conditions can be achieved by changing unhealthy behavior to healthy behavior<sup>6</sup>.

UNICEF found in 2018 that 70% of all deaths among adults (including due to heart and lung disease), could be prevented through implementing a healthy lifestyle from a young age, namely physical activity. WHO proposes several interventions to prevent and control non-communicable diseases, one of which is providing health information through the media about physical activity<sup>7</sup>. Physical activity is activity carried out in a physically and mentally healthy condition within the capacity of the individual's body. Based on a preliminary study of the phenomenon experienced by respondents, namely that respondents carried out physical activity but still did not really know what physical activity<sup>8</sup>. Teenagers spend 20 hours per week in sedentary activities. Physical inactivity significantly increases the risk of chronic disease and death<sup>9</sup>.

Health promotion is an effort to improve public health that focuses on promotive and preventive efforts<sup>10</sup>. Providing information through the media is a form of health promotion such as social media, films and animation to convey health information to teenagers<sup>10</sup>. Based on a preliminary survey at SMAN 3 Muaro Jambi, 10 people were asked and it turned out that all of them did not know about preventing risk factors for non-communicable diseases. Therefore, it is very important to immediately carry out promotive and preventive efforts for teenagers. So, research was conducted which aimed to determine the comparison of the effectiveness of social media, animation and short films as health promotion media to increase perceptions and motivation for physical activity in adolescents (Study at SMAN 3 Muaro Jambi).

## METHOD

The design of this study is experimental with Quantitative research design with quasi-experiments where measurements

are made twice. With the same sample, one group design, input (O1), intervention and observation are carried out, called process (X), and after the output results are the effects of treatment and experimentation. (O2). Population: all students of SMAN 3 Muaro Jambi amounted to 180 people. Total sampling technique in which the entire population is sampled. Inclusion criteria: Class X and willing to be a respondent. Exclusion criteria: not willing to respond. Sampling technique: purposive sampling. Place: SMAN 3 Muaro Jambi in March-November 2023. Research mechanism: preparation (*ethical clearance*, research instruments and equipment) and implementation of physical activity counseling with: 1) short films, 2) animation, and 3) Social Media = Instagram. Processing date: *editing, scoring, coding, Entry and cleaning*. Analysis date: *Univariate Analysis* (To obtain an average physical activity score before and after the intervention) and *Bivariate Analysis* (To see whether or not there is a difference between the independent variable and the dependent variable by using statistical dependent t-test and ANOVA test (parametric) at the significance level of 0.05).

## RESULTS

**Table 1. Normality test results perception and motivation of physical activity pre-test and post-test on teenagers at SMAN 3 Muaro Jambi.**

Variabel	Kolmogorov Smirnov		
	Statistic	df	Sig.
Pre-test perception	0,212	60	0,061
Post-test perception	0,240	60	0,071
Pre-test motivation	0,201	60	0,064
Post-test motivation	0,272	60	0,070

*Description\*) Significant at > 0.05.*

Based on Table 1 shows that the results of statistical tests *Kolmogorov Smirnov* obtained significant value of perception and motivation to perform physical activity both at the time of *pre-test* and *post-test*, each of which is greater than 0.05. This means that the data on perception and motivation to perform physical activity during the *pre-test* and *post-test* were normally distributed. Therefore, different statistical tests using *uji Anova test*.

**Table 2. The average value of perception and motivation to do physical activity Pre-test and Post-test counseling treatment with Social Media. Animation and short films in adolescents at**

Variable	Treatment	Variables	Mean	Std. Deviation	Min – Max
Perception	Social Media	Pre-test	3,33	1,02	2 – 6
		Post-test	2,50	0,90	8– 10
	Animation	Pre-test	3,30	1,04	2 – 6
		Post-test	2,55	0,92	7– 10
	Short Film	Pre-test	3,27	1,12	2 – 6
		Post-test	2,14	0,70	9– 10
Motivation	Social Media	Pre-test	3,33	1,331	2 – 5
		Post-test	7,67	0,568	7 – 10
	Animation	Pre-test	3,30	1,313	2 – 5
		Post-test	7,65	0,576	8– 10
	Short Film	Pre-test	4,33	1,027	2 – 5
		Post-test	9,50	0,702	9– 10

Based on Table 2 shows that *the mean value obtained* is different between the perception and motivation to perform physical activity *pre-test conditions* and perception and motivation to perform physical activity *post-test conditions*. This means that mathematically indicates there are differences in perception and motivation to do physical activity before and after counseling treatment with social media, animation and short films in adolescents at SMAN 3 Muaro Jambi.

**Table 3. The average increase in perception and motivation to do physical activity with counseling treatment with social media, animation and short films in adolescents at SMAN 3 Muaro Jambi.**

Variable	Treatment	Mean	Average Improvement
Perception	Social Media	Pre-test	3,33
		Post-test	2,50
	Animation	Pre-test	3,30
		Post-test	2,55
	Short Film	Pre-test	3,27
		Post-test	2,14
Motivation	Social Media	Pre-test	3,33
		Post-test	7,67
	Animation	Pre-test	3,30
		Post-test	7,65
	Short Film	Pre-test	4,33
		Post-test	9,50

Based on Table 3 showed an increase in the average score of perception and motivation to do physical activity after counseling treatment using social media, animation and short films in adolescents at SMAN 3 Muaro Jambi.

**Table 4. Comparison of the effectiveness of counseling with social media, animation and short films in improving the perception and motivation of physical activity in adolescents at SMAN 3 Muaro Jambi.**

Variable	Treatment variable	Average Increase	N	Sig. (2-tailed)
Perception	Social Media	Pre-test	0,83	60
		Post-test		
	Animation	Pre-test	0,75	60
		Post-test		
	Short Film	Pre-test	1,13	60
		Post-test		
Motivation	Social Media	Pre-test	4,33	60
		Post-test		
	Animation	Pre-test	4,35	60
		Post-test		
	Short Film	Pre-test	5,17	60
		Post-test		

*Description\*) significant at < 0.05*

Based on Table 4 shows that counseling with short films is more effective in improving the perception and motivation of physical activity in adolescents at SMAN 3 Muaro Jambi than counseling with social media and animation.

## DISCUSSION

### 1. Perceptions of Physical Activity

Based on Table 2, the results of the pretest were carried out on teenagers at SMAN 3 Muaro Jambi. From the results of the analysis of the pretest scores, it shows that the average perception score about physical activity among teenagers at SMAN 3 Muaro Jambi is still poor, namely 3.33 before

counseling with social media, 3.30 before counseling with animation, and 3.27 before counseling with a short film. This shows that the perception of respondents' physical activity before receiving counseling with social media, animation and short films is still a poor criterion. Based on table 3, the results of the post test carried out on teenagers at SMAN 3 Muaro Jambi show that the average perception score about physical activity among teenagers at SMAN 3 Muaro Jambi has increased, namely 0.83 after counseling with social media, 0.75 after counseling with animation, and 1.13 after counseling with a short film. Social media is a health promotion medium to increase perceptions about health<sup>11</sup>. The increase in perceptions about physical activity was caused by outreach with short films, namely providing counseling to teenagers about correct physical activity as well as increasing motivation to do physical activity among teenagers at SMAN 3 Muaro Jambi<sup>12</sup>. Short film media to increase the knowledge of school age children<sup>13</sup>. Education through film media can increase school knowledge and attitudes about healthy living<sup>14</sup>. The film media referred to here is film as an audio-visual tool for lessons, information or counseling<sup>15</sup>.

## **2. Motivation to do physical activity**

Based on Table 2, the results of the pretest were carried out on students at SMAN 3 Muaro Jambi. From the results of the analysis of the pretest scores, it shows that the average motivation score for physical activity for teenagers at SMAN 3 Muaro Jambi is still low, namely 4.33 before counseling using social media, animation and short films, 3.33. This shows that the respondent's motivation to carry out an initial physical activity before receiving counseling was still low.

Based on the results of the analysis in table 4, it can be seen that counseling using short films is very effective in increasing motivation to do physical activity among teenagers at SMAN 3 Muaro Jambi. The role of motivation is very important as a driving force for physical activity in adolescents<sup>16</sup>. This is proven by the  $p$ -value = 0.000, this value is smaller than the value 0.05. Short films are audio-visual media that can increase physical activity in teenagers<sup>17</sup>. Interventions with audio-visual media such as films showed that through post-test results there was an increase in changes in adolescent behavior

regarding changes in eating behavior, physical activity and sleep patterns<sup>18</sup>.

Short films are an educational medium that has the advantage that the main content of the discussion can be prepared beforehand, the order of presentation can be arranged quickly, charts can be taken or swapped and can be prepared easily<sup>19</sup>. Increasing the motivation for physical activity among teenagers at SMAN 3 Muaro Jambi provides readiness to learn and be independent in physical activity. Low physical activity among elementary school children is caused by several factors. These factors include the lack of adequate physical activity facilities in schools<sup>20</sup>. One way of being interested in physical activity can be done through health promotion using the right media<sup>21</sup>. Healthy lifestyle behaviors such as activity must be instilled in teenagers because their immune system is susceptible to disease compared to the immune system of adults. This is a shared responsibility, both parents and teachers at school, to teach each other and set an example for teenagers to get used to adopting a healthy lifestyle<sup>22</sup>. Apart from that, health service programs have a significant relationship with physical activity<sup>23</sup>. Irregular physical activity can be a factor in teenagers' weight gain<sup>24</sup>.

## **CONCLUSION**

There was a more significant increase in perception and motivation to do physical activity after counseling with short films compared to counseling using social media and animation for teenagers at SMAN 3 Muaro Jambi. Suggestions for further research are to examine the factors that influence perceptions and motivation for physical activity in adolescents.

## **ACKNOWLEDGEMENTS**

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## **CONFLICT OF INTEREST**

The authors declare no conflict of interest.

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## ***Effectiveness of Composter with Magic Compos System Forward Reverse Design Through Temperature and Humidity Control on Composing Quality***

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### **ABSTRACT**

*Household waste management is an important concern in an effort to reduce the potential negative impact on public health due to organic waste generation. This study aims to analyze differences in compost maturation rates based on variations in the time interval of the turning process in Magic Compost, differences in compost maturation rates based on the type of organic waste, differences in C/N ratio, carbon content, and moisture content in compost, differences in nitrogen, phosphorus, and potassium levels in compost, and differences in temperature, pH, and color in compost based on household organic waste criteria. This research uses an experimental approach with a posttest without a control group design and applies a randomized complete group design (RAKL). The tool used is Magic Compost, which is equipped with a temperature and humidity controller. The results showed a significant difference in the rate of compost maturation based on the time interval variation of the turning process on Magic Compost ( $p$  value = 0.000). The best turning time interval is 12 hours. There was a difference in the rate of compost maturation based on the type of organic waste generated by households, with mixed waste compost maturing the fastest and rice/starch waste maturing the slowest ( $p$  value = 0.001). While there was no difference in the C/N ratio ( $p$  value = 0.202), there were significant differences in the carbon content and moisture content of the compost based on the type of organic waste ( $p$  values = 0.042 and 0.000). However, there was no difference in the nitrogen and phosphorus content of the compost ( $p$  value = 0.144 and  $p$  value = 0.663). There was a difference in potassium levels in the compost based on the type of organic waste ( $p$  value = 0.000). The temperature of the resulting compost showed no significant difference ( $p$  value = 0.000), but there were differences in the pH and color of the compost based on household organic waste criteria ( $p$  values = 0.048 and 0.007). This study provides important insights into organic waste management through composting with Magic Compost, which can be an effective solution for reducing the negative public health and environmental impacts caused by organic waste generation.*

**Keywords:** Magic Compost, Turning Time, Compost Maturation Rate

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## INTRODUCTION

Household waste is waste consisting of the remains of foodstuffs, vegetables, fruit peels, used wrappers and food processing waste<sup>1</sup>. Household waste management needs to be carried out to reduce the generation of organic waste that can trigger diarrhea, skin and respiratory diseases<sup>2</sup>. With the support of science, composting methods are very important to be carried out by every individual or community group.

Currently, there are many methods of processing household waste independently, for example by sorting before disposal to the TPS by reusing especially inorganic waste such as plastic and making compost with a simple method of putting organic waste into a container and given an EM4 activator, the waste will become compost in about 7-8 weeks<sup>3</sup>. The problem with composting is that there is a wide choice of methods and activators used<sup>4</sup>, length of composting time<sup>5</sup>, temperature and humidity<sup>6,7</sup> and type of compostable organic material<sup>8</sup>, size of organic matter<sup>9</sup> as well as turning the compost<sup>10</sup> which affects the result of compost maturation and the content of C, N and P in compost.

The Composter with Magic Compos System Forward Reverse Design is an innovative composting system that utilizes temperature and humidity control to enhance composting quality. This system aims to optimize the composting process by creating an ideal environment for microorganisms to break down organic matter effectively. The forward and reverse design of the system ensures efficient mixing and aeration, which are crucial for composting. Temperature and moisture control also play a key role in the composting process. By maintaining temperature and humidity at optimal levels, these systems encourage the growth of beneficial microorganisms while inhibiting the growth of pathogens that could potentially harm human health. The result is the production of high-quality compost that is free from contaminants and rich in nutrients.

Several previous studies have investigated the effectiveness of temperature and moisture control in improving compost quality. The results of these studies show that the use of temperature and moisture control technologies can have positive results in the context of composting<sup>11,12</sup>. Therefore, this research aims to

further examine and provide a deeper understanding of the "Composter with Magic Compos Forward Reverse Design System" system as a potential method in improving the quality of compost produced. By effectively controlling temperature and humidity, it is hoped that this research can make an important contribution to the development of waste management practices that are more environmentally friendly and have a positive impact on human health and the surrounding ecosystem.

## METHOD

This research is an experimental study with a posttest without control group design approach with various treatments. The research design uses a Complete Randomized Group Design, which is a randomized group design with all treatments tried on each existing group with the aim of making the diversity of experimental units within each group as small as possible while the differences between groups are as large as possible<sup>13</sup>.

The independent variables in this study are the time interval of the reversal process, the type of organic waste produced by households, namely vegetables, rice and flour, meat and fish and fruits and variations in the time interval for reversing magic compost. The dependent variables in this study are the rate/time of compost maturation, C/N ratio, N, P, K, carbon, moisture content, color, temperature, and pH in compost produced using magic compost. The confounding variables in this study were temperature, humidity, length of turning and rotation speed of the magic compost tool. These variables were controlled according to the results of previous research, namely temperature 35-45 degrees Celsius, humidity 40-60%, 1 minute turning time and fan settings according to temperature conditions and bioactivator (EM4) 2.5 ml every 10 cm thickness.

The object of research focuses on organic waste from households. Laboratory tests were conducted at the Laboratory of the Faculty of Agriculture, Tanjung Pura University Pontianak. Tests to analyze the chemical content of mature compost such as C/N ratio elements, N, P and K and compared with SNI standards. The stages of this research in general are the preparation of materials and equipment, designing according to the results of

the initial stage of research on the dimensions of the magic compost and organic material containers, setting the work of the reciprocating machine, setting the fan and battery and setting the microcontroller for monitoring temperature and humidity, testing the tool and making reports. The design of the tool design includes the activities of calculating the optimal dimensions of magic compost and light weight to carry, designing the inner space area, designing the volume of the container, setting the working time of the reciprocating machine for compost turning, setting the fan, battery and microcontroller and designing the compost container cover.

The compost material is household waste in the form of leftover vegetables, rice, side dishes and fruit and as an activator using EM4. The composting process using the Magic Compos (Forward Reverse) composter starts with the separation of waste that will be processed, including organic waste such as vegetable scraps, food scraps, and pieces of meat or fish scraps. Waste is chopped to a size of 1-2 cm. The chopped waste is put into the composter with a thickness of 10 cm interspersed with 2.5 ml EM4 in an alternating manner until a height of 30 cm. The composter is turned on by pressing on and the temperature is set to 35-45°C, humidity 40-60%. If there is

an increase in temperature or humidity, the fan is turned on. During the composting process, stirring is done every day by tapping the stirring button on the composter.

Data analysis using Anova's difference test to analyze differences in compost maturation rates based on variations in the time interval for turning the composting process in magic compost and differences in the length of compost maturation based on variations in organic waste (vegetables, rice and flour, meat and fish, and fruit). While testing differences in C/N ratio, N, P, K, Carbon, Moisture content, temperature, pH and color of compost based on the type of organic waste (vegetables, rice and flour, meat and fish, and fruit) using the Kruskal wallis non-parametric difference test.

## RESULTS

The composter tool is designed with a compost reversal tool with a test time of 12, 18, 24 and 48 hours and to determine the difference in compost maturation rate, Nitrogen, Phosphor, Potassium, Carbon C / N ratio, moisture content, temperature, pH and color of compost produced based on the type of waste after the magic compost tool is set back the most effective reversal time interval with compost maturation rate.

**Table 1. Test result of the difference between turning time interval on compost maturation rate**

Time Lapse	Mean	Standard deviation	Lower Bound	Upper Bound	p-Value
12	7.33	0.51640	6.7914	7.8753	0.000
18	8.00	0.63246	7.3363	8.6637	
24	8.50	0.54772	7.9252	9.0748	
48	10	0.63246	9.3363	10.6637	

Based on Table 1, it is known that the reversal time interval with the fastest compost maturation rate is at an interval of reversal every 12 hours and the longest at an interval of 48 hours. The results of the difference test analysis with one-way ANOVA obtained a p-value of 0.000, meaning that there is a difference in

compost maturation rate with variations in the reversal time interval. To determine the significance value of the difference between the variation of the reversal time interval, it was further tested with LSD, with the results in Table 2.

**Table 2. LSD further test results**

Reversal process time interval (hour)	Sig.	95% Confidence Interval		
		Lower Bound	Upper Bound	
12	18	0.062	-1.3706	0.0373
	24	0.002*	-1.8706	-0.4627
	48	0.000*	-3.3706	-1.9627
18	24	0.154	-1.2040	0.2040
	48	0.000*	-2.7040	-1.2960
24	48	0.000*	-2,2040	-0.7960



**Table 3. Analysis results of temperature, pH, and color in compost based on the time interval of the turning process**

Reversal time interval	Temperature (°C)	pH	Color	Water content
12 hours	28	7,6	Brown	35
18 hours	30	7,6	developed	35
24 hours	30	7	developed	45
48 hours	35	6,5	developed	55

Based on table 3, the time interval for turning with good compost criteria according to SNI 19-7030-2004 based on the criteria of temperature, pH, color, and moisture content is the best time interval for turning every 24 hours.

Furthermore, using a 24-hour turning interval in the composting process, compost is matured with variations in the type of organic waste produced by households.

**Table 4. Results of statistical test analysis of differences in waste type with compost maturity rate.**

Maturity Rate	Sum of Squares	df	Mean Square	F	p-value
Between Groups	17.200	4	4.300	7.963	0.001
Within Groups	10.800	20	0.540		
Total	28.000	24			

Based on table 4, the p value of 0.001 means that there is a significant difference between the type of waste used as compost material and the rate of compost maturation carried out using magic compost according to the settings of temperature, humidity, and

duration of turning. Meanwhile, to find out the differences between each variation, further tests were carried out using the LSD test. The results of the analysis of differences between each type of waste and the rate of compost maturation using the LSD test can be seen in Table 5.

**Table 5. LSD test**

Type of Waste		Sig.	95% Confidence Interval	
			Lower Bound	Upper Bound
Vegetables	Rice/Starchy	0.007*	-2.3695	-.4305
	Meat/Fish	0.003*	-2.5695	-.6305
	Fruit	0.211	-1.5695	.3695
	Mixed	0.211	-.3695	1.5695
Rice/Starchy	Meat/Fish	0.672	-1.1695	.7695
	Fruit	0.101	-.1695	1.7695
	Mixed	0.000*	1.0305	2.9695
Meat/Fish	Fruit	0.044*	.0305	1.9695
	Mixed	0.000*	1.2305	3.1695
Fruit	Mixed	0.018*	.2305	2.1695

Based on table 5, there are differences in the rate of compost maturation between the types of vegetable waste with rice or flour, vegetables with meat or fish, rice or flour with a mixture of organic waste, meat or fish with fruit and a mixture, and fruit with a mixture of organic waste. The difference in the type of

organic waste used as compost material on the levels of nitrogen, phosphorus, and potassium produced in composting using magic compost was tested using the Kruskal-Wallis non-parametric statistical test. The results of the analysis can be seen in Table 6.

**Table 6. Distribution of N, P and K levels in Compost Based on Waste Type**

Type of waste	Nitrogen (%)			Phospor (%)			Potassium (%)		
	≥ 0.4	< 0.4	p-value	≥ 0.1	< 0.1	p-value	≥ 0.2	< 0.2	p-value
Vegetables	100	0		80	20		60	40	
Rice/Starchy	40	60		80	20		0	100	
Meat/Fish	60	40	0.144	80	20	0.663	60	40	0.007*
Fruit	100	0		60	40		100	0	
Mixed	60	40		100	0		100	0	

Based on table 6, it can be seen that there are differences in potassium levels in compost produced using magic compost with variations in the type of organic waste (0.007), and there are no significant differences in nitrogen and phosphorus levels in the compost produced (0.144 and 0.663). Vegetables and fruits based on 5 repetitions of the composting process have 100 percent levels  $\geq 0.4$ ; the mixture has 100 percent phosphorus levels  $\geq 0.1$

in the resulting compost; and the types of fruit waste and mixture have 100 percent potassium levels  $\geq 0.2$ . While the type of organic rice or flour waste has potassium levels in the resulting compost  $< 0.2$ , The carbon content, water content, and C/N ratio of compost produced using magic compost and the results of the difference analysis based on the type of waste can be seen in Table 7.

**Table 7. Distribution of Carbon content, Water content and C/N Ratio in Compost Based on Waste Type**

Type of waste	Carbon (%)			Water content (%)			Ratio C/N (%)		
	9.8-32	<9.8/>32	p-value	<50	$\geq 50$	p-value	10-20	<10/>20	p-value
Vegetables	60	40	0.042*	20	80	0.000*	80	20	0.292
Rice/Starchy	20	80		100	0		80	20	
Meat/Fish	60	40		100	0		40	60	
Fruit	100	0		0	100		60	40	
Mixed	100	0		100	0		100	0	

Based on the results of the Kruskal-Wallis statistical test, there is a significant difference between the type of waste with carbon content and moisture content in compost produced using the composting process with magic compost, with a p value of 0.042 and 0.00. While the C/N ratio in the compost produced shows no significant difference between the types of waste with a p value of 0.292, The type of vegetable waste had a carbon content between 9.8 and 32 percent in the resulting compost; 80 percent produced compost with a moisture content of  $\geq 50$ ; and 80 percent of the C/N ratio was between 10 and 20. The type of organic waste derived from rice or starch 80 percent has carbon levels between  $< 9.8$  and  $> 32$  in the resulting compost; 100 percent produces compost with a moisture content of  $< 50$ ; and 80 percent has a C/N ratio between 10 and 20. The type of waste that comes from meat or fish 60 percent has carbon

levels between 9.8 and 32 in the resulting compost; 100 percent produces compost with a moisture content of  $< 50$ ; and 60 percent has a C/N ratio between  $< 10$  and  $> 20$ . The type of waste originating from fruits 100 percent has carbon levels between 9.8 and 32 in the resulting compost; 100 percent produces compost with a moisture content of  $\geq 50$  and 60 percent of the C/N ratio between 10 and 20. While the type of waste that comes from a mixture of household organic waste, 100 percent, has carbon levels between 9.8 and 32 in the resulting compost, 100 percent produces compost with a moisture content of  $< 50$  and a 100 percent C/N ratio between 10 and 20.

The results of temperature, pH and color tests on compost produced through composting using magic compost based on the type of organic waste and statistical difference tests using Kruskal Wallis based on variations in waste types can be seen in Table 8.

**Table 8. Distribution of temperature, pH and color in compost based on waste type**

Type of waste	Temperature (%)			pH (%)			Color (%)		
	$\leq 30^\circ\text{C}$	$> 30$	p-value	6.8-7.5	$< 6.8/> 7.5$	p-value	developed chocolate	p-value	
Vegetables	100	0	1.000	60	40	0.048*	80	20	0.061
Rice/Starchy	100	0		100	0		40	60	
Meat/Fish	100	0		100	0		80	20	
Fruit	100	0		40	60		20	80	
Mixed	60	40		100	0		100	0	

Based on the results of the Kruskal-Wallis statistical test, there are significant differences between the types of waste with pH and color in compost produced using the composting process with magic compost, with a p value of 0.048 and 0.061. While the temperature of the compost produced shows no significant difference between the types of waste with a p value of 1.000,

The type of vegetable waste has a temperature of  $\leq 300$  °C in the resulting compost; 60 percent produces compost with a pH between 6.8 and 7.5 and a blackish color of as much as 80%. The type of organic waste derived from rice or starch produced by 100 percent has a temperature  $\leq 300$  °C and a pH between 6.8 and 7.5 in the compost produced by 100 percent, and 60 percent produces brown compost. The type of waste originating from meat or fish at 100 percent has a temperature of  $\leq 300$  °C and a pH between 6.8 and 7.5 in the compost produced by 100 percent, and 80 percent produces blackish compost. The type of waste originating from fruits: 100 percent has a temperature of  $\leq 300$  °C in the resulting compost; 60 percent produces compost with a pH  $< 6.8$  or  $> 7.5$ ; and 80 percent of the compost is brown in color. While the type of waste originating from a mixture of household organic waste has a temperature of  $\leq 300$  °C in the resulting compost, 100 percent produces compost with a pH between 6.8 and 7.5, and 100 percent of the compost produced is blackish in color.

## DISCUSSION

In the context of composting, the turning interval in the composting process with Magic Compos is a key factor in achieving effective results. The results showed that the effective turning interval to achieve an optimal compost maturation rate is 24 hours. This method may differ from the Berkeley method, where turning is done every 48 hours after the waste has been left for 4 days. This difference is due to the fact that the Berkeley method does not involve careful control of temperature and humidity, as well as different waste piles.

Turning in the composting process serves several important purposes. First, turning helps to keep the pile conditions ideal for the decomposition process carried out by microorganisms. Secondly, turning helps control the moisture content during the

composting process, which has a significant impact on the activity of decomposing microbes. The optimal compost material content is between 40 and 60%, which favors the activity of decomposing microorganisms. In addition, turning also helps to reduce excess moisture, dissipate excessive heat, and reduce the size of the waste into smaller particles, facilitating the decomposition process. The activation stage of compost materials involves shredding, applying decomposers, and stirring to even out the decomposition process, remove excess heat, introduce fresh air, and help break down waste into smaller particles<sup>14,15</sup>.

During the composting stage, the temperature of the compost pile will increase, and this is followed by an increase in the pH of the compost. Application of EM4 (Effective Microorganism 4) is one of the commonly used methods in the composting process. EM4 contains various types of decomposing microorganisms that play a role in breaking down organic matter into compost. Microorganisms such as Actinomycetes sp. bacteria have an important role in the decomposition process of organic matter into quality compost. In the context of composting household waste, understanding the time interval for turning, controlling temperature and humidity, and using decomposing microorganisms such as EM4 are important factors in achieving optimal results. Environmentally friendly waste management practices that have a positive impact on human health and the surrounding ecosystem can be realized through the application of efficient composting methods<sup>14,16</sup>.

The results of this study showed a significant effect of the type of organic waste on the rate of compost maturity, with a p-value of 0.01. This can be explained by the variation of content characteristics in compost materials that differ between types of organic waste. The fastest rate of compost maturation occurs in mixed organic waste. This is due to the fact that mixed organic waste tends to have a complementary composition, including a balanced nitrogen, phenol, potassium, and carbon content. This study is consistent with previous findings, which state that optimal compost materials contain elements such as cellulose, nitrogen, phosphorus, potassium, and carbon in a certain balance with a moisture content between 40 and 50%. Vegetable waste, for example, has the potential to contain a

variety of decomposing bacteria, such as those found in EM4 products.

In addition, the C/N ratio (carbon-to-nitrogen ratio) in waste can also be influenced by the type of organic waste and its characteristics. Moisture content below 50% requires the addition of water for microorganisms to grow properly. During composting, testing the moisture of the waste by holding and squeezing it can be an easy and effective method to determine if water addition is required. Low nitrogen content in organic matter can slow down the composting process. Based on the classification of organic matter, plant and animal remains can be divided into two categories: materials that are easily decomposed and materials that are slow to decompose. Easily decomposed materials include starch, hemicellulose, cellulose, protein, and water-soluble materials. In contrast, materials such as lignin, waxes or fats, and tannins fall into the category of materials that are difficult to decompose<sup>4</sup>.

In addition, moisture content above 60% may result in less air available for microbial activity and may cause unpleasant odors. On the other hand, if the moisture content is below 50%, the composting process will take longer to reach maturity. Similarly, pH plays an important role in nutrient availability and plant growth. Soil pH conditions around 6-7 generally support the absorption of nutrients by plant roots, while acidic or alkaline soils can affect the availability of these nutrients. Therefore, controlling pH in the composting process is key to producing quality compost. In addition, temperature also plays a very important role in the composting process, especially in reducing pathogens and harmful microbes and inhibiting weed growth. Temperatures below 20 °C can indicate the failure of the composting process, so the temperature is set in the range of 40–60 °C to achieve optimal results<sup>16–18</sup>.

It is important to note that while the types of organic waste may not differ in terms of compost temperature, they may result in differences in the pH and color of the resulting compost. This is consistent with the finding that different types of organic waste produce compost with different pH and color characteristics. Therefore, understanding the characteristics of different types of organic waste is important when producing compost according to the desired quality criteria<sup>19,20</sup>. In

composting using Magic Compos, the activation stage involves chopping the organic waste into small pieces, adding a decomposer such as EM4 to as much as 2.5 ml, and stirring to even out the decomposition process. This stage aims to ensure that oxygen and easily degradable compounds are available to mesophilic microbes. Then, the temperature of the compost pile is increased to support thermophilic microbial activity (45–60 °C), which will decompose organic matter into CO<sub>2</sub>, water vapor, and heat. The EM4 application contains various decomposing microorganisms that play a role in the composting process.

This research shows that composting with Magic Compost can produce compost that meets the quality criteria based on SNI 19-7030-2004. In this process, controlling temperature, humidity, turning interval, and understanding the characteristics of different types of organic waste play a key role in achieving optimal results. Along with more progress in this research, the next area of study could be different ways of using decomposers and moving Magic Compost around. This could lead to a more effective method that helps with managing organic waste and plant growth.

## CONCLUSION

In this study, the Magic Compost was set with temperatures ranging from 40-50°C, a rotation time of 60 minutes, and variations in the reversal interval between 12, 18, 24, and 48 hours. The study also included fan settings corresponding to a temperature rise of more than 70°C. This study shows that the 12-hour turning interval setting in Magic Compost and mixed waste composting can significantly increase the compost maturation rate, providing optimal results in the organic waste composting process. This has positive implications for efficient household waste management and composting.

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Original Article

## Health Education on Family Knowledge and Decisions in Efforts to Prevent COVID-19

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### ABSTRACT

Public knowledge and awareness about COVID-19 are essential in efforts to prevent the spread of COVID-19. Respiratory tract infections that cause mild to severe symptoms range from patients recovering after one week to acute respiratory distress syndrome (ARDS), sepsis, and septic shock, as well as multi-organ failure, including acute kidney or heart failure. The family has a vital role in maintaining health by increasing knowledge, which will ultimately influence the family in making the right decisions in dealing with COVID-19. The study aimed to determine the effect of health education on COVID-19 on family knowledge and decision-making ability. The design of this study was a quasi-experimental group in 2 groups; the intervention and control groups were 25 people each. The test used is the dependent t-test in each group, which is 5%. The results of the study of knowledge in the intervention group obtained a p-value of 0.008 < 0.05, and decision-making obtained a p-value of 0.000 < 0.05. The results of the analysis show that there is an effect of health education on knowledge. While the knowledge variable in the control group had a p-value of 0.0952 > 0.05, The decision-making variable obtained a p-value of 0.000 < 0.05. Health education can improve health by increasing knowledge and decision-making about health behavior in dealing with COVID-19 disease.

**Keywords :** COVID-19, Decision Making, Health Education, Knowledge

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## INTRODUCTION

COVID-19 (Coronavirus Disease 2019) is a disease caused by the SARS-CoV-2 virus. The virus was first identified in Wuhan, China, in late 2019 and has since spread around the world, causing a global pandemic<sup>1,2</sup>. COVID-19 has become a serious and significant health issue. COVID-19 has had a wide-ranging and serious impact around the world. The COVID-19 pandemic has affected many aspects of life, including health, economics, and social systems. Efforts are being made around the world to slow the spread of the virus, including measures such as lockdowns, travel restrictions, and public health protocols such as the use of masks and physical distancing<sup>3-5</sup>.

Outreach plays a crucial role in providing accurate, educational, and reliable information to the public so that they can understand, overcome, and reduce the risk of spreading the virus. Here are some important points that can be used as a background for counseling research for COVID-19<sup>6,7</sup>. Counseling on COVID-19 aims to provide appropriate and up-to-date information to the public regarding how the virus is transmitted, symptoms, prevention, and treatment. The amount of information circulating on social media and other platforms is often inaccurate and can lead to confusion and uncertainty among the public. Outreach can provide guidance to the public on effective prevention measures, such as hand washing, physical distancing, wearing masks, and avoiding crowds. By understanding how important these

measures are, people will be more likely to follow the guidelines set by health authorities<sup>6,8,9</sup>.

Counseling on COVID-19 can utilize technology such as mobile applications, online platforms, and social media to convey information more widely and quickly. However, it is also necessary to consider the accessibility and digital literacy of the community so that information can be accessed by all. Outreach also has a role in helping communities prepare for the post-pandemic recovery phase, including understanding vaccination, economic recovery, and adaptation to new situations<sup>10-13</sup>.

The family's ability to maintain health during a pandemic includes detecting symptoms of infection or the risk of contracting COVID-19, making the right health decisions when family members experience COVID, and implementing COVID prevention behavior. Families are also expected to be able to create a healthy home environment free from the possibility of contracting the disease and be able to play a role in their environment as an agent of change (an innovator) in health<sup>14,15</sup>. All of these family abilities will be achieved if the family has high enough knowledge about the nature, dangers, and clinical symptoms of COVID-19, as well as family knowledge in detecting whether the family is at risk or infected with COVID-19, which in turn will allow the family to make the right decision if a family member experiences COVID-19 symptoms so that they can be treated quickly and prevent more severe conditions and the spread of the virus from the family to the wider community.

Increasing family knowledge can be done by providing health education to families about COVID 19. Several studies explain the effect of health education on increasing knowledge<sup>15,16</sup>. High knowledge will be the basis for a person's decisions and actions. Increased knowledge after health counseling also increases the family's ability to make decisions<sup>17</sup>. Neglasari Urban Village in Tangerang City is one of the urban villages in Tangerang City. This village is a densely populated area that has a high risk of infectious diseases such as COVID-19, so this area is the choice of location for this research. COVID-19 is a dangerous disease that causes high mortality in humans. One of the solutions is early termination, where families must have

knowledge about the symptoms and knowledge of detecting or endangering COVID-19 infection.

## METHOD

The design of this study was quasi-experimental. The study was conducted in 2 groups. Namely, the group that received the action and the control group, each of which was given an intervention, pre-test, and post-test, were compared with the two groups. The population in this study were families who lived in Neglasari village, Tangerang City, amounting to 4,549 households. The samples involved in the study were samples that met the inclusion criteria, namely: Families who live in the Negalsari village and have a family card, are willing to be respondents, the head of the family is between 25 years - 50 years old, the head of the family has a minimum education of junior high school or equivalent, has a smartphone, does not have an acute or chronic infectious disease

The data collection was carried out in several stages. The initial stage includes managing research permits, coordinating with the field team to distribute questionnaires, preparing research instruments, conducting research sampling, and preparing research questionnaires. The second implementation stage includes explaining and filling in the consent form and filling out the questionnaire by the respondent. Then the respondent was given a questionnaire which was a variable about questions about the respondent's knowledge and attitudes about the material of the covid 19 disease, recognizing early symptoms and knowing that they were infected and at risk of being infected with covid 19 as well as the decisions taken by the family regarding this condition. Respondents were given Health Education on COVID-19 disease material with lectures, discussion, and brainstorming methods. Meanwhile, to find out if someone has been infected or is at risk of being infected by using a smartphone application. Furthermore, a post-test is carried out to determine changes in the knowledge and abilities of respondents in making decisions.

The data were analyzed using univariate and bivariate analysis. Univariate analysis in this study was used to determine the frequency distribution of respondents' knowledge and ability in decision-making

before and after health education was carried out in the intervention and control groups. For the knowledge variable using, a questionnaire consisting of 10 questions

The univariate analysis also determined respondents' knowledge and ability to make decisions before and after health education was carried out in the intervention and control groups. Bivariate analysis was conducted to determine the difference between the two variables before and after using the T statistical test. Tests dependent, then tested with = 5% (0.05). If the p-value is 0.05, then the difference is significant (significant).

The research protocol has been approved by the Poltekkes Kemenkes Semarang ethics committee with registration no. 0545/EA/KEPK/2022. Written consent was obtained from all respondents

## RESULTS

Table 1 shows that almost half (36%) of respondents in the intervention group are in the range of 26–45 years old and are adults, while based on gender, all of them (100%) are male. Based on the education level of the respondents, almost half (48%) have secondary education. By occupation, almost all (76%) are employed. Based on the type of family, the majority (64%) are of the extended family type. Based on having been infected with COVID-19, almost all (80%) have never contracted COVID-19.

In Table 1, it is known that the age of respondents in the control group is in the range of 26–45 years, which is an adult age, while based on gender, most (56%) are male. Based on the education level of the respondents, almost half (40%) have higher education levels. By occupation, most (56%) are employed. Based on the type of family, almost all (88%) are of the extended family type. Based on having been infected with COVID-19, almost all (76%) have never contracted COVID-19.

**Table 1. Respondent Characteristic**

	Intervention Group		Control Group	
	n	(%)	n	(%)
Age				
17-25	0	0	2	8
26-45	9	36	20	80
46-55	8	32	2	8
>55	8	32	1	4
Total	25	100	25	100
Gender				
Male	25	100	14	56
Female	0	0	11	44

Total	25	100	25	100
Education				
Elementery	11	44	7	28
Junior	12	48	8	32
Degree	2	8	10	40
Total	25	100	25	100
Occupation				
Un employee	6	24	11	44
Employee	19	76	14	56
Total	25	100	25	100
Family Type				
Main	9	36	22	88
Big	16	64	3	12
Total	25	100	25	100
Have Been Infected Covid-19				
No	20	80	19	76
Yes	5	20	6	24
Total	25	100	25	100

**Table 2. Distribution of Average Knowledge Before and After Activities in the Control Group and the Intervention Group**

Variable:	Mean	SD	Min	Max
<b>Knowledge</b>				
<b>Intervention Group</b>				
Score before intervention	7.00	1.979	1	9
Score after intervention	7.92	1.441	4	9
<b>Control Group</b>				
Score before intervention	7.88	1.563	3	10
Score after intervention	7.88	1.394	5	10

Based on table 2 in the intervention group, the average pre-test value of knowledge was 7.00 and the standard deviation value was 1.979 with the lowest knowledge score before being given health education and the highest score of 9. After being given health education, the average score was obtained. the post-test value of 7.92 and the standard deviation of 1.441 with the lowest knowledge score of 4 and the highest score of 9. While in the control group, the average pre-test value of knowledge was 7.88 and the standard deviation value was 1.563. with the lowest knowledge score of 3 and the highest score of 10. Meanwhile, the post test results have an average value of 7.88 and a standard deviation of 1.394 with the lowest knowledge score of 5 and the highest score of 10.



**Table 3. Distribution of Average Decision Making Before and After Action in Control Group and Intervention Group**

Variable:	Mean	SD	Min	Max
<b>Decision Making</b>				
Intervention Group				
Score before intervention	23.28	3.680	18	33
Score after intervention	26.52	3.002	21	35
Control Group				
Score before intervention	21.88	3.778	15	28
Score after intervention	23.24	3.756	17	31

Based on table 3 in the intervention group, the average pre-test score for decision-making was 23.28 and the standard deviation was 3.680 with the lowest score before being given health education was 18 and the highest score was 33. After being given health education, the average score was obtained. The average post-test score is 26.52 and the standard deviation value is 3.002 with the lowest decision-making score of 21 and the highest score of 35. While in the control group, the average pre-test value of decision-making was 21.88 and the score was 21.88. the standard deviation of 3.778 with the lowest decision-making score of 15 and the highest score of 28. Meanwhile, the post-test results have an average score of 23.24 and a standard deviation of 3.756 with the lowest decision-making score of 17 and the highest score of 31.

**Table 4. Differences in decision making before and after intervention through health education**

Variable	Mean		p value
	Pre	Post	
Intervention	23.28	26.52	0.000
Control	21.88	23.24	0.005

Based on table 4, the results of the p-value of the t-dependent test on the decision-making variable of the intervention group are 0.000. These results mean less than 0.05, and it is concluded that health education affects decision-making in the intervention group. Meanwhile, the p-value of the t-dependent test in the control group is 0.005. These results mean that it is less than 0.05, and it can be concluded that  $H_a$  is accepted and that there is an increase in the decision-making of the control group in the second measurement.

## DISCUSSION

Knowledge is the result of knowing, and this occurs after someone senses a certain object that is influenced by the learning process.<sup>18</sup> According to Putri, 2020<sup>19</sup> there are several factors that influence knowledge, including age education, occupation, experience. In table 2 it is known that the average distribution of knowledge before health education is 7.00 and after intervention 7.92 with a mean difference of 0.92 and p value  $0.008 < = 0.05$ . While in the control group there was no change in the value of the second measurement. These results show that there is an effect of health education on increasing family knowledge.

Table 1 shows the characteristics of respondents in the intervention and control groups almost no different except for education. It can be seen that the intervention group is in the age range of 17-35 years (36%) which is the adult age group. At this age stage, mental and cognitive maturity has been perfectly formed so that it is easy to receive information that can increase knowledge from 7.00 to 7.92. Likewise in the control group where most of them are in the age range of 17-35 years (80%) with a pre-test result of 7.88 but in the second measurement the results are the same, which does not show an increase in knowledge. The educational characteristics of the intervention group were mostly at the secondary education level (48%) and the control group was mostly at the higher education level (40%). This provides information that the first measurement in the intervention group and the control group had different results. The educational characteristics of the control group are mostly higher education, while the intervention group are mostly secondary education so that in the first measurement the knowledge of the control group is higher than the intervention group, but after being given health education the intervention group has a higher knowledge value than the control group who is not given health education.

In this study, knowledge was provided through health education to families about covid 19. The material explained about the covid virus, transmission, clinical symptoms, signs of conditions that endanger covid 19. Then it was also explained how to prevent it and detect whether a person is at risk of being exposed to covid 19 disease and actions that can

be taken as an effort to overcome when exposed to covid 19.

The information submitted to the respondents became a new source of knowledge which further expanded the knowledge of respondents as shown in table 4.2 where there was an increase in knowledge from 7.00 to 7.92 after Health Education. This result is the same as the results of several studies with Health Education variables to increase respondents' knowledge about covid 19, such as research by Dyananingsih and Suprapti (2021)<sup>15</sup>.

The family's ability to make the right decisions depends on the knowledge the family has about COVID-19, including the nature and characteristics and symptoms of mild and severe COVID-19. According to Notoadmojo, (2012) health education can change the knowledge of a person or society in taking health-related actions<sup>18</sup>. The results of the study in table 4.3 show an increase in decision-making abilities in the intervention group from a value of 23.28 to a value of 26.52 with a mean difference of 3.24. The maximum value of 33 became a value of 35, p value 0.000 <0.05, while in the control group there was also an increase in value but not as much as in the intervention group.

There are several family duties in health, including recognizing health problems obtained through knowledge and making decisions related to health problems that are happening in the family. Accuracy and speed of decision making are needed in dealing with the ferocity of the COVID-19 disease. Failure to make decisions in this case has a fatal impact because many people have died and this disease has even become a pandemic for two years.

Improved decision making in the intervention group begins with increasing knowledge because knowledge about covid 19, especially the symptoms, dangers and actions that must be taken in dealing with covid 19 becomes the basis for someone in making the right decisions. The results of this study are the same as the results of research by Fitri, (2022) entitled The Effect of Health Education About Covid-19 to Family Heads on Covid-19 Prevention Behavior in the Banjar I Community Health Center Work Area, although the dependent variable is different, namely covid prevention behavior<sup>20</sup>.

There was an increase in the value of decision making in the second measurement of the control group because it was supported by

the age range of 17-35 years (80%) and most of the education included college education (40%). These two factors affect the maturity and critical thinking of respondents in making decisions when facing a problem in health in the family

## CONCLUSION

Decision-making in the intervention group obtained an average pre-test score of 23.28 and a standard deviation of 3.680, the lowest score was 18, and the highest score was 33. After being given health education, the average score was 26.52, and the standard deviation value was 3,002 with the lowest decision-making score of 21 and the highest score of 35. There is a mean difference of 3.24 with a p-value of 0.000 <0.05, which means that there is an effect of Health Education on the ability of families to make decisions

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Original Article

## ***Effectiveness of the Sensitive Nutrition Intervention Program in Accelerating Stunting Reduction in Baubau City***

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### **ABSTRACT**

*Stunting is a condition of failure to thrive in toddlers due to long-term malnutrition, exposure to repeated infections, and lack of stimulation. Not all short toddlers are stunted, so pediatricians need to differentiate them, but stunted children are scarce. Responding to this problem, the government issued Presidential Regulation (Perpres) Number 72 of 2021 concerning the Acceleration of Reducing Stunting. This regulation is a form of the government's commitment to accelerating the achievement of the stunting reduction target to 14 percent by 2024. This research aims to describe the effectiveness of a sensitive nutrition intervention program to accelerate stunting reduction in Baubau City, focusing on the accuracy of program targets and program outreach. The research used a qualitative design with a phenomenological approach. Data was collected through in-depth interviews with six informants, while secondary data came from related regional government organization (OPD) data. The data was then analyzed in several stages: data collection, reduction, presentation, and conclusion drawing. The research results show that based on indicators of the accuracy of program targets and program outreach in sensitive nutrition intervention programs, the acceleration of stunting reduction in Baubau City has been running effectively even though it has not significantly contributed to reducing the stunting prevalence rate. The decline in the stunting prevalence rate of only 1% shows that the accuracy of program targets still needs to be improved. Access to drinking water and sanitation, community recipients of PKH benefits, and the formation of farming community groups in the future must be several things that need to be maximized to achieve an accelerated reduction in stunting in Baubau City. In conclusion, the consistency of policy implementers must be bound by a shared commitment and shared goals and understanding in efforts to reduce the prevalence of stunting.*

**Keywords:** *Effectiveness, Sensitive Nutrition Intervention, Stunting*

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## **INTRODUCTION**

Stunting is an increasingly common problem in developing countries, including Indonesia. Based on the 2021 Indonesian Nutrition Status Survey (SSGI) results carried out by the Ministry of Health, the stunting prevalence rate in Indonesia in 2021 was 24.4%. Basic Health Research (RISKESDAS) data shows that the prevalence of stunted toddlers has reached 30.8

percent, which means one in three toddlers is stunted. Indonesia is the country with the 2nd highest burden of small children in the Southeast Asia region and 5th in the world.

Stunting (dwarf) is when a toddler has less length or height than age. This condition is measured by body length and size that is more than minus two standard deviations from the median of WHO child growth standards. Stunted toddlers are a chronic nutritional problem caused

by many factors such as socio-economic conditions, maternal nutrition during pregnancy, infant pain, and lack of nutritional intake in babies, which means that in the future, these stunted babies will experience difficulties in achieving physical and cognitive development<sup>1</sup>.

Stunting (short) or chronic malnutrition is another form of failure to thrive<sup>2</sup>. The World Health Organization (WHO) defines stunting as a condition where the body is so short that it exceeds a deficit of 2 SD below the median length or height international reference population<sup>3</sup>. Stunting has an impact on children starting from the beginning of the child's life and will continue throughout the human life cycle<sup>4</sup>.

According to the Ministry of Health, stunting is a condition of failure to thrive in toddlers due to long-term malnutrition, exposure to repeated infections, and lack of stimulation. Not all short toddlers are stunted, so pediatricians need to differentiate them, but stunted children are scarce<sup>5</sup>.

In the short term, the harmful impacts that can be caused by nutritional problems (stunting) are disruption of brain development intelligence, physical growth disorders, and metabolic disorders in the body. Meanwhile, in the long term, the negative consequences that can arise are decreased cognitive abilities and learning achievement and uncompetitive work quality, which results in low economic productivity<sup>6</sup>.

Several non-medical factors, such as the socio-economic level of the community, can trigger stunting. Children born to highly educated parents are less likely to experience stunting compared to children born to low-educated parents<sup>7</sup>. Economic conditions also have a significant effect on the incidence of stunting in children aged 0-59 months. Children from families with low financial status tend to receive less nutritional intake<sup>8</sup>. In the results of his research Akombi et al., (2017) the family's economic status dramatically influences the child's health. Financial situation is closely related to the ability to provide nutritional intake and health services for the family<sup>9</sup>.

Responding to this problem, the government issued Presidential Regulation (Perpres) Number 72 of 2021 concerning the Acceleration of Reducing Stunting. This

regulation is a form of the government's commitment to accelerating the achievement of the stunting reduction target to 14 percent by 2024, by the mandate of the 2020-2024 National Medium Term Development Plan. This Presidential Decree also strengthens the implementation of the National Strategy for the Acceleration of Reducing Stunting 2018-2024, which aims to reduce the prevalence of stunting, improve the quality of preparation for family life, ensure the fulfillment of nutritional intake, improve parenting patterns, increase access and quality of health services and increase access to drinking water and sanitation<sup>10</sup>.

This regulation is a reference for the national scale stunting reduction acceleration program. Stunting prevention is one of the areas of focus in health development because growth at an early age is an important thing to pay attention to. One of the causes of stunting can arise from environmental factors and the food consumed, whether looking at the source of nutrition or vitamins. By looking at the percentage increase in stunting, currently in Indonesia, it is being intensified in each region based on government supervision.

This research aims to describe the effectiveness of a sensitive nutrition intervention program to accelerate stunting reduction in Baubau City, using indicators of program effectiveness proposed by Budiani, namely accuracy of program targets, program outreach, program objectives, and program monitoring<sup>11</sup>. However, in this research, the author only focuses on program targets' accuracy and socialization.

## **METHOD**

This research uses a qualitative method with a phenomenological approach. This research was carried out in the city from January to July 2023. Data was collected through in-depth interviews with six informants, while secondary data came from related regional apparatus organization (OPD) data. The data was then analyzed in several stages: data collection, reduction, presentation, and conclusion drawing.

Data were obtained from document sources, interviews, and direct observation of actors participating in sensitive nutrition

intervention programs to accelerate stunting reduction. All evidence of the origins of these findings was determined using a purposive sampling technique. Namely, the data sources were selected only from data that could explain the research focuses, namely the effectiveness of sensitive nutrition intervention programs to accelerate stunting reduction in Baubau City.

The validity of the data can be obtained by carrying out a triangulation process that consists of (1) Source Triangulation, namely by checking data that has been found from various sources such as interview results, archives and other sources, (2) Technical Triangulation, namely by checking data with the same source but with Different techniques such as rechecking the interview results with the results of observations, (3) Time triangulation, namely by checking the data obtained at different times and situations again until valid data is obtained.

## **RESULTS AND DISCUSSION**

According to Mahmudi (2015), Effectiveness is the relationship between output and goals; the more significant the contribution (contribution) of the production to achieving goals, the more influential the organization or activity program will be <sup>12</sup>. Effectiveness refers to the ability to have appropriate goals or achieve predetermined goals <sup>13</sup>. Effectiveness is also related to the problem of how to achieve goals or results obtained, the usefulness or benefits of the results obtained, the level of functional power or elements or components, and the level of user satisfaction.

From the definitions above, effectiveness is a measure of success in achieving a predetermined goal. It is likely effective if the specified objectives are achieved. Researchers see two indicators of program effectiveness: the accuracy of program targets and program socialization.

### **Accuracy of Program Targets**

The accuracy of the program target is the suitability of the beneficiaries of the sensitive nutrition intervention program to accelerate stunting reduction with the program targets that

have been determined, namely communities or families at risk of stunting in Baubau City.

Based on interviews with informants, information was obtained that this sensitive nutrition intervention target program was implemented based on Presidential Regulation Number 72 of 2021 concerning the Acceleration of Reducing Stunting, which was then followed by Baubau Mayor Regulation Number 15 of 2022 concerning Accelerating the Reduction of Integrated Stunting. The regulation states that the target of sensitive nutrition interventions is the community or family.

Informant HM revealed that the Baubau City PUPR Service's intervention in the management and development program for the drinking water supply and waste water systems is one of several mandatory activities embedded in the PUPR Service's primary duties and functions. Every year, the PUPR service will allocate a budget for these activities, the amount adjusted to the regional financial capacity. The location of the activity implementation is also the physical work related to drinking water and sanitation carried out by the PUPR Service, always starting with planning starting from the musrebang stage at the sub-district, sub-district, and so on levels. Determining the location of activities is not based on the stunting locus area alone but also pays attention to the urgency and level of availability of facilities built in the area.

Despite this, researchers assess that each PUPR Department remains committed to accelerating efforts to reduce stunting in Baubau City. This can be seen in the activities to improve the SPAM pipeline network in Baadia Village, FY 2021; Development of the home connection distribution network in Palabusa Village, T.A 2022; Development of the Sukanayo sub-district house connection distribution network T.A 2023; and Construction of individual scale septic tanks in Tomba Village, T.A. 2022". All development locations are by the priority sub-districts for preventing and handling stunting in Baubau City in 2022 as stated in Baubau Mayor Regulation Number 601 of 2021 concerning the Determination of Priority Sub-districts for Stunting Prevention in Baubau City in 2022. The priority sub-districts are Labalawa, Kempeonaho, Tampuna, Palabusa, Waborobo, Sukanayo,

Katobengke, Kantalai, Kolese, Kalialia, Liwuto, Lowu-lowu, Lipu, Sulaa and Tomba.

In the social service interviews conducted with MI, information was also obtained that the social protection programs implemented by the Baubau City Social Service include the Family Hope Program (PKH) and Non-Cash Food Assistance (BPNT), national programs. The target of this program is not based on data on families at risk of stunting issued by the Population Control and Family Planning Service (DPPKB) but is based on data from the Integrated Social Welfare Data (DTKS) application, which is input by each operator in the DTKS which is spread across all sub-districts. The program has its indicators, such as having at least one of the following categories: pregnant women, babies/toddlers, early childhood, and school-age children (elementary, middle school, high school), and is aimed at underprivileged communities.

Due to differences in data sources and program target priorities, Social Services has not yet been able to confirm what percentage of people at risk of stunting have been recorded in the social security program. Although the Baubau City Social Service remains committed to accelerating stunting reduction through training and increasing the capacity of DTKS operators in sub-districts, it hopes to prioritize people experiencing poverty and worthy of assistance because they are a group most susceptible to the threat of stunting.

However, based on researchers' observations, the slow completion of data sorting carried out by the Social Service from 2021 since the Mayor's Decree on Accelerating Stunting Prevention was issued until mid-2023 shows a lack of seriousness in dealing with the problem of stunting and even though the requirements for PKH recipients are similar to the indicators for families at risk of stunting, PKH takes into account the condition of the family's economic environment while determining the status of a family at risk of stunting does not. So researchers can recommend that they carry out data comparisons because this is a very urgent stage to carry out, anticipating the existence of people with underprivileged status who are also at risk of stunting. Moreover, the nominal amount of PKH

Program assistance will be beneficial in terms of the socio-economic environment of the community.

Likewise with the PUPR Service and Social Service, based on the results of interviews with DM, the target of the Agriculture and Food Security Service intervention program is also not based on the status of communities or families at risk of stunting. A form of sensitive nutrition intervention is by carrying out group development activities for the use of the yard, Ensuring the availability and supply of resources needed by the community, and Encouraging community participation in food-independent area programs. This program targets areas where people have home gardens. This program has been implemented in several regions of Baubau City, such as Gonda, Kadolokatapi, Karya Baru, Palabusa, and parts of Lipu. The yard can be used for planting. Meanwhile, in urban areas where community activities are predominantly traders and in small yards, intervention cannot be carried out even if families are at risk of stunting.

At the Population Control and Family Planning Service (DPPKB) and the Health Service, the interventions target communities or families at risk of stunting. This is as per the results of interviews with informant YA that the DPPBK is implementing a sensitive nutrition intervention program, namely by implementing nutritional counseling and family development interventions through data collection activities on the targets of the stunting risk family program, Carrying out case mapping of families at risk of stunting, and Forming a Family Assistance Team (TPK) at risk of stunting.

Regarding TPK, in Baubau Mayor Regulation Number 15 of 2022 Article 1, it is stated that "The Family Assistance Team, from now on abbreviated to TPK, is a group of personnel formed and consisting of midwives, TP PKK cadres, and KB cadres to carry out assistance including counseling, facilitation of referral health services, and facilitating social assistance programs for prospective brides/prospective couples of childbearing age, pregnant women, postpartum mothers, children aged 0-59 months as well as conducting surveillance of families at risk of stunting to detect early risk factors for stunting.

Informant YES also revealed that DPPKB cadres collected data on the targets of the stunting risk family program, numbering 315 people spread across eight sub-districts and 43 in Baubau City. Data collection on families at risk of stunting is determined based on indicators of whether or not there are family members who are pregnant women, postpartum mothers, toddlers, and unmarried young women. If there are any errors in the family among these indicators, then the family is at risk of stunting. After the data was collected, mapping was carried out, followed by the formation of the TPK, which was also spread across eight sub-districts, 43 sub-districts in Baubau City, and DPPKB cadres. This TPK provides education, counseling, and outreach to families at risk of stunting.

This information shows that intervention through data collection and mapping can be appropriately on target because it is carried out by DPPKB cadres who, apart from being competent, are also given clear data collection indicators and are spread throughout all sub-districts and sub-districts throughout Baubau City. Apart from that, the informant also explained that in carrying out their duties, the TPK collaborated or joined in posyandu activities carried out regularly by the Health Service. There are tables for health workers and also TPKs. On average, people who come to the community health center are categorized as being at risk of stunting. There, TPK cadres provide education or outreach regarding nutrition or other matters related to stunting prevention.

Informant YA added that the Health Service carried out interventions in various activities such as socialization of Blood Supplement Tablets (TTD) for young women in schools, validating cases of nutritional problems, and reviewing stunting integration performance. The program targets babies, toddlers, pregnant women, breastfeeding mothers, and teenage girls or young adults. This program has become routine by health officers and cadres in posyandu activities at community health centers. Based on the results of interviews, it is also known that the Health Service always routinely carries out posyandu activities at least ten times in each community health center spread across Baubau City. In this activity, various handling activities

such as illumination and others. Thus, the sensitive nutritional interventions carried out by the Health Service have been right on target.

However, observing one of the posyandu implementations at the Bukit Wolio Indah Community Health Center, it appears that the cadres actively provide education and outreach per their duties. However, there were people there who seemed serious about paying attention to what the cadres said, but there were also those who seemed indifferent. This is found <sup>1</sup> The response of the program's target group will significantly influence how the program achieves its results. In the stunting intervention program, two answers will be obtained: a positive response and a negative one.

There are different intervention targets in program implementation for each OPD involved. Some target society in general, but some only focus on communities or families at risk of stunting. In this way, researchers think that the program targets that have been set need to be reviewed again, considering that the indicators for program implementation are always different, although it cannot be denied that each program has a significant impact on efforts to reduce stunting prevalence. A policy has no significance without being accompanied by genuine efforts made with programs, activities, or projects. A program as a comprehensive plan must clearly describe the targets to be achieved so that implementers do not have multiple interpretations of the program <sup>1</sup>.

Likewise, Ramadhan (2022) states that organizational effectiveness must begin with clarity on the goals to be achieved to make it easier for the organization and its parts to determine strategies for achieving the set goals<sup>14</sup>. This is no exception to program effectiveness because programs are part of efforts to achieve organizational goals.

Differences in interpretation occurred, where initially, the DPPKB released data on families at risk of stunting. For the Health Service, this data will serve as a guide in implementing various interventions. This is different from other OPDs. For example, the PUPR Service in building access to drinking water and sanitation does not focus on communities with family status at risk of stunting



but all communities. Next, for example, the Social Service provides PKH or other assistance with its standards. The most important thing is that the community is categorized as poor or unable.

Meanwhile, determining whether people are at risk of stunting, poor or rich, is not an indicator. This difference, of course, also impacts the recipients of interventions carried out by the Social Service. Then, the Department of Agriculture and Food Security, in forming farming community groups to implement Sustainable Food Yards (P2L), was also not based on whether the family's status was at risk of stunting. But in communities that have readiness, especially land/house yards.

So, according to researchers, the standards or indicators for determining people with family status at risk of stunting issued by the DPPKB should consider the condition or economic situation of the community. Why is that? Because stunting is a condition of chronic malnutrition, and this condition is prevalent in communities or families who experience economic limitations. Most of them eat to survive, but food quality and nutritional content are not considered. Even if they know it is essential, economic deprivation limits their options. They also prefer alternative medicine, drinking traditional herbs or other things when sick. The government providing just for control to health facilities is very rare. Apart from calculating costs, even just travel costs, they always spend time working and earning a living.

### **Program Socialization**

Program socialization delivers information related to sensitive nutritional intervention programs to accelerate stunting reduction to communities or families at risk of stunting in Baubau City. Program socialization is the starting point that determines the program's success in achieving its goals. Therefore, program socialization must be carried out in planned and systematic ways by utilizing the resources owned by an organization to achieve the intended purposes. Communication from each OPD in implementing its intervention programs to accelerate the reduction of stunting does not only lie with its officials but also requires communication in the form of outreach to the

people of Baubau City as program targets, both directly and indirectly.

Regarding the implementation of program socialization at the PUPR service, the results of interviews with HM informants revealed that socialization of intervention programs was carried out through coordination meetings with stakeholders in sub-districts and the community and also form/appoint several people to become Field Facilitators in the sub-districts that are the location of activities to carry out socialization and supervise program implementation.

DM informants for the intervention program carried out by the DPPKB were often socialized. Especially in the Baubau City level stunting consultation activities by presenting the relevant OPD Team included in the Stunting Handling Acceleration Team. Socialization was also carried out in mini-workshops at sub-district and sub-district levels, and stunting status audit activities were carried out directly in the field involving the DPPKB team, Health Service, and TPK. Then, the results are submitted to the expert team to obtain the RTL for stunting action. Apart from that, the DM informant also revealed that socialization by the DPPKB was also carried out at posyandu activities with the health service. Direct socialization is carried out face-to-face with the community. For example, if there is a pregnant woman, the DPPKB officer will ask several questions, such as how many children she has. If the mother has a second or third child, she will be advised to use contraception and many other things, the essence of which is to maintain and minimize the risk of stunting.

The information above shows that the socialization of the implementation of the stunting reduction acceleration intervention program has been carried out by both PUPR and DPPKB. For the socialization program carried out by the DPPKB in conjunction with posyandu activities. So that the process of socializing the intervention program is also carried out in an integrated manner.

Next, the Health Service, informant YES, also provided information that outreach regarding stunting was carried out through stunting publications, stunting discussions, stunting socialization in sub-districts, sub-districts,

Posyandu, schools, and coordination meetings across related OPDs. Apart from that, the socialization process is becoming more massive with the involvement of the Information and Communication Service, which is responsible for socializing stunting both through online and print media.

The outreach carried out by the Health Service is not only limited to delivering material but also takes the form of direct action. This is the same as the information obtained from informant YA in socialization activities at schools targeting young women. Health workers, accompanied by nutrition officers, give blood supplement tablets to young women. It is recommended that these tablets be taken directly in the officer's presence, provided that the participant has had breakfast first. Apart from that, the informant, YA, provided information that the Health Service, through community health centers, routinely conducts classes for pregnant women. This class is a forum for health workers to provide various understandings regarding stunting to prospective mothers, especially regarding the urgency of the 1000 First Days of Birth (HPK).

At the Social Service, the MI informant also explained that the socialization of the intervention program was carried out through coordination meetings at sub-district and sub-district levels, which aimed to ensure that underprivileged families were included in the DTKS (Integrated Social Welfare Data) application, according to predetermined indicators, for example, a Certificate of No Capable (SKTM) which is strengthened by direct verification in the field. After input, a village-level deliberation is held and published in the Minutes. The next stage is that the Minutes are deposited with the Social Service and included in the SIS-NG application. The Ministry of Social Affairs will verify the data that has been input. Apart from that, outreach was also carried out to program beneficiaries, as he said as follows:

PKH Recipient Group meetings at least once a month or up to 2/3 times a month, depending on the urgency of the socialization material or data needed. PKH recipients in each sub district are grouped based on proximity to residence, with the number of members varying from 15-30 KPM. Specifically in 2022 and 2023,

the material discussed is a stunting prevention and management module which consists of 15 material sessions, namely: 1) Stunting problems; 2) Supporting Pregnant Women in Accessing Appropriate Information and Services Available in the Community; 3) Supporting the Daily Care of Pregnant Women; 4) Supporting Mother and Father to Provide Stimulation to the Fetus; 5) Prevention and Handling of Stunting through Fulfilling the Welfare of Newborn Babies and Breastfeeding Mothers; 6) Supports the provision of Stimulation to newborn babies; 7) Supports the provision of Stimulation to babies aged 6 - 12 months; 8) Supports the provision of Stimulation to children aged 1-2 years; 9) Supports the provision of Stimulation to children aged 2-6 years; 10) Utilization of Social Assistance to Fulfill Nutrition for Children and Pregnant Women; 11) Support the practice of washing hands with soap (CTPS); 12) Supporting the Use of Healthy Latrines; 13) Mapping the Potential of Self, Family and Surrounding Environment; 14) Supporting Families in Accessing the Referral System for Handling Stunting Children and 15) Commitment to Implementing Follow-up Plans.

Program socialization was also carried out by the Department of Agriculture and Food Security as the results of interviews with informant YN explained that socialization on using sustainable food yards (P2L) had been carried out at both sub-district and sub-district levels. P2L is a form of utilization of homeyard land by community groups who jointly utilize homeyard land as a sustainable source of food. This is also explained in Baubau Mayor Regulation Number 15 of 2022 article 1, which demonstrates that Sustainable Food Yards, abbreviated as (P2L), are activities carried out by community groups who jointly cultivate yard land as a sustainable source of food to increase the availability, accessibility, utilization, and income.

Meanwhile, YN revealed that Bappeda plays a role in socializing and ensuring that the stunting intervention program is included in the OPD Renja according to its function, including planning and budgeting for sub-districts through sub-district funds. The implementation of socialization is a form of government awareness, in this case, TPPS, in its efforts to accelerate the reduction of stunting, which, of course, does not

only lie with the apparatus but also requires communication in the form of outreach to the people of Baubau City, both directly and indirectly. This needs to be implemented because, after all, the people of Baubau City are the main object of implementing interventions to accelerate stunting reduction, compassionate nutrition interventions as the subject of this research.

Socialization in cross-OPD meetings shows that the implementation of sensitive nutrition intervention programs is built with coordination. In various cases, the performance of a program sometimes needs to be supported and coordinated with other agencies to achieve the expected success<sup>2</sup>. However, Van Meter and Van Horn stated that social-environmental factors, including economic conditions greatly influence the successful implementation of a program<sup>1</sup>.

Socialization and various campaigns related to the prevention and dangers of stunting will not significantly impact stunting prevention. This is again because stunting is closely related to the quality of housing and community food. The government also cannot rely on the sensitive nutrition intervention program currently being implemented. In the long term, the government should not continue to act as the leading actor in stunting prevention because as long as poverty and economic difficulties are still the dominant color in people's lives, it is only time to wait for new stunting cases to emerge. For this reason, society must be empowered economically. Apart from implementing various stunting prevention intervention programs, the government must also pursue policies and programs that can encourage increased employment and community welfare. The improvement in the economic aspects of society will promote improvements in the quality of housing and food consumed. This means that people can intervene for themselves and their families against the risk of stunting. Therefore, to support socialization that has been carried out well, the government must also start improving aspects of the community environment, especially the community's economic climate.

## CONCLUSION

This research concludes that based on indicators of the accuracy of program targets and program outreach, the sensitive nutrition intervention program to accelerate stunting reduction in Baubau City has been running effectively even though it has yet to significantly contribute to reducing the stunting prevalence rate. The decline in the stunting prevalence rate of only 1% shows that aspects of achieving program goals still need to be improved. Access to drinking water and sanitation, community recipients of PKH benefits, and the formation of farming community groups in the future must be several things that need to be maximized to achieve an accelerated reduction in stunting in Baubau City. Apart from that, there needs to be attention and improvement efforts made by the government to strengthen the socio-economic aspects of society, especially for poor and low-income groups. The hope is that in the future, the community will not depend on intervention programs carried out by the government, but rather, the community will intervene independently to protect themselves and their families from the dangers and risks of stunting.

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## ***Study of Anemia, Hemoglobin Level, and Subjective Well-being among Women of Reproductive Age in Indonesia***

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### **ABSTRACT**

*Anemia is a burden for women of reproductive age (15 – 49 years old) which in Indonesia takes 22.3% of prevalence based on Basic Health Survey data in 2018. Women of reproductive health have different points of view according to their subjective well-being. This study aimed to examine the correlation between anemia status and hemoglobin level related to subjective well-being among women of reproductive age. This cross-sectional study used the Indonesia Family Life Survey (IFLS) wave 5 in 2014/15 with a total study sample were 12,818. Subjective well-being is self-reported data with categories satisfied, somewhat satisfied, and not satisfied. Hemoglobin level is measured by blood test and if the Hb level is less than 12, it will be categorized as anemia. This study tested the analysis of univariate, bivariate (Chi-square and ANOVA), and multivariate (multinomial logistic regression) using STATA version 17. The findings revealed that anemia and hemoglobin levels did not have a correlation with subjective well-being. However, some other covariates were found significantly associated with having satisfied subjective well-being including being married, pregnant, having poor SES, more than adequate of family life satisfaction, and adequate and more than adequate standard of life, with RRR 1.21, 1.21, 0.63, 1.77, 1.19, and 1.74, respectively. It is concluded that subjective well-being is associated with not only health aspects but also social and economic. Intervention in the level of community is needed to improve the quality of life to achieve satisfied well-being. For example by joining the social group at the village level. Future study can include other health-based predictors at individual level that potentially predict subjective well-being.*

**Keywords:** *Anemia, Hemoglobin Level, Indonesia Family Life Survey, Women of Reproductive Age, Subjective Well-Being*

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### **INTRODUCTION**

Anemia is a medical condition characterized by a deficiency of red blood cells or hemoglobin in the blood. It can have various impacts on an individual's well-being, including subjective well-being. Subjective well-being refers to an individual's self-perceived happiness, life satisfaction, and positive affect<sup>1</sup>. Research has shown that anemia can have a negative impact on subjective well-being. A study conducted on pregnant women found that the severity of anemia had a significant effect

on their quality of life, which encompasses physical, mental, and social well-being<sup>2</sup>. Another study on elderly patients found that chronic anemia was highly associated with fatigue, which is a subjective sensation of weakness, lack of energy, and tiredness<sup>3</sup>. Furthermore, socioeconomic status (SES) has been found to be linked to subjective well-being. Lower SES is often associated with reduced access to material and social resources, as well as higher levels of stress-inducing conditions. These factors can negatively impact child well-being and overall subjective well-

being<sup>4</sup>.

Anemia is a medical condition characterized by a decrease in the number of red blood cells or a decrease in the amount of hemoglobin in the blood. It can have significant effects on an individual's health and well-being. One study conducted on pregnant women in Yogyakarta found that the severity of anemia had a significant effect on their quality of life, including their physical, mental, and social well-being<sup>2</sup>. This suggests that anemia can have a negative impact on subjective well-being. Subjective well-being (SWB) refers to an individual's evaluation of their own well-being and life satisfaction<sup>1</sup>. It encompasses both hedonic well-being, which refers to how people feel emotionally in their everyday lives, and evaluative well-being, which refers to how people evaluate their overall current and future lives<sup>5</sup>. Research on SWB has made extensive advancements in the past few decades, and it has become the most widely used index of well-being<sup>6</sup>.

In addition to anemia and SES, other factors such as health status can also influence subjective well-being. A study conducted in Russia found that characteristics such as poor health had a significant negative impact on subjective well-being<sup>7</sup>. Moreover, the impacts of flooding and flood preparedness were found to severely impact human subjective well-being<sup>8</sup>. Overall, anemia can have a negative impact on subjective well-being, as evidenced by studies on pregnant women and elderly patients. Additionally, socioeconomic status, health status, and environmental factors such as flooding can also influence subjective well-being. Understanding these relationships can help healthcare professionals and policymakers develop interventions and strategies to improve subjective well-being in individuals affected by anemia and other related factors.

In the global context, anemia is still a burden for women of reproductive age. In low-middle-income countries, the prevalence of anemia is still high<sup>9-15</sup>. In the Indonesian context, anemia is a burden for women of reproductive age. In Indonesia, there are some studies that found the factors associated with anemia among women<sup>16</sup>. Moreover, sociocultural determinants were found as the drivers of anemia based on a previous study in Indonesia<sup>17</sup>. According to the Basic Health Survey in 2018, the prevalence of anemia was 22.3%<sup>18</sup>. According to the correlation between

anemia and subjective well-being, there is some mediators including physical disability that might influenced<sup>19,20</sup>. This study aimed to examine the correlation between anemia and hemoglobin status to subjective well-being among women of reproductive age in Indonesia using IFLS wave 5 data.

## METHOD

This study was an analytical observation study with a cross-sectional design using Indonesia Family Life Survey (IFLS) wave 5 data (2014-2015), to analyze the relationship between anemia and subjective well-being. The study population was all women in Indonesia who were selected as respondents to the IFLS 5 study, namely women aged 15-49 years. The study sample was an IFLS 5 study respondent, who met the inclusion and exclusion criteria. Inclusion criteria: women of reproductive aged 15-49 years and completed the Hemoglobin test. Exclusion criteria: Women whose data were not completed. The IFLS 5 survey was held from the end of 2014 until the beginning of 2015 using the same respondents as IFLS 4, namely 16,204 households, 50,148 individuals, and 2,662 individuals who died since IFLS 4<sup>21</sup>. The only extensive longitudinal survey that is currently available for Indonesia is IFLS. IFLS provides a means to comprehend behavior dynamics at the individual, household, family, and community levels since data are available for the same persons at different times. From the IFLS 5 data, there were 18,825 female respondents who answered questionnaires. Then, from this data, it was re-selected based on inclusion and exclusion criteria. There were 12,818 study samples that were obtained according to inclusion and exclusion criteria. The dependent variable in this study is subjective well-being (*satisfied/somewhat satisfied/not satisfied*). The main independent variable is anemia and hemoglobin level. Hb level in this study was measured by blood test. Those who are categorized as having anemia if Hb level is less than 12 mg/dL. There are some other independent variables including age, marital status, pregnancy, menstruation, breastfeeding, SES, family life satisfaction, standard of life, and food consumption.

The analysis is divided into 3 parts, namely, univariate, bivariate, and multivariate analysis. Univariate analysis can be presented

in the form of frequency distribution, which in this study describes the characteristics of anemia and subjective well-being among women of reproductive age. Bivariate analysis in this study was performed on two tests including Chi-Square for categorical independent variables and ANOVA for continuous independent variables. A 95% Confidence interval was used as cut off for significant levels. Multivariate analysis was done using multinomial logistic regression. Subjective well-being in this study was categorized into satisfied/somewhat/not satisfied, so in the multivariate analysis, the baseline or reference group is somewhat. It is because the authors want to explore the factors associated with satisfied and not-satisfied well-being. All the tests have been done using STATA version 17. The procedures in the IFLS were previously tested and approved by Institutional Review Boards (IRBs) in the United States (RAND Corporation) since IFLS 1. All data processed in this study came from IFLS 5 data which was conducted by Survey Meter and RAND Corporation. The original survey IFLS 5 has been approved by IRBs (Institutional Review Boards) in the United States (at RAND) and in Indonesia at the University of Gadjah Mada (UGM) <sup>22</sup>. This current study using secondary data has been approved by the Universitas Muhammadiyah Pontianak Ethical Committee with number 013/KEPK-FIKES/UMPONTIANAK/2023.

## RESULTS

Table 1 below describes the general characteristics of the samples. Hb level in this study has a minimum 4 g/dL, maximum 18.8 g/dL and mean 14.5 g/dL. About the age, minimum age is 15, maximum is 49, and mean 31 years old. Among all respondents in this study, around half of them reported satisfied according to their subjective well-being (47%). About the anemia level, more than one-fourth of them were anemia (32%). More than three fourth of them were married (77%), not pregnant (95%), not in menstruation (86%), not in breastfeeding (86%), poor SES (67%), adequate family life satisfaction (59%), adequate standard of life (54%), and adequate food consumption (55%).

**Table 1.** General characteristics of respondents

Variables (n = 12,818)	Frequency	Percentage (%)
Subjective wellbeing	6,023	46.99
Satisfied	5,369	41.89
Somewhat satisfied	1,426	11.12
Not satisfied		
Anemia		
No	8,754	68.29
Yes	4,064	31.71
Age	Mean (Min-Max) = 31 (15 – 49)	
Hb level	Mean (Min-Max) = 14.5 (4 – 18.8)	
Marital status		
Married	9,803	76.48
Not married	3,015	23.52
Pregnant status		
No	12,188	95.09
Yes	630	4.91
Menstruation status	10,976	85.63
No	1,842	14.37
Yes		
Breastfeeding status	11,014	85.93
No	1,804	14.07
Yes		
Socioeconomic status	4,205	32.81
Rich	8,613	67.19
Poor		
Family life satisfaction	2,033	15.86
Less adequate	7,597	59.27
Adequate	3,188	24.87
More than adequate		
Standard of life		
Less adequate	2,228	17.38
Adequate	6,876	53.64
More than adequate	3,714	28.97
Food consumption	1,392	10.86
Less adequate	7,003	54.63
Adequate	4,423	34.51
More than adequate		

The results of bivariate using Chi-Square are reported in Table 2 below. In this table, there are some variables that have a correlation with subjective well-being, including age, pregnancy, SES, family life satisfaction, standard of life, and food consumption. However, the variables of anemia, Hb level, marital status, menstruation, and breastfeeding.

**Table 2.** Bivariate result between each independent variable and subjective wellbeing

Variables	Subjective wellbeing			Total	p-value
	Satisfied	Some-what	No		
Anemia					0.888
No	4,126	3,658	970	8,754	
Yes	1,897	1,711	456	4,064	
Age***					0.0000
Hb level					0.7894
Marital status					0.328
Married	4,631	1,267	356	3,015	
Not married	1,392	4,102	1,070	9,803	
Pregnant*					0.032
No	5,695	5,132	1,361	12,188	
Yes	328	237	65	630	
Menstruation					
No	5,160	4,589	1,227	10,976	0.854
Yes	863	780	199	1,842	
Breastfeeding					
No	5,150	4,626	1,238	11,014	0.357
Yes	873	743	188	1,804	
SES***					0.000
Rich	2,534	1,440	231	4,205	
Poor	3,489	3,929	1,195	8,613	
Family life satisfaction***					0.000
Less	560	795	678	2,033	
Adequate	3,323	3,642	632	7,597	
More	2,140	932	116	3,188	
Standard of life***					0.000
Less	620	903	705	2,228	
Adequate	2,968	3,327	581	6,876	
More	2,435	1,139	140	3,714	
Food consumption***					
Less	439	530	423	1,392	0.000
Adequate	2,884	3,369	750	7,003	
More	2,700	1,470	253	4,423	

\*p-value <0.05, \*\*p-value <0.01, and \*\*\*p-value <0.001

Table 3 below describes the multivariate analysis using multinomial logistic regression. This variable included two: satisfied subjective well-being and not satisfied subjective well-being. There are some variables found to have a correlation with those reported satisfied subjective well-being including those who are married, pregnant, poor, more than adequate family life satisfaction, more than adequate standard of life. However, the variables of anemia, Hb level, age, menstruation, breastfeeding, and food consumption did not have any correlation with satisfied subjective well-being. In detail, married women were 1.21 times more likely to be satisfied according to their well-being compared to single ones. Pregnant women were

1.21 times more likely to have satisfied well-being compared to non-pregnant women. Compared to rich ones, poor ones had a 37% probability of having satisfied well-being. According to those who have more than adequate family life satisfaction, an adequate standard of life, and more than adequate standard of life, they were 1.77 times, 1.19 times, and 1.74 times more likely to have satisfied well-being compared to those who have less adequate.

According to those reported not satisfied subjective well-being, it was revealed that some variables have correlation including married, poor, adequate family life satisfaction, more than adequate family life satisfaction, adequate and more than the adequate standard of life, adequate and more than adequate food consumption. In detail, married ones have a 26% probability to report not satisfied well-being compared to those not married. Poor women are 1.29 times more likely to have not-satisfied well-being compared to rich ones. Those who have adequate and more than adequate family life satisfaction, adequate and more than adequate standard of life, and adequate and more than adequate food consumption have the probability to have not-satisfied well-being 61%, 66%, 54%, 64%, 34%, and 25%, respectively.

**Table 3.** The multivariate results of the correlation between anemia and other covariates with subjective wellbeing

Variable	RRR	p-value (95% CI lower – upper)
<b>Subjective well-being: satisfied</b>		
Anemia (ref: No)		
Yes	0.99	0.972 (0.88 – 1.14)
Age	0.99	0.085 (0.99 – 1.00)
Hb level	1.02	0.369 (0.98 – 1.06)
Marital status (ref: No)		
Married	1.21**	0.001 (1.08 – 1.35)
Pregnant (ref: No)		
Yes	1.21*	0.042 (1.00 – 1.46)
Menstruation (ref: No)		
Yes	0.96	0.501 (0.86 – 1.07)
Breastfeeding (ref: No)		
Yes	1.04	0.502 (0.93 – 1.17)
SES (ref: Rich)		
Poor	0.63***	0.000 (0.58 – 0.69)
Family life satisfaction (Ref: Less adequate)		
Adequate	1.08	0.490 (0.93 – 1.24)
More than adequate	1.77***	0.000 (1.50 – 2.09)
Standard of life (ref: Less adequate)		
Adequate	1.19*	0.032 (1.03 – 1.36)
More than adequate	1.74***	0.000 (1.48 – 2.04)



Food consumption		
(ref: Less adequate)		
Adequate	0.88	0.056 (0.76 – 1.03)
More than adequate	1.13	0.920 (0.95 – 1.34)
<b>Subjective well-being: not satisfied</b>		
Anemia (ref: No)		
Yes	1.04	0.746 (0.84 – 1.28)
Age	1.01**	0.001 (1.00 – 1.02)
Hb level	1.02	0.517 (0.98 – 1.06)
Marital status (ref: No)		
Married	0.74**	0.001 (0.63 – 0.88)
Pregnant (ref: No)		
Yes	1.26	0.156 (0.92 – 1.72)
Menstruation (ref: No)		
Yes	1.02	0.846 (0.85 – 1.22)
Breastfeeding (ref: No)		
Yes	1.04	0.663 (0.87 – 1.27)
SES (ref: Rich)		
Poor	1.29**	0.002 (1.10 – 1.53)
Family life satisfaction		
(Ref: Less adequate)		
Adequate	0.39***	0.000 (0.33 – 0.47)
More than adequate	0.34***	0.000 (0.26 – 0.44)
Standard of life		
(ref: Less adequate)		
Adequate	0.46***	0.000 (0.39 – 0.55)
More than adequate	0.36***	0.000 (0.28 – 0.47)
Food consumption		
(ref: Less adequate)		
Adequate	0.66***	0.000 (0.55 – 0.78)
More than adequate	0.75*	0.051 (0.60 – 0.94)

\**p*-value <0.05, \*\**p*-value <0.01, and \*\*\**p*-value <0.00

## DISCUSSION

According to the findings in this study, there is no correlation between anemia and subjective well-being. However, other covariates have a significant correlation to either satisfied well-being or not satisfied well-being. Apart from anemia as the main predictor, there are other studies that found covariates have more tendency to be correlated with subjective well-being.

The opposite result found there is a significant positive relationship between subjective well-being and marital satisfaction<sup>23</sup>. Studies have shown that higher levels of subjective well-being are associated with higher levels of marital satisfaction among married women. This suggests that subjective well-being can have a positive impact on the quality of marital relationships. Furthermore, subjective well-being is influenced by various factors, including economic status<sup>24</sup>. A meta-analysis found that individuals in developing countries with higher economic status tend to have higher levels of subjective well-being. This suggests that economic factors play a role in shaping an individual's subjective well-being.

In summary, anemia can have a negative impact on subjective well-being, as evidenced by the study on pregnant women<sup>2</sup>. Subjective well-being is a multidimensional construct that encompasses both hedonic and evaluative well-being<sup>5</sup>. It is influenced by various factors, including economic status<sup>24</sup>. Additionally, subjective well-being is positively related to marital satisfaction among married women<sup>23</sup>. Understanding the relationship between anemia and subjective well-being can help inform interventions and support for individuals with anemia to improve their overall well-being. The study in Indonesia found sociocultural variables had more influence on anemia<sup>16</sup>.

Several studies about subjective well-being have been done before. The result of this study is supported by the study about food insecurity and subjective well-being in more-developed and less-developed countries<sup>25</sup>. One study found that job uncertainty on fertility intentions was channeled by subjective well-being<sup>26,27</sup>. In terms of the child, another study found that infertility was correlated with women's well-being<sup>28</sup>. Parenthood on subjective well-being was also discussed in the study in Hungary<sup>29</sup>. Another study about subjective well-being found that disaster is highly correlated with satisfied well-being<sup>7,8</sup>. Among the students, there is a role and interaction of social support, resilience, and subjective well-being<sup>30</sup>.

Even though anemia was not significantly associated with subjective well-being, other core variables were found associated with subjective well-being. Health behavior was found to correlate with subjective well-being by a longitudinal study<sup>31</sup>. Among the elderly, iron deficiency, fatigue, and muscle strength have correlated with daily life activity that also impacts satisfied well-being<sup>32</sup>. This study has limitations in that anemia and Hb level are not predictors of subjective well-being, but there are other strong variables that predict, there any some potential biases, and data management challenges.

## CONCLUSION

Regarding to results of this study, there is no correlation between anemia and hemoglobin level with subjective well-being. However, there are some other covariates that have a correlation to satisfied and not-satisfied well-being including marital status, pregnancy, SES, family life satisfaction, the standard of

life, and food consumption. It is concluded that subjective well-being is associated with not only health aspects but also social and economic. Intervention in the level of community is needed to improve the quality of life to achieve satisfied well-being. Joining the community and social group at the village level may increase subjective well-being. Government and stakeholders might establish community and social groups at the smallest level.

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## CONFLICTS OF INTEREST

All authors declared there is no conflict of interest in this study.

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## *Efforts of Government Institutions to Support Exclusive Breastfeeding Among Civil Servants*

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### ABSTRACT

*Exclusive breastfeeding rate in Palu City has decreased in the last three years from 59.9% (2018) to 57.8% (2019) and 52.42% (2020). Work caused failure to provide exclusive breastfeeding among women. This study aims to explore the efforts of government institutions to support exclusive breastfeeding among civil servants in Palu City, Central Sulawesi. This study applied a qualitative approach, constructivism paradigm, and phenomenological strategy. The study subjects were selected according to the study objectives, which involved the main informants namely the heads of health department; women's empowerment and child protection department, education department, employment department, social affairs department and head of the Religious Office. In addition, there were key informants, namely civil servants with babies aged <12 months who had breastfed or were currently breastfeeding. The number of study subjects was considered sufficient when the coding results and data categories obtained were saturated. Triangulation was carried out towards the Mayor of Palu. Data were collected through in-depth interviews based on interview guides. All interviews were recorded using an audio recorder. The main instrument in this study was the researchers. Ethical Clearance letter Number: 0042/KEPK-KPK/V/2022 dated June 7, 2022 was issued by the Ethics Commission of Palu Health Polytechnic. The results revealed that breastfeeding rooms in the workplace were not yet available for breastfeeding women; there was no reduction in working hours for breastfeeding women, the workload for breastfeeding women was the same, and there was no specific support or motivation from the leaders, and no one had ever provided rewards. Furthermore, the triangulation towards the Mayor of Palu revealed that he promised to make a Regional Regulation (PERDA) that women who exclusively breastfeed will be given leave for 6 months. It can be concluded that the government institutions had not provided support for civil servants to perform exclusive breastfeeding. To achieve the target of exclusive breastfeeding, the government must support exclusive breastfeeding.*

**Keywords:** *Exclusive Breastfeeding, Breastfeeding, Civil Servants, Leaders Support*

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## INTRODUCTION

Exclusive breastfeeding is the best way to meet the nutritional needs of newborns up to six months of age. Breast milk is a complete food for babies and provides many benefits for the health of mothers and children by

supporting growth and development. WHO recommends protection, promotion and support for breastfeeding women. Unfortunately, there is no serious concern about such issues in the workplace. This makes it difficult for working women to keep breastfeeding when they have to return to work<sup>1</sup>.

The causes of failure of working women to provide exclusive breastfeeding include stress due to high workloads, unavailability of facilities and infrastructure for expressing breast milk or breastfeeding at work, and limited time for household maternity leave<sup>2</sup>. In fact, civil servants have to return to work before the baby is 6 months old<sup>3</sup>. Based on Government Regulation No. 24 of 2017, the period of Maternity Leave for civil servants is 3 months. Therefore, it is deemed necessary to have programs that support lactation in the workplace for breastfeeding women. Some actions to support breastfeeding in the workplace involve providing breast pumps, breast milk storage facilities, child care facilities and maintaining women's privacy for breastfeeding babies or expressing breast milk in the workplace<sup>4</sup>. Support to continue breastfeeding at work is very important for breastfeeding women. In Nigeria, it was reported that less than 10% of respondents received support for breastfeeding at work. Most support was obtained from the closest family members, especially the husband<sup>5</sup>.

Nationally, the exclusive breastfeeding target has not been achieved. The highest and the lowest achievement of exclusive breastfeeding were found in West Nusa Tenggara (87.35%) and in Papua (15.32%), respectively. Furthermore, Central Sulawesi Province (54.69%) ranked 27th out of 34 provinces<sup>6</sup>. Data derived from the Palu City Health Office showed that the achievement of exclusive breastfeeding decreased from 59.9% in 2018 to 57.8% in 2019. In 2020, the achievement of exclusive breastfeeding increased to 62.42%. Working outside the home, either as a state civil servant or in the private sector, was one of the highest causes of failure to provide exclusive breastfeeding<sup>7</sup>.

Based on the background described above, a research problem can be formulated, namely: "What are the efforts of Government Institutions to support exclusive breastfeeding among civil servants in Palu City, Central Sulawesi?". This study aims to explore the efforts of government institutions to support exclusive breastfeeding among civil servants in Palu City, Central Sulawesi.

## METHOD

This study was conducted in Palu City,

Central Sulawesi from June 8 to July 31, 2022. This study applied a qualitative approach, constructivism paradigm, and phenomenological strategy. The study subjects were selected according to the study objectives, which involved the main informants name the heads of health department; women's empowerment and child protection department, education department, employment department, social affairs department and head of the Religious Office. In addition, there were key informants, namely civil servants with babies aged <12 months who had breastfed or were currently breastfeeding.

The number of study subjects was considered sufficient when the coding results and data categories obtained were saturated. Triangulation was carried out towards the Mayor of Palu. Data were collected through in-depth interviews based on interview guides. All interviews were recorded using an audio recorder. The main instrument in this study was the researchers. Ethical Clearance letter Number: 0042/KEPK-KPK/V/2022 dated June 7, 2022 was issued by the Ethics Commission of Palu Health Polytechnic.

## RESULTS

The results of a study regarding the efforts of government institutions in supporting the success of breastfeeding for civil servants in Palu City were obtained from leaders of government institutions in Palu City and breastfeeding civil servants in that city. Hammer. There were four main themes to be discussed as follows:

### 1) **There were no lactation rooms available at the workplace**

A lactation room is a specific room that is ideally provided for every institution (office, workplace) which functions to maintain the comfort of women to breastfeed their babies or express breast milk during working hours. Six heads of departments as the main informants in this study said that they had not provided such room as stated by the following informants:

*...before the earthquake there was a specific room for breastfeeding, but after the earthquake it was used as a goods warehouse (kdkk)(kdp).*

*It was always forgotten, it is never be a*

*concern for us here (kka).*

There are institutions that said that it was not a priority and considered as the task of the Health Department. Having a breastfeeding corner in the workplace that employs breastfeeding women will be very helpful in carrying out their duties. Breastfeeding provides many benefits for both baby and mother. Apart from giving very complete nutrition for babies, breastfeeding will also strengthen the emotional closeness between mother and baby. The breast milk corner is not only for breastfeeding, but can also be used to express breast milk during working hours so that babies can still get exclusive breast milk.

Breastfeeding women usually use available space to express breast milk, for example a corner at the office that is not passed by many people and is slightly closed off, or a prayer room and a toilet. Such practice was expressed by the following informant:

*I most often use the prayer room corner, after 10 o'clock, rarely people come in (Id).*

Unsupportive condition means that the woman's privacy and comfort when expressing breast milk is not fulfilled. There was a dilemma, despite a demand for breastfeeding woman to provide exclusive breastfeeding, but support and facilities to help meet such demand are not available.

## **2) There was no reduction in working hours for breastfeeding women**

The leave period after giving birth is only 1.5 months, while exclusive breastfeeding must be given until the baby is 6 months old. Therefore, breastfeeding women must arrange time for work and time for breastfeeding or expressing breast milk. It's best to breastfeed baby before going to work so that the breasts are empty. 10.00 am at the office is the best time to express breast milk or breastfeed the baby if the baby is accessible. Several department leaders said that there was no reduction in working hours for breastfeeding women, but they never forbade them from going home to breastfeed their babies, as expressed by the following informant:

*...we never forbid anyone from asking*

*permission to go home to breastfeed, or asking permission to bring their child to the office, but there are no specific written rules for breastfeeding women to come late or go home early (kdpp, kds).*

*.... There are two women here who have just worked after postpartum leave, they come home for breastfeeding at 10 am, there is a woman who doesn't come back until noon, returning to the office after taking a break (kdp).*

Breastfeeding women preferred to go home to breastfeed their babies directly. It is due to no space to express breast milk and also they didn't understand how to store breast milk after expressing it and how to give expressed breast milk to babies. In addition, women also said that their babies should not use pacifier, as stated by the following informant;

*My child doesn't want to use pacifier, that's why I still go home, but it is really tiring on the way (IA)*

The use of pacifier should be avoided since it can have a negative impact on the child's growth and development. Using a pacifier may cause nipple confusion, disrupt dental and oral health, and can increase the risk of speech delay.

## **3) The same workload for breastfeeding women**

Working women have multiple roles after they get married, especially while breastfeeding. With the role as a housewife, especially while taking care of baby, a woman has almost no rest in 24 hours. There are challenges for working and breastfeeding women. Working women have an increase in the workload they have to complete, both at the office and to take care of their family. However, there are several alternatives for breastfeeding women to complete their workload in the office, as stated by the following informant:

*We even allow women to bring their children to the office so they can breastfeed at any time, but with the condition that the children are accompanied by the nanny. In fact, no one ever asks (kds).*

*We do not reduce the workload for employees who breastfeed, but we are more*

*flexible about when it must be completed, if there is still time (kdpp), (kka).*

#### **4. There was no specific support or motivation from the leaders**

Motivating and supporting pregnant and breastfeeding women to provide exclusive breastfeeding can not only be performed by healthcare workers, but also families. It is also the responsibility of the government, especially heads of institutions. However, not all leaders provide motivation for pregnant women to breastfeed, as stated by the following informant:

*... forgotten, so far we have never conveyed it....*

*Women breastfeed their babies of their own accord and may know the advantages from the healthcare workers at the Integrated Healthcare Post. We never speak up about this, but if this has to be shared about, we are ready to convey and support it (kdp, kka).*

So far, there has been no institution that specifically conveys its support or motivates or brings healthcare workers to offices to provide education about the importance of exclusive breastfeeding.

*... no... never be supported or motivated to breastfeed, I know about this when during pregnancy check-ups at the doctor or midwife practice (idp, ids).*

#### **5. Provision of rewards or sanctions**

Providing rewards to breastfeeding women who succeed in providing exclusive breastfeeding or at the Breastfeeding Week commemoration will motivate other women to breastfeed their babies. This can be a way for all women to breastfeed their babies. However, none of the institution leaders who were the main informants in the study ever did so, either only through supporting words in the form of appreciation or other forms, as stated by the following informant:

*...Completely never, completely overlooked. Breastfeeding Week commemoration? I never be involved at all (ika, idk, idp)*

*There were congratulations and gifts when giving birth, lots of friends came, but no*

*support for breastfeeding (ikpp).*

*During breastfeeding, it feels like I'm just trying and being responsible for myself, sometimes I want to give up (ikds).*

## **DISCUSSION**

Support for exclusive breastfeeding is contained in Employment Law no. 13 of 2003 article 83 which states that female workers who are still breastfeeding their children must be given the opportunity to breastfeed during working hours. Furthermore, this is stated in Health Law no. 39 of 2009 article 128 which states that during exclusive breastfeeding (6 months), the family, government and regional government as well as the community are obliged to fully support the baby's mother by providing facilities and time both at work as well as in public facilities. Furthermore, the obligation to provide exclusive breastfeeding for women is contained in the Government Regulation of the Republic of Indonesia Number 33 of 2012 concerning Exclusive Breastfeeding in Article 6 which states that every woman who gives birth is obliged to provide exclusive breastfeeding to her newborn baby<sup>8</sup>.

Based on the results of triangulation and discussions with the Mayor of Palu, it was revealed that such issue had not yet become a concern and he promised to make a Regional Regulation that "Women who exclusively breastfeed their babies will be given six months' leave (until the end of the year) for exclusive breastfeeding)". This section will discuss the findings compared to the theory and previous study results related to this topic.

#### **1. There were no lactation rooms available at the workplace**

The availability of lactation rooms in government institutions in Palu City was very limited. In fact there were no breastfeeding corners in the six institutions involved in this study. Such finding is in line with a study conducted by Kumalaningsih, 2020 in Serang which found that it was still very difficult to find lactation room facilities or breastfeeding corners in the workplace or in public facilities. Breastfeeding corner must be one of the requirements for companies to apply for a business license at the Investment and Integrated Services Agency<sup>9</sup>.



In the Joint Regulation of the State Minister for Women's Empowerment, the Minister of Manpower and Transmigration and the Minister of Health No. 48/MEN.PP/XII/2008, PER.27/MEN/XII/2008 and 1177/MENKES/PB/XII/2008 concerning Increasing breastfeeding during working hours, institutions and companies are encouraged to give women the right to breastfeed at workplace. Since this joint regulation is only an advisory, companies or institutions that provide breast milk corners cannot be subject to sanctions.

A study conducted by Abekah, 2020 in Ghana reported that the main factor influencing the success of exclusive breastfeeding for working mothers was the practice of exclusive breastfeeding which involved knowledge, understanding of exclusive breastfeeding and experience in providing exclusive breastfeeding<sup>10</sup>.

Understanding the practice of exclusive breastfeeding is very important due to the fluctuation of volume and concentration of micro and macronutrients in breast milk. Such fluctuation is influenced by maternal factors such as psychological conditions, including work stress and supplementation which are very influential in supporting good breastfeeding practices<sup>11</sup>.

In addition, Vilar reported that the main influencing factors for breastfeeding success among working women were the intention to breastfeed, the availability of a lactation room for breastfeeding or expressing breast milk at work, beliefs about breastfeeding, and workplace peer support and policies issued by the leaders<sup>12</sup>. Furthermore, Ibarra, 2020 reported that more women breastfed longer (more than 6 months) in workplaces with breastfeeding corners (75.0%) compared to workplaces with no breastfeeding corners (25.0%)<sup>13</sup>.

## **2. There was no reduction in working hours for breastfeeding women**

Another finding in this study was no reduction in working hours for women who provided temporary exclusive breastfeeding. Law Number 36 of 2009 concerning Health and Wellness in article 128 explains that every baby has the right to receive exclusive breast milk from birth for six months unless there is a medical indication. As long as the family

provides exclusive breastfeeding, the government and society must fully support women by providing specific time and facilities, both at work and in public facilities. Moreover, postpartum leave only lasts for 1.5 months, while exclusive breastfeeding lasts for 6 months<sup>14</sup>.

Such a finding is in line with a study conducted by Eren, 2018 in Turkey, which revealed that changes in laws in Turkey regarding pregnancy and childbirth leave significantly increased the exclusive breastfeeding rate and overall breastfeeding rate. In Turkey, from 2011 to the present, the rule regarding leave is during the first six months after giving birth for breastfeeding women, after work 3 hours earlier and 1.5 hours in the following six months. Furthermore, pregnant women who have reported pregnancy are not scheduled for night shifts until 24 months after giving birth. Women who have given birth are given 16 weeks of paid leave and can choose to take 24 months of unpaid leave<sup>12,15</sup>.

Exclusive breastfeeding is an investment that has a positive impact on the health of mothers and children, as well as the country's economy. Exclusive breastfeeding will also reduce maternal and child morbidity and mortality, increase children's intelligence (IQ), improve children's achievement at school which indirectly contributes to poverty alleviation. In Brazil, 91% of women during postpartum leave period provided exclusive breastfeeding compared to those who were not in postpartum leave period. Postpartum leave allows women to be close to their children<sup>16</sup>. The experience of women who have to return to work or study while breastfeeding, encourage certain policies and facilities that can help them continue breastfeeding or take paid leave until the baby is 12 months old, flexible work arrangements, comfortable rooms for breastfeeding and expressing breast milk, and childcare room<sup>17</sup>.

Chhetri in Karnataka reported that 52% of working women did not receive postpartum leave benefits. Only 11% of women were allowed breaks between work hours and no women were provided with childcare right at work. This was a common reason for working women to stop exclusive breastfeeding.<sup>17</sup> It was shown that a more flexible work schedule and living close to work could influence

breastfeeding success<sup>18</sup>.

### **3. The same workload for breastfeeding women**

Another finding in this study is the same workload for breastfeeding women. Workload is the total number of tasks that a person or group of people must complete in a certain time. This workload can take the form of physical, mental and social demands. A previous study found that one of the factors that could thwart exclusive breastfeeding was a high workload<sup>19</sup>. A qualitative study conducted by Zakar et al, 2018 in Pakistan further revealed that the failure of exclusive breastfeeding referred to insufficient daily breast milk intake due to the high workload for breastfeeding women and lack of social support<sup>20</sup>. Workload for breastfeeding women that is not reduced may cause work stress and hinder breast milk production<sup>9</sup>.

A qualitative study conducted by Ahishakiye, et al in Rwanda, 2019 revealed that heavy workloads were responsible for suboptimal exclusive breastfeeding in Rwanda. The heavy workload for breastfeeding women was a challenge to consistently breastfeed. Despite housework and work outside the home that must be completed, they must still be able to smile<sup>21</sup>.

Women involved in this study were responsible for all duties both as a civil servant and as a housewife, and such condition certainly limited their ability and opportunity to provide exclusive breastfeeding<sup>22</sup>. The serious challenges faced by women in providing exclusive breastfeeding were due to the heavy workload which could have a negative impact on children's nutrition, so that the baby's right to receive exclusive breastfeeding was also hampered<sup>23</sup>. Such finding requires intervention so as to help women allocate more time to care for and provide exclusive breastfeeding through reduction in the workload during the exclusive breastfeeding period<sup>5</sup>.

The level of workload is related to the level of work stress. Support from colleagues is needed so that it does not have a negative impact on the woman's psychology which can further cause a decrease in breast milk production. Therefore, peer support is very important and must be delivered in a positive way without negative judgment<sup>24,23</sup>. Good teamwork was found to have a positive effect

on organizational productivity<sup>25</sup>.

### **4. Motivation or rewards for breastfeeding women**

The fourth finding from this study showed that there had never been any motivation or reward for women who successfully provide exclusive breastfeeding, especially on certain days, such as national or international breastfeeding week or when the baby is seven months old. Likewise, there were no sanctions for women who did not breastfeed or did not breastfeed exclusively without medical reasons. The motivation to provide exclusive breastfeeding is the encouragement or recommendation given by the leaders to breastfeeding women in such institution<sup>26</sup>. The approach that can be taken by leaders and colleagues may focus on the bonding attachment to improve the emotional relationship between mother and baby and facilitate mothers if they experience difficulties during breastfeeding<sup>27,28</sup>.

A qualitative study conducted by Jhonson, 2018 in the UK reported that awards in the form of prizes were given as a form of motivation for women to continue breastfeeding enthusiastically. This was considered to be compensation for the difficulties faced during breastfeeding. Award given to breastfeeding women was proven to create awareness and encourage other women who refused to breastfeed<sup>29,30</sup>.

Bekker, 2018 in the United States reported that breastfeeding women preferred to receive incentives in the form of cash, although exclusive breastfeeding was also influenced by maternal characteristics<sup>31</sup>. Moreover, Clare Relton, 2017 in England reported that providing incentives in the form of cash had proven to be effective in increasing exclusive breastfeeding rate, especially in areas with a low prevalence of breastfeeding. Incentives in various countries were provided in various ways, for example France provided paid breastfeeding break during the working day. On the other hand, incentives to support the provision of formula milk were also provided, for example by providing vouchers [US\$7.75] per week in the first year of birth which could be exchanged for formula milk<sup>32</sup>.

Motivating mothers to breastfeed before birth can increase good intentions and determination to breastfeed immediately after

the birth of the baby. Motivation is especially appropriate to be provided in the third trimester of pregnancy<sup>33</sup>. A previous study found that combined interventions in the form of motivation, support and incentives could increase breastfeeding success. Interventions mainly take the form of efforts to overcome breastfeeding difficulties and provide appreciation for the efforts made by breastfeeding women<sup>34,35</sup>.

## CONCLUSION

There were no breastfeeding rooms for women available either in government institutions or public facilities. There was no reduction in working hours or workload for breastfeeding civil servants. Furthermore, there had never been an award given to civil servants who successfully breastfed. The form of support from government institutions in providing exclusive breastfeeding has not yet been stated in written regulations regarding Breastfeeding in Palu City. Therefore, the Mayor of Palu, Central Sulawesi, as a policy maker, tried to establish written rules in the form of Regional Regulations to grant six months' leave for civil servants who are willing to exclusively breastfeed. The issuance of such regulation helps socialization to institutions and supports monitoring and evaluation towards civil servants who breastfeed.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Original Article

## ***The Impact of Promotion and Basic Immunization Counseling Program on Mother's Knowledge and Attitude***

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### **ABSTRACT**

*Immunization is an effort to actively create/increase the body's immunity to protect children from various diseases. However, Indonesian society's understanding of immunization still varies especially parental knowledge and behavior, which will be the main factor in immunization completeness for children, thereby reducing immunization coverage and immunity gaps. This research aims to determine the effect of promotion and counseling on the knowledge and attitudes of mothers with children over 2 years in the urban areas of Kaliombo and Manisrenggo, the working area of the Southern City Health Center. The research method is Quasi-Experimental with a one-group pre-post test approach. The sampling technique used Total Sampling with a sample size of 64 people. Data was collected in the form of knowledge and attitude questionnaires. Data were analyzed using descriptive statistical tests, Wilcoxon and multiple linear analyses. The research results related to knowledge show a p-value of 0.000 ( $p < 0.05$ ). In contrast, attitudes show a p-value of 0.000 ( $p < 0.05$ ), which means there is a significant increase in knowledge and attitudes after basic immunization counseling and education. Based on the linear regression test results, it shows that if knowledge increases by one score, then attitude also increases by 0.668. This research concludes that promotion and counseling impact knowledge and attitude.*

**Keywords:** Knowledge, Attitude, Promotion, Counseling, Basic Immunization

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## **INTRODUCTION**

Exclusive breastfeeding is the best way to meet Immunization comes from the word immune, resistant. Children are immunized, meaning they are given immunity against a certain disease. Children are immune to one disease but not necessarily immune to other diseases<sup>1,2</sup>. Immunization is an effort to actively create/enhance a person's immunity to disease and the formation of immunity in individuals

against infectious diseases, which is usually done by vaccination.<sup>3</sup> So that if one day exposed to the disease will not get sick or only experience mild illness<sup>1</sup>.

Routine immunization of children in the United States continues to reduce the incidence of all vaccine-preventable diseases. In the vaccine era, the incidence of diphtheria, Hib, measles, polio, rubella, and tetanus has been reduced to <1 per 100,000 of all targeted diseases, with 24 million cases prevented

through vaccination in the United States by 2019. Routine immunization remains an effective public health intervention to avert disease; maintenance of high vaccination coverage rates is necessary for sustained impact<sup>2</sup>.

Indonesian people's understanding of immunization is still different, so many infants and toddlers have not received immunization services. The reasons parents give include that the child is afraid of overheating, often gets sick, the family does not allow it, the immunization place is far away, does not know where the immunization is and is busy<sup>1</sup>. Parents often live in a wider social environment with characteristics that make vaccine reluctance or nonacceptance seem totally reasonable. This is true whether the parents are in the impoverished world of more socially excluded parents or the neoliberal world of more affluent parents<sup>4</sup>. Therefore, immunization services must be improved at various levels of service units<sup>1</sup>.

This is by data from the Maternal and Child Health Profile in Indonesia in 2020. In 2020, 57 out of 100 children aged 12-23 months have received complete basic immunization. This percentage increased by 1.84 percent from the previous year. Based on the region type, the rate of children who received full basic immunization in urban areas is higher than in rural areas. This proves that there are still many children who have not been immunized<sup>5</sup>. The immunization performance achievement of East Java Province in 2021 is 84.90%, a slight decrease compared to the achievement in 2020, whose immunization coverage was 99.34%<sup>6</sup>.

Numerous vaccinations frequently cause injection site discomfort, redness, swelling, and a few systemic symptoms like fever, malaise, and headache. These adverse effects manifest during the first two days after vaccination, indicating the immunological and inflammatory reactions that successfully establish vaccine-induced protection. Even though these side effects are self-limiting and generally mild—and insignificant in light of the high morbidity and mortality of the diseases that the vaccines are intended to prevent—parents may find them extremely concerning, and medical professionals who are advising families on vaccinations frequently downplay their significance<sup>7</sup>. This shows that the factors determining whether a mother does not fulfill full vaccination status include her knowledge,

father's education, location of delivery, time to reach a health facility, participation in pregnant women's conferences, and parental discussions<sup>8</sup>.

The coverage of complete basic immunization in Kediri was 90.12%, with a dropout (DO) of 1.75%. With full immunization coverage in 9 Puskesmas in Kediri, including Mrican 95.09%, Campur Rejo 113.74%, Sukorame 90.42%, North City Region 73.88%, Balowerti 93.24%, Pesantren I 93.18%, Pesantren II 73.24% and Ngletih 85.50%<sup>9</sup>.

This can be used as a reference that the complete basic immunization coverage in the working area of South City Health Center (KOWILSEL) reports the assessment of BCG immunization in babies with a target of 95% and 84.74%, DPT/HB 1 immunization in babies with a target of 95%. And achievement of 87.47%, DPT/HB 3 immunization in babies with a target of 90% and achievement of 87.02%<sup>10</sup>. The decrease in immunization coverage can lead to immunity gaps and vaccine-preventable disease outbreaks<sup>11</sup>.

The purpose of immunization in children is to protect children from various diseases<sup>5,11</sup>. The complete basic immunizations covered include 1 (one) Bacillus Calmette Guerin (BCG) immunization, 3 (three) Tetanus Diphtheria Pertussis (DPT) immunizations, 3 (three) polio immunizations, 3 (three) Hepatitis B immunizations, and 1 (one) complete basic immunization with measles<sup>1,3</sup>. Ideally, children should have received complete basic immunization by 12 months because according to Minister of Health Regulation No. 12/2017 on the implementation of Immunization, basic immunization is given to infants before the age of 1 (one) year. Conversely, according to Law No. 36/2009 on Health, article 130 states that the government must provide complete immunization to every infant and child<sup>5</sup>. Vaccination effectively reduces infectious disease burden in children, preventing two to three million deaths annually, but basic coverage remains below target<sup>4,9,12</sup>.

Immunization programs are crucial for public health, but parents' education about routine vaccination benefits is a major concern, with reports focusing on education levels<sup>13</sup>. Lack of knowledge about child vaccination schedules and vaccine-preventable diseases among mothers and caregivers may increase the risk of children not being fully immunized,

especially those who have not attended pregnant women's conferences<sup>8,14</sup>. The knowledge and attitude of a child's parents significantly impact their child's basic immunization, with most having sufficient knowledge and good behavior towards diphtheria and diphtheria ORI<sup>3,15</sup>. Some mothers argue that vaccines aren't important due to their parents' lack of vaccination, highlighting the need for proper health education to prevent misbeliefs and affect mothers' attitudes<sup>3,16</sup>.

Based on the data above, the authors want to know about the impact of promotion and counseling on the knowledge and attitude of mothers who had children aged more than 2 years in the hope later counseling and counseling on basic immunization will motivate the mother to immunize the next child completely in Kaliombo and Manisrenggo urban areas working area of Public Health Center City of Southern Territory. It is hoped that the contribution of this research can be used as a source of information for the health service to improve the implementation of the basic immunization program and create health promotion media in the form of more intensive counseling for mothers who do not do basic immunization.

## METHOD

This research is quasi-experimental, one group pre-test post-design. The research population was all mothers with children <2 years old who were admitted to Posyandu in Kaliombo and Manisrenggo Villages within the scope of the Southern Region City Health Center (KOWILSEL) of Kediri City. The total sampling in this study was 64 people. The total sampling was all mothers who had children <2 years old<sup>4,8,15,17-24</sup>. As well as those who have children who have received complete basic immunization, which is given including one dose of Bacillus Calumet Guerin (BCG) vaccination against tuberculosis at birth or at first clinical contact, three doses of pentavalent vaccine (DPT). -HepB -Hib), three doses of polio vaccine, and three doses of pneumococcal conjugate vaccine (PCV) at 6, 10, and 14 weeks of age. In addition, two doses of rotavirus vaccine at 6 and 10 weeks of age and one dose of measles vaccine at 9 months or immediately before the first year of birth are recorded on the

vaccination card given to parents or caregivers<sup>1,3,8,14,21,22</sup>.

Respondents provided informed consent and notification of being volunteered for use for research purposes<sup>10,15</sup>. Data was collected directly from respondents through questionnaires regarding mothers' knowledge and attitudes regarding basic immunization. The group intervened by researchers was given a questionnaire before and after promotion and counseling<sup>8,15-17,19-21,24-26</sup> as many as 64 people. Data collection was carried out using a questionnaire that had been prepared and filled in directly by the subject with supervision from the researcher<sup>9</sup>. Research data regarding the mother's knowledge and attitudes were obtained from primary data<sup>8,9</sup>. Statistical analysis used the normality test with Kolmogorov Smirnov, a comparison test with Wilcoxon, while multivariate analysis was carried out using the Multiple Linear Regression Test<sup>8,20-22,26</sup>.

## RESULTS

Research data about the level of knowledge and attitudes of mothers was obtained from the primary data taken directly from the respondents through a questionnaire of mothers' knowledge and attitudes associated with basic immunization. Based on table 1, it shows a sample of 64 with the ages listed.

Based on Table 2, the majority of mothers have a final high school education as many as 32 people (50%), junior high education as many as 21 people (32.8%), education bachelor as many as 7 people (10.9%) and elementary education as many as 4 people (6, 3%).

**Table 1. Description of Mother Age**

Age of mothers	Amount
20	1
21	1
22	1
24	5
25	1
26	4
27	2
28	7
29	5
30	9
31	2
32	6
33	2
34	3



35	6
36	2
37	3
38	1
39	1
41	1
43	1
amount	64

**Table 2. Maternal Education**

	Amount	%
ES	4	6,3
JHS	21	32,8
SHS	32	50
Bachelor	7	10,9
Total	64	100

In this study, the number of samples used is 64 samples. Therefore, the researchers used the Kolmogorov-smirnov normality test because of the sample size > 50. Based on Table 3, the results of the normality test obtained a significance value of knowledge 0.036 (P < 0.05) and attitude 0.000 (P < 0.05). Data is said to be normal if p > 0,05. The results of this study obtained p < 0.05, followed by the Wilcoxon test.

**Table 3. Normality Test Results**

	Kolmogorov-Smirnov <sup>a</sup>		Shapiro-Wilk			
	Statistic	df	Sig.	Statistic	df	Sig.
difference_Knowledge	,115	64	,036	,940	64	,004
difference_Attitude	,207	64	,000	,929	64	,001

This research aimed to know the difference in knowledge and attitude before and after counseling and education about basic immunization.

Based on Table 4, Wilcoxon test results obtained improved Knowledge from before counseling and basic immunization education and after counseling and basic immunization education, 56 samples got improvement, and 8 pieces did not increase or fix with p value 0,000 (p < 0,05), which means a significant increase in knowledge after counseling and basic immunization education.

**Table 4. Wilcoxon Test Results**

	N	Decrease	Equal	Increase	p
Knowledge Post –	64	-	8	56	0,000

Known					
ge Pre					
Attitude	64	-	-	64	0,000
Post –					
Attitude					
Pre					

Improved attitudes before counseling and basic immunization education and after counseling and basic immunization education occurred in 64 samples with p p-value of 0.000 (p < 0.05), which means a significant increase in attitude after counseling and basic immunization education.

**Table 5. Result of Linear Regression Test**

Model	Unstandardized Coefficient	Standardized Coefficient	Sig.
	B	Beta	
	(Constant)	26,081	
Knowledge	,668	,781	,000
Age	,016	,030	,747
Last maternity education	-,582	-,171	,057
Maternity occupation farmer	-,718	,5059	,598
Maternity occupation teacher	,553	,037	,707
Maternity occupation entrepreneur	,485	,078	,363
Maternity occupation house Assistant	-1,200	-,081	,313
Father's occupation Teacher	2,017	,136	,212
Father's occupation entrepreneur	,074	,009	,943
Amount of child	-,524	-,153	,123

From the regression analysis result of Table 5, it was known that the variable having a significance value < 0,05 is pre-knowledge only, while other variables had a significance value > 0,05. This shows that the variable that influences attitude is knowledge only. Overall, the contribution seen from the adjusted R square value was 61.5%, meaning the role of knowledge on attitude is 61,5%. In comparison, the rest, 39,5%, was influenced by other factors not included in the research. From the linear

regression test result, when knowledge increases one score, his attitude will also increase by 0.668.

## DISCUSSION

This research was an experimental Quasi research with a group pre-test and post-test design approach that was conducted in one group without a comparison group, which aims to know the impact of counselling programs and basic immunization education on mothers' knowledge and attitudes in the working area of Public Health Center of the southern city.

The age distribution of this study consisted of 64 mothers aged 20 – 43 years. Meanwhile, other research shows the dominance of women in early adulthood (26-36 years). The younger age level has a better immunization status compared to children of mothers over 25; the higher the immunization status shows that the mother's age affects the childcare experience and preventive measures to protect the child from disease<sup>3</sup>. Of all the sociodemographic and background variables, only older maternal age was associated with better knowledge of immunization names/preventable diseases ( $p = 0.03$ )<sup>16</sup>. Maternal age 30 - 39 was more prevalent compared to other ages<sup>11</sup>. The most common age was between 26-34 years. 15 53% were found to be between 26 and 35 years old in the distribution<sup>21</sup>. Most participants (39.2%) were from the 25-29 age group<sup>22</sup>. A total of 200 postnatal Malaysian mothers were enlisted; the mean age of the mothers in the study sample was  $27.29 \pm 2.45$  years<sup>27</sup>. While research points to the fact that younger age is associated with higher compliance with vaccination ( $p < 0.001$ ), compliance appears to decrease as parents age<sup>28</sup>. The age distribution shows that the average age of mothers in our study was 30 years. This is by the research of Hu, Y., et al. In 2019 many mothers are under 30 years of age<sup>29,30</sup>. Based on the research of Cataldi, J. R. et al. In 2019, mostly in part-time jobs and unemployment,<sup>29</sup> other studies also have an average maternal age of 34<sup>29</sup>. Other studies also show that immunization frequency is higher in mothers under 30 years, especially in mothers aged 25-30 years, compared to mothers over 30 years<sup>22</sup>. Even in other studies, many mothers were under 30<sup>30</sup>. Another study found children born to older mothers (>35 years old) were 2.4

times more likely to have incomplete immunization (AOR = 2.4, 95% CI: 1.09, 5.28) compared to younger mothers (<26 years old)<sup>20</sup>.

The maternal education in this study had a high school education of as many as 32 people (50%). This is the same as Ali AHM's research in 2020, in which high school education is dominant compared to others.<sup>16</sup> Even in the research of Touray et al. in 2021, 87.2% of high school education (aOR = 0.128; 95% CI = 0.029, 0.561)<sup>21</sup>. There are still many mothers with a secondary education level, as many as 402 people<sup>23</sup>. Based on the level of knowledge, the number of high school students is 30 more than at other levels of education. It is assumed that other factors besides maternal education also influence the child's basic immunization status<sup>3,16</sup>. In contrast to other studies, the mother's education had the most undergraduate degrees, as many as 126 people. Mothers with a high level of education (OR 12.5, CI 95%). 3.71-42.1,  $p < 0.001$ ) were likelier to have high knowledge about immunization than mothers with moderate education levels (high school graduates). Mothers with higher education levels were associated with higher child immunization rates (61%) than those with high school education (33%,  $p < 0.05$ ) or primary-middle school education (10%,  $p < 0.05$ )<sup>11</sup>. In this study, 7 people (10.9%) had university education. Education is important, especially for immunization coverage. Due to the lack of parental education, making mothers unaware of immunization and its benefits, there is also a growing phenomenon that parents believe immunization is unsafe at certain levels<sup>13</sup>. Women are more likely to regularly bring their children for immunization, although more highly educated mothers are more likely to be immunized than men. The results make it possible to describe a profile of "immunization-compliant parents" (with an academic degree, young, urban, eating any food, using conservative medicine). Belief is a major factor influencing immunization, but external factors such as community voice, social trends, and opinions of religious leaders may play a role in immunization adherence, in addition to personal beliefs, individual habits, and self-care. While in our study, junior high school education was 21 people (32.8%), and primary education was 4 people (6.3%). This can be shown in other studies that parents who bring

their children to developmental follow-up tend to be more educated ( $p = 0.002$ ) and do not use alternative medicine ( $p < 0.001$ ). Parents who did not trust doctors tended to be less educated ( $p = 0.001$ ) and used alternative medicine ( $p = 0.027$ )<sup>28</sup>.

The knowledge measurement results showed a significant effect of 0.036 ( $P < 0.05$ ). Comparable to research by Balbir Singh et al. In 2019, which showed the relationship between age ( $p = 0.031$ ), education ( $p = 0.021$ ), occupation ( $p = 0.013$ ), and knowledge scores on immunization were found to be statistically significant. However, ethnicity ( $p = 0.127$ ), work ( $p = 0.197$ ), and mode of delivery ( $p = 0.750$ ) on maternal knowledge about immunization were not significant<sup>27</sup>. Our study used knowledge to measure the impact of promotion and basic immunization. Maternal/caregiver knowledge factor (AOR=4.32, 95% CI: 2.78-6.70) determines defaulting from full immunization<sup>8</sup>. Caregivers and stakeholders believe knowledge and awareness boost vaccine acceptance, as vaccination benefits child health and development. Local health staff highlight providers' lack of knowledge can increase hesitancy and lower confidence<sup>31</sup>. Only older maternal age was associated with better knowledge of the names of vaccines/preventable diseases ( $p = 0.03$ ). The knowledge score about vaccines/preventable diseases was poor, with  $p = 0.21$ <sup>16</sup>. Knowledge on immunization schedules (AOR=1.92 95% CI, 1.03–3.60), PNC (AOR=3.19; 95% CI, 1.57–6.47), discussion on side effects and contraindications of vaccines (AOR=2.75; 95% CI, 1.4–5.3) were notably associated with full vaccination among urban children<sup>26</sup>. This is different from the research of Nabila Arfimita et al. 2020 regarding knowledge. Still, there is no significant relationship between parents' knowledge about diphtheria disease and (Outbreak Response Immunization) diphtheria ORI on diphtheria ORI coverage ( $P=0.075$ )<sup>15</sup>. Parents with a master's degree and having a monthly income between Rs 20,000 and 30,000 have much better knowledge than others. However, no significant differences ( $p \leq 0.05$ ) were found between gender, age, occupation, city and importance of immunization. The research results by Hussain, A. et al. In 2021 it showed that most respondents knew this but did not know that the immunization schedule was

listed on the immunization card from the hospital or immunization center. Parents' knowledge regarding immunization of children under two years old is still lacking, but they positively perceive children's immunization.<sup>24</sup> Only 238 (39.5%) participants had good knowledge about immunization, and two-thirds had poor knowledge about complete immunization<sup>25</sup>.

The result of the attitude significance value is 0.000 ( $p < 0.05$ ). This is different from Hanka VS and Sujono's research, E in 2021, there was no relationship between parental behavior ( $p=0.868$ ), parental attitude ( $p=0.647$ ), and provision of complete basic immunization. On the other hand, parental knowledge influences whether children will receive full basic immunization or not ( $p=0.000$ )<sup>3</sup>. Regarding the attitude of mothers/caregivers towards child immunization, 53 (36.6%) among cases and 23 (42.1%) among controls had an unfavorable attitude towards child immunization<sup>8</sup>. In other studies, many (99.2%) mothers had a positive attitude, and 98.4% reported that they would recommend immunization to others. All of them (100%) stated they were fully responsible for their children's immunization, 98.4% thought that immunization was important, and 99.2% thought it was safe<sup>16</sup>. Comparison of attitude scores between the 2 groups revealed a significant difference in an item regarding perceived benefits: the score was higher in the intervention group ( $3.12 \pm 1.25$ ) than in the control group ( $2.7 \pm 1.36$ ) ( $P = 0.018$ ) for the item, "If my baby receives his/her vaccines, it will help protect my friends and family from getting vaccine-preventable diseases."<sup>17</sup> Our research showed that an increase in attitudes before basic immunization education and counseling and after basic immunization counseling and education occurred in 64 samples with a  $p$ -value of 0.000 ( $p < 0.05$ ), which means there was a significant increase in attitudes after basic immunization counseling and education. This is similar to research by Nabila Arfimita et al. 2020. Good parental attitudes towards diphtheria and ORI significantly correlated with complete ORI coverage ( $P=0.004$ )<sup>15</sup>. Despite generally positive attitudes, some rumors and misunderstandings persist among caregivers. Although many participating caregivers stated that they did not believe the words, they had

heard them and knew other caregivers in their communities who also accepted them. Caregivers reported feeling hesitant about repeated injections: “. . .since the introduction of the third shot [attenuated Polio vaccine (IPV)], mothers have been worried about having too many shots and not bringing their children on time. . .”.<sup>18</sup> In addition, mothers whose immunizations were incomplete had lower knowledge about the benefits of immunization (AOR = 2.02, 95% CI: 1.20, 3.39). Negative attitude towards immunization (AOR = 4.9, 95% CI: 2.82, 8.49)<sup>20</sup>.

This research aims to determine the differences in knowledge and attitudes before and after education and education about basic immunization. Based on Table 4, the results of the Wilcoxon Test show that there was an increase in knowledge from before basic immunization counseling and education and after basic immunization counseling and education, 56 samples experienced an increase, and 8 models did not experience an increase or remained with a p-value of 0.000 ( $p < 0.05$ ) which means an increase significant knowledge after basic immunization counseling and education. This is by research by Saitoh A et al. in 2020, which showed scores for maternal knowledge questionnaire items were significantly higher in the intervention group. Knowledge is believed to be a determining factor in the success of an immunization program<sup>17</sup>. Immunization rates were higher in children whose mothers knew about the immunization program ( $p = 0.000$ ). Knowledge obtained from husbands has a higher impact on immunization rates than community mobilization ( $p = 0.000$ )<sup>22</sup>. This shows that a mother's knowledge of a particular health service that is provided, including immunization, creates a situation conducive to using that service. In addition, a possible explanation is that if primary caregivers know about immunization benefits, schedules, and side reactions, they can immunize their children based on the recommended schedule without being negligent and afraid of side reactions due to immunization<sup>20</sup>. In fact, some respondents in the study already knew basic immunization but still had misunderstandings about the benefits of immunization itself. This is in Elbert et al.'s 2023 research; analysis of immunization knowledge shows that the majority of participants (87.8%) understand that if an

immunization dose is missed, they will be affected by having to visit a health facility and seek advice, 74% know that immunization does not cause autism, and 68.9% of participants knew that immunization does not cause impotence. There are still misconceptions among mothers that vaccines contain nutritional supplements, are growth factors, contribute to children's brain development, and can prevent non-communicable diseases. However, misunderstanding regarding vaccine safety remains low, recorded at less than 10% of participants. Most mothers already know that immunization does not cause autism or impotence<sup>11</sup>. In contrast to research by Nakatudde, , et al. in 2019, the primary caregiver's knowledge about the timing of immunization for premature babies is inaccurate. Most do not know when premature babies should receive immunization, and some choose not to. The child's caretaker thought that he had already been given immunizations when he was at the hospital, so there was no need for immunizations anymore<sup>32</sup>. Better knowledge about vaccine schedules and benefits will motivate children to get immunized. Poor knowledge of the immunization schedule increases the risk of children not receiving immunizations (AOR: 4, 95% CI 2.2 to 7.1)<sup>14</sup>.

From the regression analysis results in Table 5, it is known that variables with a significance value of  $< 0.05$  are only pre-knowledge variables. In contrast, other variables have a significance value of  $> 0.05$ . This shows that the only variable that influences attitudes is knowledge. Overall, the contribution seen from the adjusted R square value is 61.5%, meaning that the role of knowledge on attitudes is 61.5%. Other research showed mother's knowledge status positively affects the completion of child immunization. Thus, children whose mothers/caregivers have poor immunization knowledge are 2.02 times more likely to have children who do not receive complete immunization compared to mothers who have good knowledge<sup>20</sup>. Knowledge increased by one score; this research shows that attitude also increased by 0.668, the results of this research show that it provides insight into mothers' knowledge and attitudes towards child immunization as findings that can be used as a basis. Other research shows that the mother's or closest caregiver's attitude towards

immunization was important in determining child immunization. Mothers or caregivers with a negative attitude towards immunization are 4.9 times more likely to have children who do not receive complete immunization than mothers or direct caregivers who have a positive attitude<sup>20</sup>. Maternal factors, including education, occupation, and ethnicity, account for 49.7% of the explained inequality, while children's birth order and immigration status also contribute<sup>29</sup>. Negative attitudes are usually associated with low knowledge.<sup>8</sup> The likelihood of incomplete child immunization is 6.1 times higher among caregivers with unfavorable attitudes towards the benefits of vaccines than caregivers who do not receive immunizations. (AOR: 6.1, 95% CI: (3.4, 11.1). The chance of incomplete child immunization is higher in caregivers who have an unfavorable attitude towards vaccines than caregivers who have an unfavorable attitude towards vaccines. Negative attitudes towards immunization (AOR = 4.9, 95% CI: 2.82, 8.49)<sup>20</sup>. The majority of caregivers of children who received incomplete immunization (65.4%) had poor knowledge of the immunization schedule and a negative attitude towards the benefits of vaccines (63.8%)<sup>14</sup>. Other research also shows that bad attitudes can be due to the influence of religion: religion appears as an influence on parents' attitudes towards immunization. It becomes an obstacle in carrying out immunization. One mother described the influence of religion as follows: I took my child for immunization, and he felt very sick." (FGD2- "...There are reasons, for example, if I take my child for immunizations to the clinic, I must have a clinic card, and even if they explain that the card is lost, maybe because it was flooded or burned, they just insist that you are lazy." (FGD7-P8; Single mother basic education). "... We have heard the Catholic Church say that immunization (given to women) is bad because it will prevent them from giving birth<sup>33</sup>.

## CONCLUSIONS

Promotion and counseling impact knowledge and attitudes, as seen from the significant increase in knowledge and attitudes before and after socialization and education about basic immunization.

The Kediri City Health Service is advised to improve basic immunization

programs and increase coordination with Community Health Center officers. The KOWILSEL Community Health Center is also recommended to provide ongoing counseling and create health promotion media for mothers who do not carry out basic immunizations.

Further research is needed to explore additional factors that may influence mothers' attitudes toward basic immunization, which has not been thoroughly studied.

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Article Review

***BLS Training on The Application of BLS and The Standard Operational Procedures First AID on Emergeny Tourism at Tanjung Karang Beach Donggala District***

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**ABSTRACT**

*Indonesia is an archipelago consisting of around 17,508 islands, 70% of which are oceans. Indonesia's seas are rich in natural resources, including coral reefs and marine animals. However, this natural wealth can cause problems and is fatal to humans due to stings from animals in the sea. In other emergency conditions, people can drown, causing suffocation and heart attacks. First aid in emergencies is basic life support (BLS), which can be done by people who have received training. Tanjung Karang Beach is a domestic and international tourist destination; however, health services and experts in providing BLS are not yet available. The data from 2015 to 2022 reported the occurrences of tourist vehicle accidents, tourists were stung by Marlyn fish stabs, and the incident of people drowning resulted in death without emergency action. This study aimed to determine the effect of BLS training on applying BLS and standard operational procedures in emergency first aid. The research method was a quasi-experimental pretest and posttest group design. The population was lifeguards and tourist vehicle drivers, with samples taken purposively. The measurement of the application of BLS was carried out twice: before and after training. Data analysis used univariate and bivariate analyses. The results showed a mean value before training was 1.37, with a standard deviation was 0.684. The mean value after training was 14.63, and the standard deviation was 1.383. The dependent T-test results were 13.263, and the standard deviation was 1.327, with a p-value of 0.000 ( $p < 0,005$ ). The conclusion is that BLS training affects the application and operational standards of BLS training. Training members are recommended to apply for BLS in caring for the victims, and the Donggala Regency Government is to organize a tourist clinic in Tanjung Karang Beach and empower training personnel as rescuers.*

**Keywords:** *BLS Training, Emergency, Beach Tourism, Tanjung Karang*

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## INTRODUCION

Indonesia is an archipelagic country consisting of 17,508 islands and is famous for its vast and beautiful seas. The ratio of area between sea and land is 3:1, meaning that Indonesia's most significant area is the sea at 70% of its area. Within the vast ocean waters, there is impressive biodiversity, including spectacular coral reefs. This coral reef is home to notable marine species, such as colorful fish, rare marine life, and other aquatic animals. Indonesia's underwater world natural beauty makes it one of the best destinations for divers and nature lovers<sup>1</sup>.

Beaches are one of the most popular tourist destinations for people worldwide. The natural beauty, white sand, calm waves, and various recreational activities make the beach a popular holiday destination. However, behind its charm, beach tourism also has potential risks that cannot be ignored. One of them is an emergency that can occur whenever and to whoever is on holiday at the beach<sup>2</sup>.

Emergencies at the beach include various situations such as drowning, injuries due to water sports, the loss of children, as well as other urgent medical conditions such as a sudden heart attack in a person<sup>3</sup>. An emergency condition at the beach is a situation that requires a quick and appropriate response to overcome various risks and dangers that can occur around the beach. Some emergency conditions that often occur at the beach include someone drowning. This condition is one of the most severe emergencies on the coast. Drowning can occur for various reasons, including solid ocean currents, high waves, or a person's inability to swim. A quick response and knowledge of rescue first aid is very important<sup>4</sup>.

Another condition that may occur is injury due to water sports. Activities like surfing, windsurfing, or even swimming can pose a risk of injury. Common injuries include fractured bones, severe cuts, or even head injuries from falling off water sports equipment. An emergency healthcare provider should be called immediately in cases like this<sup>5</sup>. Another emergency that can occur at beach tourist destination is the disappearance of children. Beaches are usually crowded, and children can easily get lost or disappear without the supervision of their parents or caregivers. It is a highly urgent situation, and a search should be carried out immediately by beach safety officers or local authorities. Urgent medical conditions such as heart attacks, strokes, or severe allergic reactions can occur at any time, including at the beach. Immediately calling the emergency number and providing first aid if necessary is very important<sup>6</sup>.

In situations like these, time is a crucial factor in determining the safety and well-being of visitors. Therefore, managing emergencies in beach tourism must be a significant concern for the government, local authorities, and related parties<sup>7</sup>.

During the holiday season, beach tourist destinations are always attractive to visit by local and foreign tourists, as is the case with the Tanjung Karang beach tourist destination. The Tanjung Karang beach tourist village in Labuan Bajo village, Donggala Regency, Central Sulawesi, is very busy with tourists, and a rapid increase occurs during national holidays<sup>8</sup>.

Beach tourist destinations that are busy being visited have the potential for accidents due to marine animal stings or existing tourist facilities. This condition may result in an emergency,

while at this tourist attraction, no service post can serve visitors who need service<sup>9</sup>.

Based on preliminary studies that have been carried out at the Tanjung Karang tourist beach, data has been obtained that there were no health service posts and officers who are trained and are routinely at the location, especially on holidays, to provide first aid if a disaster occurs at this place. If an emergency occurs, the victim is immediately referred to the nearest health service, namely the Donggala Community Health Center and the Kabelota Regional Hospital, which is 30 minutes from the location. This condition could cause death because the victim is too late to get help. Data was obtained in January 2016 at the Tanjung Karang tourist destination; there was a banana boat accident that caused four people to die at the scene. This incident has occurred frequently since 2015, not only in accidents with banana boats but also due to being stung by fish in the sea. Seeing the existing problems, it is necessary to provide basic life support (BLS) training to ordinary people, especially beach managers and beach tourist motorbike drivers, so that they can provide first aid to victims if an accident occurs.

This research aimed to provide skilled personnel who can provide first aid when an emergency occurs to visitors the Tanjung Karang Donggala tourist beach, as well as standard operational procedures for first aid in beach tourism emergencies.

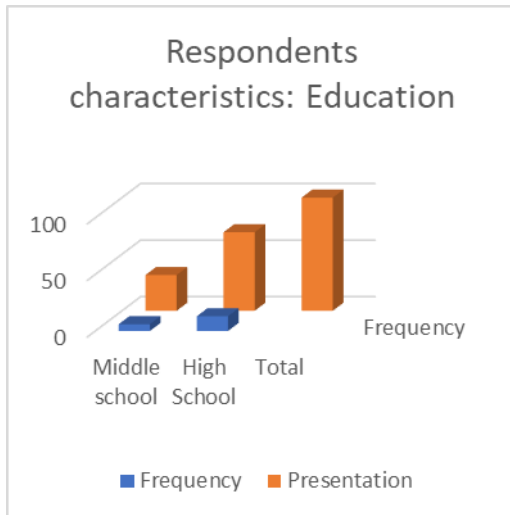
## **METHOD**

The research method used is a quasi-experiment using a pre-test and post-test group design where basic life support (BLS) implementation variables are measured (O1), then BLS training was carried out for two days (X). In addition, a first aid SOP was created for beach tourism emergencies.

The research was carried out at Tanjung Karang beach tourist destination, which is located in Labuan Bajo village, Donggala Regency, Central Sulawesi Province. The implementation time was May to October 2016, with a sample size of 19 people consisting of beach officers and tourist motorbike drivers. The sampling method used was Non-Random Sampling using a Side Purposive method, where samples were taken according to the researcher's considerations<sup>10</sup>. Inclusion criteria: Donggala Regency government tourist beach managers were three people, and officers who brought tourist motorbikes (tourist boats, banana boats, speed boats) were 16 people. The variable in this research is the treatment variable, which consists of BLS training and making SOPs. The data collection was carried out by observation using a checklist. The BLS variable used a checklist as a Guttman scale of 17 statement items. Then, the data analysis presented univariate and bivariate views in diagram form and diagram explanations.

## RESULT

**Diagram 1. Distribution of respondents based on educational level characteristics.**



According to Diagram 1, the majority of the 19 respondents (68.4%) had a high school education, while six respondents (31.6%) had a junior high school education.

**Diagram 2. Distribution of respondents based on job characteristics**

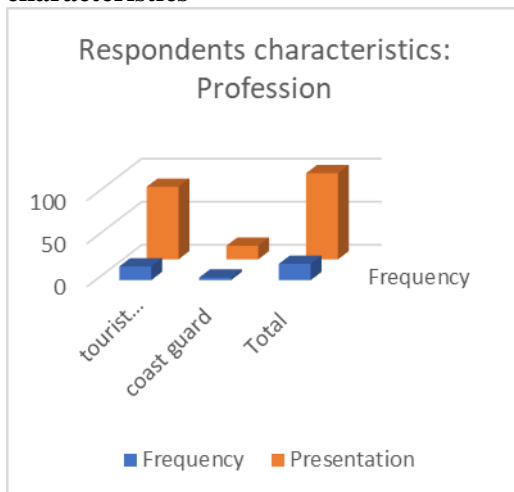


Diagram 2 shows that more than 16 of the 19 respondents (84.2%) were tourist motorbike riders. Tourist motorbike riders will encounter more beach emergency cases, whereas three people (15.8%) are Donggala Regency Regional Government cottage guards.

**Diagram 3. Distribution of respondents based on length of work characteristics**

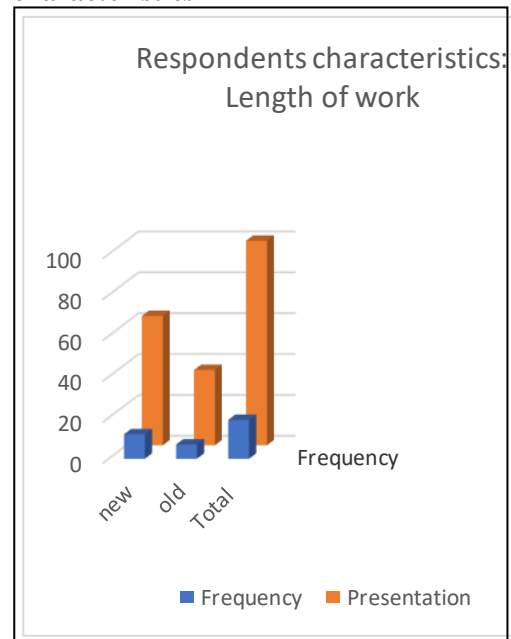
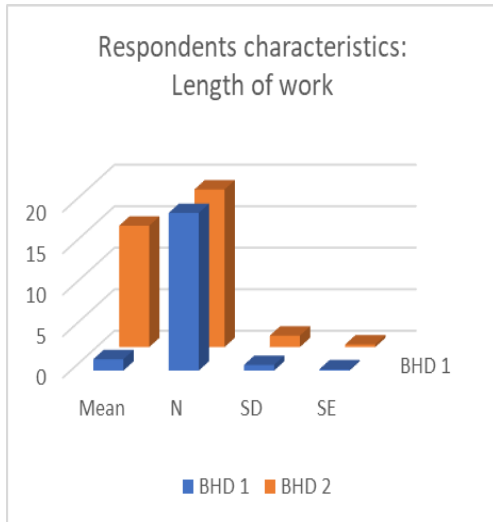


Diagram 3 illustrates that 12 persons (63.2%) among the 19 respondents have not worked for a long time at the Tanjung Karang tourist beach destination, whereas seven people (36.8%) have worked for a long time.

**Table 1. The Average distribution of BLS abilities based on the first and second measurements of respondents**

Variable	Mean	N	SD	SE
BLS 1	1,37	19	0,683	0,157
BLS 2	14,63	19	1,383	0,317



Based on diagram 4, it can be seen that the mean BLS ability in the first measurement (before BLS training) was 1.37, the standard deviation (SD) was 0.683, and the standard error mean (SE) was 0.157. In the second measurement (after BLS training), the mean BLS ability was 14.63, the standard deviation (SD) was 1.383, and the mean standard error (SE) was 0.317.

**Table 2. Average distribution of BLS abilities after BLS training on Tanjung Karang beach**

Variable	Mean	SD	SE	p-value	N
BLS1-	-	1,327	0,304	0,000	19
BLS2	13,263				

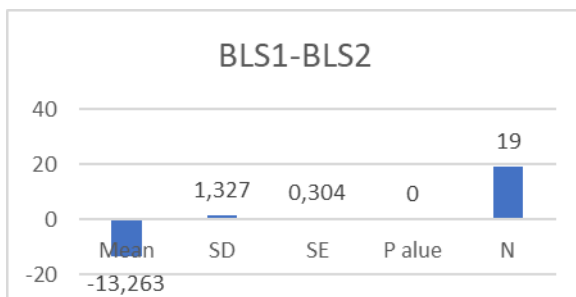


Diagram 5 shows the mean difference between the first (pre-test) and second (post-test) measurements was -13.263, with a standard deviation of

1.327 and a standard error of 0.304. The statistical test results obtained P value = 0.000 ( $p < 0.05$ ) OR=.304 (13,263 - 13,903). It means that statistically, there is a significant effect of BLS training on BLS abilities where there is a significant increase in people who are given BLS training with a chance of 13,263 up to 13,903 times increased knowledge about BLS training compared to people who were not given training.

## DISCUSSIONS

The success of training implementation was greatly influenced by the skills of the personnel providing the training, the training methods, and the tools used. In implementing the BLS training, the researcher was aided by a master trainer (MT) who had a trainer certificate in emergency disasters. The training material is delivered using lecture, simulation, and demonstration methods. The lecture method uses LCD to deliver the material about first aid in emergencies and uses a basic life support (BLS) mannequin (Phantom) for simulation and demonstration.

At the demonstration stage, participants were given the opportunity to see the procedures for implementing BLS actions. Then, the training participants could practice BLS actions while being supervised by the trainers and researchers. It aligns with the theory that changing attitudes into practice requires learning facilities. Participants are given the opportunity to see and hear from other people; they are given the opportunity to master skill components; they perform new skills themselves; and trainers evaluate the results of new skills and provide feedback<sup>11</sup>. It aligns with the research<sup>12</sup> that education is needed to obtain information that can improve

health and quality of life. Respondents' good knowledge was influenced by the training methods provided through demonstrations. The results of this research<sup>13</sup> are in line with research showing that there is an influence of health education regarding handling seawater drowning victims on increasing the knowledge of the fishing community in Bolangitan II village, North Bolaang Mongondow Regency, where the Wilcoxon test results obtained a mean rank value of 24, p-value = 0.000 (p.0 .05). This is also in line with the research results of Turambi D et al., that there is an influence of BLS training on increasing the knowledge of class XI (p<0.005). Likewise, the research results<sup>14</sup> show that there is an influence of BLS Theory research on the knowledge of cardiopulmonary resuscitation of female students at SMA Negeri I Toili, where the Wilcoxon test results obtained a value of p = 0.000 (p<0.05). In research<sup>15</sup> on the effect of BLS training on the knowledge of tourist drivers, the pre-test results showed that 12 respondents had good knowledge. In the post-test, 30 respondents had good knowledge.

Based on the results in Diagram 4, the average ability to apply BLS before being given training was 1.37. Of the 17 question items on BLS implementation procedures, an average of 19 respondents were only able to carry out 1-2 procedures. If seen from the observation sheet (pre-test), the participant only asked for help, and the victim was left lying on his back; the victim was not given first aid measures. This condition can cause death. It is due to the participants' ignorance about what first aid can be provided. After being given training and carrying out a post-test, the average mean of BLS implementation was 14.63. From the 17

items stating BLS implementation procedures, an average of 19 participants could carry out 14–15 actions. It showed a change in the ability to implement BLS. After training, participants could perform BLS well and assess the condition of victims who need basic life support. Analysis of research results showed that BLS training positively influenced the ability and knowledge of officers or the public in implementing BLS in emergencies at beach tourism. It is in accordance with training theories, which emphasize the importance of training to improve individual competence. The results of this comparison can illustrate the extent of increased competency achieved through training.

This condition was very beneficial because the training participants were tourist motorbike riders and coast guards, and they would likely find victims while traveling on Tanjung Karang beach. According to the researchers' assumptions, changes in the ability to apply BLS before and after this training were also inseparable from the participants' educational factors. Of the 19 training participants, 13 respondents (68.4%) had a high school or equivalent education. This educational background played a crucial role in the implementation of training, where younger participants received the information provided during training. It is in line with<sup>16</sup> theories that one factor influencing health education to achieve its targets is the level of education. Education can influence a person's perspective on the information provided, so the higher the level of education, the easier it is for a person to accept the information obtained<sup>7</sup>. Apart from education, experience was also a factor that played a role in successfully implementing training<sup>17</sup>—experience

from a long time working as a tourist motorbike guide and lifeguard. The average length of work for participants was four years; from the results of their interviews, they said that if someone drowns, they usually see tourists providing mouth-to-mouth breathing assistance, so, during BLS training, mouth to mouth breathing assistance is carried out for participants who are easier to understand because they have already seen it. In implementing the training, material was also provided on first aid in coastal emergencies in the form of assistance to drowning victims, evacuation and transportation of victims, and assistance to victims bitten by sea animals. The material is given using the lecture method: question and answer. For evacuation and transportation actions, the practice was carried out, namely evacuation and transportation, without using tools. Furthermore, the training materials created standard operating procedures so participants could use them when providing first aid<sup>18</sup>.

In the Evaluation of First Aid Standard Operating Procedures (SOP), the effectiveness and relevance of first aid SOPs in beach tourism were in line with BLS standards taught in training. There was awareness and compliance with the SOPs that have been taught, and all participants could follow the SOP well. The benefits obtained from BLS training in the context of beach tourism included increasing visitor safety and reducing the risk of accidents. These benefits can be measured in terms of the number of lives avoided or injury rates reduced.

## CONCLUSIONS

This research showed that BLS training positively impacts implementing

BLS and Standard Operational Procedures for First Aid in emergencies at beach tourism destinations. It has the potential to improve visitor safety and well-being<sup>19</sup>. Therefore, beach tourism managers and related parties should consider implementing a structured and ongoing training program to increase preparedness in dealing with emergencies. Having clear Standard Operating Procedures (SOP) for handling emergencies at tourist beaches is also essential<sup>20</sup>. It is also essential to educate visitors about the actions to take in emergencies and place clear warning and information signs along the beach to increase safety awareness. By adhering to good SOPs and having well-trained staff, beach tourism could become safer for everyone who visits it.

Based on the research and discussion results, it can be concluded that the ability to apply BLS to drowning people before BLS training was carried out obtained a mean value of 1.37 with a standard deviation of 0.684. The ability to apply BLS to drowning people after BLS training was obtained with a mean value of 14.63 and a standard deviation of 1.383. There is an effect of BLS training on the application of BLS to drowning people, where the mean value was -13.263 and  $p=0.000$  ( $p<0.005$ ). There are standard operational procedures for first aid in coastal emergencies, namely SOP for evacuation and transportation, SOP for drowning people, and SOP for treating sea animal bite wounds.

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## ***The Relationship Between Family Support and Family Stress in Pulmonary Tuberculosis Patients***

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### **ABSTRACT**

*Pulmonary tuberculosis is the third most prevalent disease worldwide. It is a contagious disease caused by Mycobacterium tuberculosis, a bacterium characterized by dimensions of 0,5-4 $\mu$  x 0,3-0,6 $\mu$  and an outer thick layer composed of lipids that are resistant to chemical penetration. Family support is one of the factors influencing the treatment of pulmonary tuberculosis, where both main and extended family serve as a support system for their affected members. The primary function of a family is to provide healthcare. The objective of this study is to investigate the relationship between family support and family stress among pulmonary tuberculosis patients at Tamalanrea Primary Health Center. This study employed a quantitative cross-sectional research design and utilized a total sampling approach with a sample size of 32 patients. Data were collected through questionnaires and analyzed using Fisher's Exact test. The results of the study revealed a significant relationship between family support and family stress in tuberculosis patients, with a p-value of 0,018. In conclusion, this study established a correlation between family support and family stress among pulmonary tuberculosis patients at Tamalanrea Primary Health Center. It is suggested that future researchers use larger sample sizes to explore additional factors that impact family support and family stress among tuberculosis patients.*

**Keywords:** Tuberculosis, Family Support, Family Stress

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## **INTRODUCTION**

Pulmonary tuberculosis is an infectious disease caused by mycobacterium tuberculosis, which commonly affects the lungs but can also affect other organs<sup>1</sup>. Pulmonary TB is particularly contagious in densely populated areas with poor ventilation and limited exposure to sunlight. However, in well-ventilated spaces with adequate air circulation, TB bacteria can only remain viable for 1-2 hours<sup>2</sup>.

This global endeavour to combat tuberculosis, which has saved approximately 66 million lives since the year 2000. In 2018, a total of 1,5 million individuals, including 251,000 individuals with HIV, succumbed to

pulmonary tuberculosis. An estimated 10 million people (ranging from 9 to 11,1 million), comprising 5,7 million men, 3,2 million women, and 1,1 million children, are believed to have become infected due to pulmonary TB in 2018. This places Pulmonary Tuberculosis as the third leading cause of death worldwide, following coronary artery disease (ischemic heart disease) and stroke. Therefore, eradicating the TB pandemic is one of the key objectives of the 2030 Sustainable Development Goals (SDGs) that every nation must strive to achieve. Meanwhile, Indonesia stands out globally for its high tuberculosis incidence, as evidenced by its classification as one of the top five countries in the world for TB prevalence<sup>3</sup>.

Tuberculosis continues to pose a significant global health challenge, persisting as one of the top 10 leading causes of mortality worldwide. According to the World Health Organization's Global TB Report for 2021, Indonesia holds the unenviable distinction of being the third-highest burdened nation for tuberculosis on the planet. It is estimated that in the year 2020, there were a staggering 824,000 new tuberculosis cases in Indonesia, resulting in a grim tally of 93,000 deaths, equivalent to an alarming 11 deaths per<sup>4</sup>.

Specifically focusing on South Sulawesi, the year 2020 saw a total of 18,863 reported cases of pulmonary tuberculosis, comprising 11,095 males and 7,768 females. Among these cases, 11,476 individuals (accounting for 60,83% of the total) were registered and underwent treatment, with a noteworthy 8,686 individuals (representing 70,65% of the treated cases) attaining recovery during the same year<sup>5</sup>.

From the initial data at Tamalanrea Health Center, the escalation of tuberculosis cases has not exhibited a significant increase compared to the previous years. In the current year, the health center has recorded approximately 10 patients suffering from pulmonary tuberculosis. When compared to the preceding years, the prevalence of pulmonary tuberculosis patients at the Tamalanrea Primary Health Center has notably higher.

Family Support plays a pivotal role in influencing the management of pulmonary tuberculosis, with both main and extended family members serving as a robust support system for their effected relatives. As its core, the family function lies in healthcare provision, encompassing the family's ability to offer emotional understanding and encouragement, there by motivating patients to diligently adhere to their treatment<sup>6,7</sup>.

Family support is significantly a cornerstone of success in the treatment of pulmonary TB by consistently providing understanding and motivation, ensuring patients remain committed to their treatment regimen<sup>8</sup>. This support entails emotional concern, practical assistance, and reinforcement, effectively preventing patients

from feeling isolated and helpless in the face of their condition. Moreover continuous family support empowers pulmonary tuberculosis patients throughout their treatment journey, promoting an enduring sensitivity to potential medication side effects<sup>9</sup>.

The influence of family support holds immense significance for individuals facing health challenges, serving as a vital strategy to mitigate stress<sup>10</sup>. This support is particularly crucial in the context of adherence to medication regimens, including Anti-Tuberculosis Drugs (ATDs). The family's role in providing this support cannot be understated, as it significantly contributes to individuals' commitment to adhering to prescribed treatments<sup>11</sup>.

The role of family support significantly influences a patient's decision to complete their medication regimen. Some patients, experiencing adverse effects from anti-tuberculosis medications, opt to discontinue their treatment. Family support, serving as a Patient Management Officer (PMO), empowers tuberculosis patients throughout their treatment by offering continuous assistance, such as reminders for medication adherence. Beyond their role as PMOs, families are crucial in providing support to tuberculosis patients by demonstrating care, empathy, and tending to their needs<sup>12</sup>.

Family Stress refers to the mechanisms employed by pulmonary tuberculosis patients to cope with stress, involving both adaptive (effective) and maladaptive (ineffective) coping strategies. Coping mechanisms represent an individual's efforts to address their challenges. It can be elucidated that coping mechanisms are the strategies employed by an individual confronting their issues, adapting to all threatening situations, thereby enabling pulmonary tuberculosis patients to undergo their treatment without fear<sup>13</sup>.

In family stress theory, it is elucidated that a crisis arises when sources and adaptive strategies are ineffective in addressing stressor threats, rendering the family incapable of proficiently problem-solving, and consequently, less functional. Furthermore, according to Cox and Ferguson, family crises or

stress often originate from family instability and disarray. When stress occurs, families typically experience discomfort and become more receptive to advice and information<sup>14</sup>.

This objective of this research is to investigate the correlation between Family Support and Family Stress in Pulmonary Tuberculosis patients within the operational area of the Tamalanrea Primary Health Center.

## METHOD

The research design employed in this study is cross-sectional, focusing on examining relationships and associations. It was conducted at the Tamalanrea Primary Health Center in Makassar during the month of July. The study population comprises pulmonary tuberculosis patients receiving treatment within the jurisdiction of the Tamalanrea Primary Health Center in Makassar, with a sample size of 32 patients chosen via total sampling.

The measurement tools utilized in this study consist of self-efficacy questionnaires and behavioral factor questionnaires. Data processing techniques encompass editing, coding, data entry, and tabulation. Univariate analysis was used to examine respondent characteristics' frequency distribution and treatment adherence. Bivariate analysis was conducted to assess the relationship between the dependent and independent variables, using Fisher's Exact test. The research has received ethical clearance with reference number 400/STIKES-NH/KEPK/VI/2022, issued on June 16, 2022.

## RESULTS

**Table 1. Frequency Distribution Based on Respondent Characteristics (n=32)**

General Characteristics	n	%
Age		
Aged 2-10 years	3	9,4
Aged 11-19 years	1	3,1
Aged 20-60 years	27	84,4
Aged >60 years	1	3,1
Gender		
Male	18	56,2

General Characteristics	n	%
Female	15	43,8
Education Level		
Elementary School	9	28,1
Junior High School	9	28,1
Senior High School	10	31,2
Undergraduate	4	12,5

Table 1 illustrates that out of the 32 respondents, the age characteristics of the respondents indicate that the majority fall within the 20-60 age bracket, comprising 27 respondents (84,4%), while the represented age group is over 60 years, comprising only 1 respondent (3,1%). As for the gender characteristics, the majority are male, totaling 18 respondents (56,2%), with 15 respondents (43,8%) being female. In terms of educational background, the majority of the respondents have completed high school education (SMA), accounting for 10 respondents (31,2%).

**Table 2. Frequency Distribution Based on Family Support at Tamalanrea Primary Health Care**

Medication Adherence	Frequency (f)	Percentage (%)
Adherent	27	84,4
Non-adherent	5	15,6
Total	32	100,0

Table 2 indicates that among Pulmonary TB patients at Tamalanrea Primary Health Care in Makassar, 27 respondents (84,4%) exhibit adherence to their medication regimen, while 5 respondents (15,6%) do not adhere to the prescribed treatment.

**Table 3. The Association Between Family Support and Pulmonary TB Patients' Medication Adherence at Tamalanrea Primary Health Care in Makassar**

Family Support	Medication Adherence				Total	P-Value
	Adherent		Non-adherent			
	n	%	n	%	n	%
Positive	24	92,3	2	7,7	26	100,0
Negative	3	50,0	3	50,0	6	100,0
Total	27	84,4	5	15,6	32	100,0

Table 3, concerning the relationship between family support and treatment adherence among pulmonary tuberculosis patients at Tamalanrea Primary Health Center in Makassar, which reveals that patients with positive family support exhibited a high adherence rate, with 24 patients (92,3%) adhering to the prescribed medication regimen. In contrast, there are 2 patients with positive family support but did not adhere to the medication. Among patients with negative family support, there are 3 patients are adhere to their prescribed medication, on the contrary, patients with negative family support who did not adhere to the medication consist of 3 patients (50%).

**Table 4. The Association between Family Stress and Pulmonary Tuberculosis Patients' Medication Adherence at Tamalanrea Primary Health Center in Makassar**

Family Stress	Medication Adherence				Total		P-Value
	Adherent		Non-adherent		n	%	
	n	%	n	%			
Not Stressed	25	92,6	2	7,7	26	100,0	0,018
Stressed	2	40,0	3	50,0	6	100,0	
Total	27	84,4	5	15,6	32	100,0	

Table 4, which investigates the association between family stress toward Pulmonary Tuberculosis patients' medication adherence at Tamalanrea Primary Health Center in Makassar indicates that patients who experience low family stress or not stressed demonstrated a quite high adherence rate, comprising 25 patients (92,6%) diligently adhering to their medication, while there are 2 patients (7,4%) with low family stress did not adhere to their prescribed medication. On contrary, among patients experiencing high family stress, 2 patients (40%) adhered to the medication regimen, while the other 5 patients (15,6%) did not adhere to the prescribed treatment.

## DISCUSSION

According to the research findings regarding family support and medication

adherence, it was investigated that patients who received good support and exhibited adherence accounted for 92,3% of the respondents, totaling in 24 individuals. This strong correlation can be attributed to the support provided by their families, including encouragement to be recovered, informative discussion regarding benefits and risks of non-compliant medication, and logical assistance, such as escorting patients to their medical appointments. Furthermore, family members were readily available to offer guidance in resolving any issues, ensuring that patients did not feel isolated. Whereas, those who has a high family support but did not compliant to their medication numbered 2 individuals (7,7%), this non-compliance or non-adherence can be linked to the stress experienced by the patients due to their environment, including their neighbors and friends, as well as their negligence to take their medications routines and failed to adhere to prescribed schedule at the health center. While for the patients with negative family support but adherence, amounted 3 individuals (50%), these patients possessed a level of self-confidence that motivated them to recover from their ailments. Those who do not experience family support and not compliance to their medication amounted 3 individuals (50%), arised by the absence of family attention and support, since family support is one of the pivotal factors in affecting the treatment progress.

Family Support constitute as one of the factors that affect Pulmonary TB medication, where main family or extended family serving as support system for their families. The fundamental role of the family lies in healthcare provision which represents the family's capability. Family support significantly encourage the success of pulmonary tuberculosis patients treatment by continuously reminding the patients to adhere to their prescribed medication and providing motivation to ensure consistent medical adherence<sup>15-18</sup>.

Correspondingly to a study conducted by (Wulandari, Jeanny Rantung, & Malianti, 2020), it is affirmed that positive family support enhances the motivation of the TB patients to adhere to their medication, and through the

improved medication adherence, the recurrence rate of tuberculosis among patients can be reduced, effectively mitigating the rise in cases of Multi-Drug Resistant Tuberculosis (MDR-TB)<sup>19</sup>.

This aligns with the research conducted by Mando, (2018) regarding association between family support and medical professionals encouragement in Pulmonary Tuberculosis Patients at the Likupang Primary Health Center in North Minahasa regency<sup>6</sup>. This study was undertaken due to crucial role of family support for tuberculosis patients, wherefore it is the family's responsibility to encourage patients to consistently adhere to their medication and remind them to undergo sputum re-examination at the specified intervals. With a positive family support, pulmonary tuberculosis patients are prone to be more motivated to diligently attend their medication regimen<sup>6</sup>.

Research finding conducted by (Akbar, Fauzan, Langingi, & Darmin, 2021) also suggests that patients adherence depend on the family attitudes as a form of family support so as motivating the patient to take an action towards achieving recovery<sup>18</sup>.

The result of this study also indicates that the majority of the respondents (72,3%) experience positive family support and the remains as much 26,8% patients experience a low family support. Family plays a crucial role in encouraging pulmonary TB patients to consistently attend and take their medication<sup>18</sup>.

The success of pulmonary tuberculosis patients treatment is significantly aided by the families who consistently remind them to take their medications as its prescribed and encourage them to do so regularly. Family support is essential for motivating pulmonary tuberculosis patients by demonstrating care, sympathy, and willingness to provide care. Patients with tuberculosis often feel less isolated when facing crisis scenarios resulting from their condition through emotional support, assistance, and inspiration.

In line with the study conducted by Pitters et al., 2019, titled "Family Support and Its Relationship with Medication Adherence in Pulmonary Tuberculosis Patients at the Ronatan

Weru Primary Health Center, Sam Ratulangi in 2018", which claimed that measures to ensure medication adherence in pulmonary tuberculosis patients involve family support<sup>20</sup>. Based on that study, it is imperative for the family to play an active role and participate in the research conducted at Ranotana Weru Primary Health Center. The finding revealed that among 66 pulmonary tuberculosis patients who were adhere to their medication, 17 of them received a positive family support, it is indicate a strong significant correlation between family support and medication adherence, with a p-value of 0,000.

Based on the research on family stress and treatment adherence among pulmonary tuberculosis patients at the Tamalanrea Primary Health Center in Makassar, the following observations were made as patients who were not experiencing stress and were adherent to their treatment regimen numbered 25 individuals, representing 92.6%. This is attributed to the positive and supportive treatment environment, which encourages patients to diligently adhere to their treatment without feeling stressed or pressured. Among patients who were not experiencing stress but were not adherent to their treatment, 2 individuals were identified, comprising 7.4%. This non-adherence primarily resulted from patients frequently forgetting to take their prescribed medication provided by the health center for daily consumption. Patients who experienced stress but remained adherent to their treatment totaled 2 individuals, accounting for 40.0%. Their persistence in adhering to treatment despite stress was influenced by their determination to overcome the illness they were facing. In contrast, there were 3 patients who experienced stress and were non-adherent, representing 60.0%. The stress led these patients to constantly dwell on their illness, making them feel worthless and sad. This emotional burden was a significant factor contributing to their non-adherence to the treatment provided or facilitated by the health center.

Family stress in the context of pulmonary tuberculosis patients can serve as a coping mechanism to address stress-related

issues, whether adaptively (effectively) or maladaptively (ineffectively). Coping strategies represent individuals' efforts to manage these issues. The theoretical concept of an individual's coping strategy relates to how they deal with problems and adapt to potentially hazardous situations, enabling pulmonary tuberculosis patients to accept treatment without fear. According to the notion of family stress, crises emerge when resources and adaptive tactics fail to adequately counter stressor threats. Consequently, families lose their capacity to resolve problems effectively and become less valuable. As per the ideas put forth by Cox and Ferguson, family instability and turmoil are at the root of family stress. Families typically feel uncomfortable and are receptive to advice and ideas when they are experiencing stress<sup>17</sup>.

This indicates that the majority of Pulmonary Tuberculosis patients chose positive as their answers on family support, not stressed on family stress, and adherent on medication adherence category at Tamalanrea Primary Health Center.

After the Fisher's Exact test has been utilized to investigate the impact between family support and family stress toward pulmonary tuberculosis pulmonary patients, where family support affects pulmonary tuberculosis patients on medication adherence. With a p-value=0,034 ( $p < 0,05$ ) which indicates a strong relationship between family support and pulmonary tuberculosis patients medication adherence at Tamalanrea Primary Health Center in Makassar.

The result of this study is in line with a study conducted by (Septia, et al., 2019), it implies that bivariate analysis using Chi-square showed that there is a significant relationship between family support and pulmonary tuberculosis patients medication adherence at Arifin Achmad Region Hospital<sup>1</sup>. According to the odds ratio (OR) of patients who experience negative family support have the possibility to be non-compliant compared to the patients who experience positive family support<sup>1</sup>.

According to the result of the study, the researcher assumed that there is an association between family support and family stress

towards pulmonary tuberculosis patients medication adherence at Tamalanrea Primary Health Center in Makassar. It is established that during the medication regimen the majority of the patients are adhere to their prescribed medication.

## CONCLUSION

According to the result and discussion of the study, it can be conclude that there is a significant relationship between family support and family stress among the Pulmonary Tuberculosis patients at Tamalanrea within the operational area of the Tamalanrea Primary Health Center with a p-value of 0,018. It is suggested for medical professionals to continuously support for pulmonary tuberculosis patients at home by actively monitoring their medication adherence, the recovery progress of the patients, and by consistently enhancing their knowledge, skills, and positive attitudes in providing care to pulmonary tuberculosis patients to lessen the risk of a decreased quality of life in patients.

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Original Article

## **Exclusive Breastfeeding Support to Increase Exclusive Breastfeeding at Muhammadiyah Gresik Hospital**

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### **ABSTRACT**

*The first 1000 days of life is a critical period, exclusive breastfeeding and infant stimulation are important. The purpose of the study was to analyze the effectiveness of Communication, Information and Education (CIE) on: (1) the mother's knowledge about exclusive breastfeeding, (2) breast care, (3) how to breastfeed correctly, (4) mother's attitude in exclusive breastfeeding. The research design was quasi experimental with pre-post test group intervention. The research time was 8 months, from August 2022 to March 2023. The dependent variable was the provision of CIE by Aisyiyah cadres and the independent variables were 1) mother's knowledge about exclusive breastfeeding, (2) breast care, (3) the correct way of breastfeeding, and (4) mother's attitude. The sample was quota sampling, totaling 100 subjects. The data collection technique used a pre questionnaire given directly during the first or second post partum day and a post questionnaire given after 6 months through visits and MCH books. Data analysis found that mothers' knowledge about breast milk and breastfeeding before and after CIE showed an average value increased from 56.68 to 90.12. The mean value of breast care skills before and after the CIE was 41.24 and 88.48. The mean value of breastfeeding skills before and after the CIE was 43.64 and 88.46. The mean scores of maternal attitudes before and after the CIE were 63.61 and 90.27. Breastfeeding success rate was 91%. The effectiveness of CIE using the Wilcoxon analysis test, shows; there is effectiveness of CIE on knowledge of breast milk and breastfeeding ( $p < 0.05$ ), the value of negative ranks (decrease) is 0. The value of positive ranks (increase) is 50.50. Likewise, the effectiveness of CIE on breast care skills, the effectiveness of CIE on correct breastfeeding skills, and the effectiveness of CIE on maternal attitudes showed the same value ( $p < 0.05$ ), the value of negative ranks (decrease) was 0. The value of positive ranks (increase) was 50.50. The value of ties (equal) is 0.*

**Keywords:** CIE, Correct Breastfeeding Method, Exclusive Breastfeeding

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## **INTRODUCTION**

The growth and development of children from pregnancy to 2 years old is a very important golden period. Pregnant women eat balanced nutrition, check-ups according to standards, from the time the baby is born until the age of 6 months is only given breast milk (breast milk) without any food. After 6 months, complementary foods are added, and breast milk is continued until the age of 2 years. Stimulation of infants and children must also be done, will make children able to achieve optimal growth and development<sup>1</sup>. The goals of the Sustainable

Development Goals (SDGs)<sup>2</sup> by 2030 include: (1) poverty reduction, (2) healthy and prosperous living, (3) economic improvement, (4) peace and justice. This is important to prepare quality human resources. According to Rollins et al.<sup>3</sup> every child deserves to achieve an optimal life.

Breast milk is linked to children's brain growth and development<sup>4-7</sup>. Breast milk has tremendous benefits for the health of both mother and baby. Breastfeeding is important for saving lives and improving the health and well-being of mothers and babies<sup>8</sup>. Exclusive breastfeeding support, then complementary



feeding, and breastfeeding is continued until the child is 2 years old, then stimulation is also carried out from birth to adulthood to get a quality child<sup>9</sup>. In Al-Baqarah:233, it is stated that "Let the child be breastfed for two years to complete the breastfeeding period". In Luqman 14: "Do good to mothers and fathers. The mother has painstakingly conceived and breastfed for two years, so you should be grateful to Allah and your mother and father"<sup>10</sup>.

WHO<sup>11</sup> recommendations stated: (1) Initiate early breastfeeding immediately after birth, (2) Provide exclusive breastfeeding for the first 6 months of life, unless there are medical recommendations, (3) Provide complementary foods with adequate nutrition after 6 months of age and continue breastfeeding until the age of two years. Mothers need to be counseled and supported.

Breast milk contains nutrients and vitamins needed by babies<sup>12</sup>. Breast milk provides many benefits for mother and baby: improving the quality of emotional relationships, baby's immunity becomes more optimal<sup>13</sup>.

According to Indonesia's Health Profile<sup>14</sup> the coverage of exclusively breastfed infants in 2021 was 56.9%. This figure has exceeded the 2021 program target of 40%. The highest percentage of exclusive breastfeeding coverage was in NTB Province (82.4%), while the lowest percentage was in Maluku Province (13.0%). The coverage of exclusive breastfeeding in East Java in 2021 is 56.6% (has not yet reached 70%). A preliminary survey conducted at Muhammadiyah Gresik Hospital on August 2, 2022, out of 20 mothers who had babies under 1 year old, only 12 mothers (60%) provided exclusive breastfeeding. One of the factors that do not provide because the child does not want to breastfeed, and does not know about breastfeeding there is a command in the Qur'an.

If breast milk is not given, it can result in, among others; (1) The baby's immune system is low so that it is prone to infectious diseases<sup>4,15</sup>. (2) Obesity<sup>16,17</sup>. (3) Incidence of diabetes mellitus and hypertension. (4) Incidence of Asthma and Allergies<sup>18</sup>. (5) Influence on child intelligence<sup>19,20</sup>.

Breastfeeding support that needs to be done: (1) Promotion of the advantages of breastfeeding, (2) Facilitation of breastfeeding (maternity/paternity leave, expressing breast milk, breastfeeding facilities in public places),

(3) Promotion of breastfeeding saves lives and money, (4) Enforcement of the Breast Milk Substitute Law, (5) Monitoring health interventions and services<sup>21</sup>.

Causes of mothers not exclusively breastfeeding: (1) employment, (2) level of commitment, social support and pre breastfeeding exposure<sup>21</sup> (3) Maternal experience<sup>22</sup> (4) Socio-economic<sup>23</sup> (5) Relationship problems between husband and wife<sup>12</sup> (6) Knowledge about exclusive breastfeeding<sup>24</sup> (7) Lack of knowledge about breastfeeding is a religious commandment<sup>25</sup>.

Previous studies on breastfeeding support that have been given include: husband support<sup>26</sup>, counseling for breastfeeding mothers in hospitals<sup>27</sup>, breastfeeding support groups to increase knowledge, family support. Breastfeeding support by Aisyiyah religious organization for pregnant women in 4 Community Health centers (CHc Cerme, CHc Metatu, CHc Benjeng and CHc Dadap Kuning) in Gresik Regency until exclusive breastfeeding<sup>28</sup>.

In Social Learning Theory, information gained from observations is used for learning through a number of cognitive and behavioral processes. Social learning of a behavior requires attention to the observed person, recall of the observed behavior (retention), ability to replicate the behavior (reproduction), and motivation to perform the behavior in the same way<sup>29,30</sup>.

The formulation of the problem in this study is whether CIE on breastfeeding knowledge, breast care, the correct way of breastfeeding at Muhammadiyah Gresik Hospital by the Religious Women's Organization can affect the attitude of mothers in providing exclusive breastfeeding.

The hypothesis of this study is that there is an effectiveness of CIE on maternal knowledge, breast care, the correct way of breastfeeding and maternal attitude to exclusive breastfeeding.

The purpose of this study was to analyze the effectiveness of CIE on: (1) mothers' knowledge about breastfeeding with exclusive breastfeeding, (2) breast care, (3) the correct way of breastfeeding, and (4) mothers' attitude in providing exclusive breastfeeding and knowing how to provide exclusive breastfeeding.

## METHOD

This study used Quasi experiment with pre post test group intervention. The research was conducted for 6 months from August 2022 to January 2023 in Muhammadiyah Gresik Hospital, East Java, involving trained Aisyiyah organization (4 people), about breast milk, breastfeeding in general and religion related for 40 hours. Respondents were post partum mothers.

The sample in this study were postpartum mothers who gave birth in August 2022 totaling 245 postpartum mothers. While the sample taken based on quota sampling amounted to 100 people, with inclusion criteria: (1) Mothers who gave birth at Muhammadiyah Gresik Hospital, (2) Willing to participate in the study, (3) Willing to be given CIE about breastfeeding, (4) Willing to be monitored about breastfeeding until the baby is 6 months

old, (5) Willing to sign an inform consent sheet.

The dependent variable was the provision of CIE by Aisyiyah cadres who had received training on breast milk and breastfeeding, and the independent variables were (1) mothers' knowledge about breastfeeding with exclusive breastfeeding, (2) breast care, (3) the correct way of breastfeeding, and (4) mothers' attitudes towards exclusive breastfeeding.

The training of Aisyiyah cadres mentioned above was conducted for 40 hours with 9 trainers (1 pediatric specialist), a Master of Religion, of which 7 were Masters in Maternal and Child Health. It was attended by 25 Aisyiyah cadres (from Aisyiyah breastfeeding communities in Cerme, Dadap Kuning, Benjeng and Metatu sub-districts of Gresik Regency). The training was conducted with a pre-test, and post-test. The results obtained are as written in tables 1, 2 and 3.

**Tabel 1. Characteristics of Aisyiyah Cadres**

Characteristics	Category	Frequency	Percentage
Age	20-35 years	10	40
	>35 years old	15	60
Education level	Secondary education	17	68
	College	8	32
Jobs	Work	5	20
	Not working	20	80
Number of children	1 child	2	8
	2 children	13	52
	3 children	10	40
Breastfeeding	Never breastfed	25	100

Table 1 shows that 60% of Aisyiyah cadres were >35 years old, all had children, most had secondary education (68%), and most were not working (80%). All had 2 children (52%), and none had >3 children, and all mothers had breastfed their babies. All mothers

were able to attend training on breastfeeding, breastfeeding, religious breastfeeding, and stimulation. All mothers were able to provide materials during workshops for pregnant women, and conduct supportive visits to mothers after delivery for up to 6 months.

**Tabel 2. Univariate Analysis (Continuous Data)**

Independent variable	Mean	SD	Min.	Max.
Age	38	7.81	27	56
Breast milk and breastfeeding knowledge	60.2	9.94	40	80
Infant stimulation knowledge	63.8	11.11	50	85
Breast care skills	51.4	15.97	30	78
Breastfeeding skills	48.8	8.73	37	67
Breast pumping skills	48.84	12.31	29.67	67
Developmental stimulation skills for infants aged 0 - 3 months	54.32	11.68	36	77
Developmental stimulation skills for infants aged 3-6 months	56.28	9.28	31.25	67
Attitude of Aisyiyah cadres	65.16	4.05	62	76

In Table 2, shows, the average age of cadres, 38 years, the lowest age is 27 years, and the highest is 56 years. The average value of cadre knowledge of breastfeeding 60.2, the lowest value 40, the highest 80. The average value of stimulation knowledge 63.8, the lowest value 50, and the highest 85. The average value of breast care skills 51.8, the lowest value 30, and the highest 78. Breastfeeding skills 48.4,

the lowest value 37, and the highest 67. Milking skills 48.84, the lowest value 29.67, and the highest 67. Infant stimulation skills 0-3 months 54.32, the lowest value 36, and the highest 77. 3-6 months stimulation skills 56.28, lowest value 31.25, and highest value 67. Furthermore, the mean value of Aisyiyah cadres' attitude was 65.16, lowest value 62, and highest value 76. The SD value of all variables was >4.

**Table 3. Knowledge and Skills of Aisyiyah Cadres Before and After Training with T-test**

Variables	Before		After		P
	Mean	SD	Mean	SD	
Breast milk and breastfeeding knowledge	60.20	9.94	88.6	3.39	< 0.001
Infant stimulation knowledge	63.8	11.11	92.8	3.55	< 0.001
Breast care practices	48.84	12.31	94.24	4.85	< 0.001
Proper breastfeeding practices	48.8	8.73	91.28	5.46	< 0.001
Practicing how to express breast milk	48.84	12.31	94.24	4.85	< 0.001
Infant development stimulation skills 0-3 months	54.32	11.68	87.40	6.60	< 0.001
Infant development stimulation skills 3-6 months	56.28	9.78	85.28	2.47	< 0.001
Cadre attitude	65.16	4.05	93.40	5.96	< 0.001

Table 3 shows that the mean knowledge of cadres on breastfeeding and infant feeding after training was better (mean=88.6; SD=3.39) than before training (mean=60.2; SD=9.94). The mean knowledge of cadres on infant stimulation after the training (mean=92.8; SD=3.55) was better than before the training (mean=63.8; SD=11.11).

The mean value of breast care skills after training (mean=89.04; SD=4.98) was better than before training (mean=51.4; SD=15.97). The mean value of breastfeeding skills after training (mean=91.28; SD=5.46) was better than before training (mean=48.8; SD=8.73). The mean value of milking skills after the training (mean=94.24; SD=4.85) was better than before the training (mean=48.84; SD=12.31).

The mean score of infant stimulation skills 0 - 3 months after training (mean=87.4; SD=6.60) was better than before training (mean=54.32; SD=11.68). The mean value of infant stimulation skills 3 - 6 months after training (mean=86.28; SD=2.47) was better than before training (mean=65.16; SD=9.78), and the mean value of attitude after training (mean=93.4; SD=5.96) was better than before training (mean=65.16; SD=4.05). All variables were statistically significant (p<0.001).

The results of the training of Aisyiyah

cadres then conducted counseling at the Gresik Muhammadiyah Hospital for Post-Partum mothers.

The Aisyiyah cadre training mentioned above was conducted for 40 hours with 9 trainers; a Pediatrician, a Master of Religion, of which 7 were Masters in Maternal and Child Health. Followed by 25 Aisyiyah mothers, who are Aisyiyah breastfeeding community in Cerme, Dadap Kuning, Benjeng and Metatu sub-districts of Gresik Regency. The training was carried out with a pre-test, and post-test.

The data collection technique was to use a questionnaire that had been tested for validity and reliability, while the mother's skills about breastfeeding correctly used an observation sheet with a Likert scale.

Univariate data analysis was used to describe the characteristics of continuous and categorical data samples. Bivariate analysis was used to compare the effect of CIE intervention on mothers' knowledge about breastfeeding, breastfeeding skills, breastfeeding methods and attitudes before and after intervention by trained Aisyiyah cadres using the Wilcoxon test.

This research was conducted with approval obtained from the Health Research Ethics Committee of Muhammadiyah Gresik University, with number: 122.1/KET/II.3.UMG/KEP/A/2022. In this

study, there is social value, there is scientific value, there is no equal distribution of burdens and benefits (if any, it cannot be applied), there is no risk to researchers, there are inducements as a sign of gratitude (by giving souvenirs in the form of baby towels), confidentiality and privacy must be considered (by communicating in a closed room), before the research has been carried out Inform Consent (given an

explanation and signed IC).

## RESULTS

Mother's knowledge about breast milk and breastfeeding in general and about the relationship with religion, apart from that, the characteristics of postpartum mothers are as follows.

**Table 4. Characteristics of Post Partum or Breastfeeding Mothers (Continuous Data)**

Variables	n	Mean	SD	Min.	Max.
Age (years)	100	27.74	5.56	15	44
Parity	100	1.84	0.83	1	5
Breast milk and breastfeeding knowledge					
Before	100	56.68	10.70	31.25	75.00
After	100	90.12	4.96	81.25	93.75
Breast care skill					
Before	100	41.24	9.06	33.30	66.66
After	100	88.48	5.02	81.48	96.20
The right way to breastfeed					
Before	100	43.64	10.50	33.30	70.30
After	100	88.46	4.92	81.48	100
Mother's attitude					
Before	100	66.61	4.52	61.54	74.36
After	100	90.27	5.01	82.05	100

Table 4 shows that the mean age of the study subjects was 27.74 years, with a minimum age of 15 years and a maximum age of 44 years. The mean value of knowledge about breast milk and breastfeeding before the CIE was 56.68 and after the CIE was 90.12. The mean value of breast care skills before the CIE was 41.24 and after 88.48. The mean value of breastfeeding

skills before the CIE was 43.64 and after 88.46. Furthermore, the mean value of maternal attitude before the CIE was 63.61 and after 90.27. Based on the data above, there was an increase in the value before and after the CIE from the religious women's organization. Thus, the CIE implemented by religious women's organizations is effective.

**Table 5. Characteristics of Post Partum or Breastfeeding Mothers (Categorical Data)**

Characteristics	n	%
Age		
<20 years	2	2
≥20 – 35 years	74	74
>35 years	24	24
Education		
Junior High School	6	6
Senior High School	68	68
College	26	26
Jobs		
Not Working (Housewife)	74	74
Work	26	26
Labor and delivery measures		
Normal	60	60
Vacum/Forcep	1	1
SC	39	39
Parity		
1 <sup>st</sup>	32	32

2 <sup>nd</sup>	37	37
3 <sup>rd</sup>	20	20
4 <sup>th</sup>	7	7
5 <sup>th</sup>	4	4
Number of exclusive breastfeeding		
Yes	91	91
No	7	7

Table 5 shows that there are still pregnant women who are less than 20 years old (2%), and more than 35 years old (24%). Primary education level (junior high school) (6%), high school level (68%), while university level (26%). Non-working mothers (74%), while working mothers (26%). Normal delivery (60%), vacuum or forceps (1%) and SC (39%). Pregnancy with primipara (32%), while grande multipara (4%). There were 100 respondents.

The number of mothers who exclusively breastfed was 91%. Table 2 above shows the existence of age risk factors for pregnant women by 2% (age < 20 years) and age > 35 (24%). In addition, grande multipara (having children > 4 there are 7 people (4%), can also be at risk of bleeding in labor because uterine muscle contractions are not good. The number of mothers who breastfed amounted to 91%, indicating this study was effective.

**Table 6. Data Normality Test**

Variable	p-Value	Standard	Asumption
Breast milk and breastfeeding pre-knowledge	<0.01	<0.05	Abnormal
Pre breast care skills	<0.01	<0.05	Abnormal
Pre breastfeeding skills correctly	<0.01	<0.05	Abnormal
Mother's attitude pre	<0.01	<0.05	Abnormal

Table 6 shows the results of the data normality test on the pre-test variables of breast milk and breastfeeding knowledge, breast care

skills, correct breastfeeding skills and maternal attitudes, showing all abnormal values ( $p < 0.05$ ).

**Table 7. Results of Wilcoxon Test on the Effectiveness of CIE on Breast Milk and Breastfeeding Knowledge, Breast Care Skills, Correct Breastfeeding Skills and Maternal Attitudes.**

Independent Variable	N	Mean Rank	Sum of Ranks	p
Breast milk and breastfeeding knowledge				
Negative Ranks	0	0.00	0.00	<0.05
Positive Ranks	100	50.50	5050.00	
Ties	0			
Breast care skills				
Negative Ranks	0	0.00	0.00	<0.05
Positive Ranks	100	50.50	5050.00	
Ties	0			
Correct breastfeeding skills				
Negative Ranks	0	0.00	0.00	<0.05
Positive Ranks	100	50.50	5050.00	
Ties	0			
Mother's attitude				
Negative Ranks	0	0.00	0.00	<0.05
Positive Ranks	100	50.50	5050.00	
Ties	0			

Table 7 shows that there is an effectiveness of CIE on knowledge of breast milk and breastfeeding before and after the intervention ( $p < 0.05$ ). The negative ranks value (decrease) is 0. The positive ranks value (increase) is 50.50. There is an effectiveness of CIE on breastfeeding skills before and after the

intervention ( $p < 0.05$ ). The negative ranks value (decrease) is 0. The positive ranks value (increase) is 50.50. There is an effectiveness of CIE on breastfeeding skills before and after the intervention ( $p < 0.05$ ). The negative ranks value (decrease) is 0. The positive ranks value (increase) is 50.50. There is an effectiveness of

CIE on maternal attitude before and after the intervention ( $p < 0.05$ ). The negative ranks value (decrease) is 0. The positive ranks value (increase) is 50.50. The value of ties (same) is 0.

At the time of the implementation of Communication Information Educational about breastfeeding, breast care practices, how to breastfeed babies correctly by Aisiyiyah cadres, post partum mothers in Muhammadiyah Gresik Hospital, can accept and can follow the explanation and practice of breast care and breastfeeding well. In addition to general material about breastmilk and breastfeeding, breastfeeding information was also provided based on Islamic religion. This can have a positive impact on the mother's belief in exclusive breastfeeding.

## **DISCUSSION**

### **Effectiveness of CIE on mothers' knowledge about breastfeeding with exclusive breastfeeding**

Breast milk is effective in improving children's cognitive understanding because it contains complete micronutrients according to the needs of brain growth<sup>3,31</sup>. Breastfeeding is beneficial for mothers and babies during labor (early initiation of breastfeeding), postpartum and beyond and there is no recommended substitute for breast milk<sup>32</sup>.

Breastfeeding support includes: (1) support from a trusted person, (2) clear and continuous advice, (3) practical breastfeeding support, (4) information support, (5) a comfortable environment, (6) emotional support. (7) individualized care, and (8) social support<sup>33</sup>.

According to Ochola SA et al.<sup>34</sup>, the lactation process includes; (1) prolactin reflex: Breast milk is produced after 16 weeks of pregnancy but does not continue because it is suppressed by pregnancy hormones. When the baby is born and the placenta comes out, prolactin hormone will be activated especially if Early Breastfeeding Initiation is done. The baby's suction affects the release of prolactin hormone which will stimulate the anterior hypophysis, to enter the blood vessels and play a role in milk production. At night prolactin is produced more by the body and the formation of prolactin occurs in 30 minutes after breastfeeding, and more is produced at night, breastfeeding at night is very important.

Prolactin can cause the mother to relax and sometimes even become sleepy, so often the mother can rest even though she is breastfeeding at night. Psychological problems can inhibit the action of oxytocin. Oxytocin is produced faster than prolactin<sup>35</sup>.

According to Alamirew et al.<sup>24</sup> in Northwest Ethiopia, 69.8% had good knowledge about breastfeeding. According to Tadele et al.<sup>36</sup>, only 34.7% were knowledgeable about the duration of breastfeeding despite being given information. According to Ayed<sup>37</sup> in Abha city, Saudi Arabia, overall breastfeeding knowledge was good, only 14% had poor knowledge. According to Vijayalakshmi et al.<sup>38</sup>, knowledge of breastfeeding for mothers was good, but exclusive breastfeeding for their infants was low. Officers in Maternal and Child Health services should provide continuous CIE including to families at every visit in order to influence the attitude of mothers and be able to carry out exclusive breastfeeding.

### **Effectiveness of CIE on breast care skills**

CIE should be given clearly to mothers and families about breast care skills. Practices given to mothers should be carried out patiently and painstakingly.

According to Clark<sup>39</sup>, breast milk production is influenced by hormones, breast care during pregnancy (carried out at  $> 37$  weeks gestation) and after delivery is important, with the aim of; breast hygiene, stimulating milk production and nipples becoming flexible to prevent nipple chafing during breastfeeding.

According to WHO<sup>40</sup>, breast care methods are; (1) breast care for breast milk production begins at  $> 37$  weeks of pregnancy, (2) cleaned using baby oil, (3) Cotton swabs that have been moistened with baby oil place on the nipples and areola mammae 5 minutes, then clean, (4) do nipple tightening with the index finger and thumb, rotated slowly right and left, (5) stimulate the breasts (by massaging the breasts, compressing warm water and cold water alternately), (6) clean and support the breasts with a bra.

### **Effectiveness of CIE on how to breastfeed correctly**

The mean value of breastfeeding skills before the CIE was 43.64 and after the CIE was 88.46. Breastfeeding technique skills are skills that are applied so that someone can become a

counselor as well as a motivator to a mother so that she wants and can breastfeed her child correctly<sup>41</sup>. The key to successful breastfeeding is the correct position of the attachment of the baby's mouth and the mother's breast. The correct position and attachment allows the baby to suck on the areola (not on the nipple) so that the milk easily comes out from where it is produced and avoids nipple blisters<sup>42</sup>.

According to Bahagia<sup>43</sup>, how to breastfeed correctly are: (1) Cleaning hands with soap, then rinsing with running water, (2) The mother sits leaning upright (legs do not hang), by sleeping on her side, or standing, (3) removing a little milk (thumb and index finger aligned at the edge of the areola, then press towards the chest wall then squeeze until the milk comes out, then apply breast milk to the nipple and around the areola. (4) The baby is held on the mother's lap at the arch of the mother's elbow, the baby's body is supported by the baby's arms and buttocks on the mother's palm, one arm of the baby under the mother's armpit and one arm in front, (5) make sure the baby's belly is facing the mother's belly and breast, (6) The mother's affection will affect milk production. (7) The breast is held by using the thumb above the breast while the other four fingers support the lower part of the breast, (8) Provide stimulation for the baby to open the mouth (rooting reflex) by: touching by slightly pressing the cheek so that the mouth opens / it can also be touched the side of the baby's mouth, (9) When the mouth is open, bring the baby's mouth close to the nipple, then enter the nipple along with the areola mammae so that when breastfeeding the nipple reaches the palate of the baby's mouth. (10) The signs of good and correct breastfeeding attachment should be noted. (11) If the breastfeeding time is about 10 to 15 minutes, release the baby's suction by: inserting the little finger through the corner of the baby's mouth or pressing the baby's chin down, then breastfeed the second breast. (12) For further breastfeeding (about 2.5 - 3 hours later), start from the breast that was sucked last during the previous breastfeeding, (13) After finishing breastfeeding, remove a little milk, apply it to the nipple and around the areola. (14). Hold the baby upright by leaning on the mother's shoulder and then patting the baby's back slowly, or it can also be put on the mother's lap, then patting the back slowly.

According to Dick<sup>8</sup>, knowledge of breastfeeding skills increases the mother's

ability to help overcome barriers to breastfeeding. According to the Ministry of Health<sup>44</sup> the correct breastfeeding attachment and position is one of the factors in successful breastfeeding. Incorrect attachment can lead to nipple chafing, and the wrong breastfeeding position can lead to poor milk flow.

### **Effectiveness of CIE on mothers' attitude towards exclusive breastfeeding**

Attitude is the result of human learning, can grow and develop through the learning process, can relate to one particular object, has a relationship with aspects of motivation and feelings, can be positive and negative which leads to certain behaviors. Attitude consists of 4 levels, namely: (1) accept, want to pay attention to the stimulus given, (2) respond, give answers when given questions, do and complete tasks, (3) appreciate, for example inviting others to discuss, (4) be responsible for something chosen.

According to Alamirew<sup>24</sup>, breastfeeding attitudes in Dabat Health Center, Northwest Ethiopia showed, 24% had negative attitudes towards exclusive breastfeeding and 76% had positive attitudes, 28.4% (strongly disagree) and 33.9% (disagree) with the opinion of discarding colostrum, starting complementary foods before 6 months is important, 12% strongly agreed, 15.9% agreed, 44% disagreed and, 28.1% strongly disagreed. According to Ayed<sup>37</sup>, positive attitude towards breastfeeding was 62.2%, negative attitude 37.8%. According to Tadele<sup>36</sup>, in Mizan Aman town of Ethiopia, 89.5% had a positive attitude, only 59.3% believed in exclusive breastfeeding and 26.4% of children were exclusively breastfed for six months. These differences may be due to variations in sampling techniques, sociocultural status of study participants, health care delivery systems, and economic status of study participants.

According to Vijayalakshami<sup>38</sup>, mothers have excellent knowledge and neutral attitudes towards breastfeeding, but exclusive breastfeeding rates are low. It is important to provide prenatal education to mothers and fathers. Recommends strengthening public health education campaigns for breastfeeding.

### **Research Limitations**

This study was conducted in 8 months, because the determination of exclusive breastfeeding is to wait within 6 months, so it requires patience to monitor the research subjects. Alhamdulillah, this research can be carried out well, hopefully the knowledge gained can be transferred to family or others.

## CONCLUSION

Research on Exclusive Breastfeeding Support to Increase Exclusive Breastfeeding at Muhammadiyah Gresik Hospital, including maternal knowledge about breastfeeding with exclusive breast milk, breast care skills, how to breastfeed correctly, and maternal attitudes in doing exclusive breastfeeding to the success of breastfeeding as much as 91%.

Breastfeeding behavior is shaped by habit, and can be colored by custom (culture), and the norms of society. Breastfeeding behavior is not a sudden occurrence, but a process that takes place and is acquired during pregnancy. So it is important to provide CIE, learning by health care workers, families or breastfeeding supporters about breastmilk and breastfeeding. Thus, mothers and families understand what is contained in breastmilk, what are the benefits of breastmilk, the disadvantages of not getting breastmilk, how to properly care for breastmilk and breastfeed properly.

In addition to exclusive breastfeeding, knowledge support on infant and child stimulation for infant development is important. Maternal and child care workers are expected to share knowledge and Communication, Information, and Education (CIE) with the community. In addition, in community organizations, work programs are held on learning infant stimulation until children are 6 years old according to the guidance of the Ministry of Health 2016<sup>45</sup>. With the hope that the community will know about infant and child stimulation, and provide a good environment, so that quality human resources are also independent.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## ***Dietary Regulation As A Factor Predicting Quality of Life in Diabetic Peripheral Neuropathy Patients***

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### **ABSTRACT**

*Diabetic peripheral neuropathy is a complication of diabetes mellitus with the number of sufferers continuing to increase from time to time. A decrease in quality of life occurs as this disease progresses, both in physical, mental, and social aspects. Controlling risk factors for declining quality of life needs to be done early, one of the risk factors for declining quality of life is diet. The aim of this research is to analyze dietary regulation as a predictive factor for quality of life in diabetic peripheral neuropathy sufferers. The type of research used is quantitative research with a cross-sectional approach. The respondents in the study were 210 diabetic peripheral neuropathy sufferers who were selected using consecutive sampling techniques. Data collection uses a questionnaire that meets the existing validity and reliability criteria. The data analysis used in this research is SEM PLS analysis. The results show that dietary regulation has a positive influence on quality of life ( $r=0.236$ ,  $p=0.0001$ ). Dietary regulation has an effect size on quality of life ( $f$  square = 0.095) and also has the ability to predict quality of life well ( $Q$  square = 0.232). Dietary regulation is also feasible and suitable in explaining interactions between variables ( $NFI = 0.540$ ;  $SRMR = 0.99$ ). The conclusion is dietary regulation can be a good predictive factor for quality of life, so that by improving the diet of diabetic peripheral neuropathy sufferers it will be possible to improve their quality of life.*

**Keywords:** Predictive Factors, Diabetic Peripheral Neuropathy, Dietary Management, Quality of Life

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## **INTRODUCTION**

*Diabetic peripheral neuropathy (DPN)* is one of the complications of diabetes mellitus with the highest number of sufferers among other complications. At least 50% of people with diabetes mellitus will develop diabetic neuropathy. Controlling blood glucose levels is important to prevent this complication <sup>1</sup>. At the

global level, the prevalence of DPN ranges between 16% and 87% of diabetes mellitus sufferers. The same thing also happens in Indonesia, where the prevalence is 58% of all diabetes mellitus sufferers <sup>2,3</sup>.

DPN causes a decrease in the quality of life for sufferers. An increased risk of falls, the appearance of pain and a decrease in quality of

life are the main problems in DPN<sup>4</sup>. This decrease in quality of life will not stop at just decreasing the quality of life but can also increase the risk of death in DPN sufferers<sup>5</sup>.

The reduction in the quality of life of DPN sufferers requires holistic and comprehensive treatment and must be done early. For this reason, it is necessary to analyze each risk factor that has a significant effect on the sufferer's quality of life. There are several risk factors for decreasing quality of life in DPN sufferers collected from various studies. These factors can be categorized into lifestyle factors consisting of diet, smoking, lack of physical activity and regularity of treatment. Characteristic factors of sufferers such as age, length of time suffering from DM, blood sugar levels, lipid levels. Comorbid disease factors such as hypertension<sup>6-13</sup>.

Among these factors, lifestyle factors are the factors with the most potential to be used as predictors of the quality of life of DPN sufferers. This is because lifestyle factors are one of the risk factors for DPN that can be modified. Lifestyle factors are also one of the main causes of diabetes mellitus and its complications. Lifestyle factors are also one of the main management factors in managing diabetes mellitus itself<sup>14</sup>.

One of the lifestyle factors that is very dominant in DPN sufferers is diet. Diet can be an important key in controlling blood sugar. A good diet can not only maintain blood sugar levels within normal limits but can also provide sufficient nutritional intake that the body needs for metabolism. So that the disease does not worsen and ultimately the sufferer's quality of life can be maintained as optimally as possible<sup>15</sup>.

Early prevention of decreased quality of life in DPN sufferers needs to be done. Assessment of predictive factors for decreased quality of life can be studied further by building a prediction model. Predictive models are the process of uncovering relationships between variables to predict some desired outcome<sup>16</sup>. According to Kalechofsky (2016) and Shmueli (2010), this prediction model generally uses statistical techniques to predict future behavior<sup>17,18</sup>.

Dietary regulation as a predictive factor for quality of life will make an important contribution to the management of *diabetic peripheral neuropathy sufferers*. Where these sufferers will be able to maintain their general

quality of life while also being able to prevent the occurrence of diabetic ulcers which will ultimately reduce the risk of amputation or even death. Based on the explanation above, researchers are interested in conducting research related to dietary regulation as a predictive factor for quality of life in sufferers of diabetic peripheral neuropathy.

## METHOD

The type of research used was qualitative research with a *cross sectional approach*. This research was carried out in the work area of Puskesmas throughout Padangsidempuan City for 5 months, namely from May 2022 to September 2022.

Respondents in this study were *diabetic peripheral neuropathy sufferers* who had been diagnosed by a doctor and had been assessed using the *Diabetic Neuropathy Score* (DNS) instrument with a total of 210 people. Respondents were selected using *consecutive sampling technique*. The sample inclusion criteria used in this research were not being anxious or depressed, not experiencing cognitive disorders, being able to communicate, being able to read and write and being willing to follow all research procedures.

The research instrument used is a research instrument that has been developed by the research team. This instrument has been tested for validity and reliability. Validity testing is carried out using *face validity*, *content validity* and *construct validity*. The reliability test used is *internal consistency* by paying attention to the *Cronbach alpha value*.

Data analysis in this research was SEM PLS using the SMART PLS application version 3.2.9. The research has obtained ethical approval from the Research Ethics Commission of the Faculty of Medicine, Andalas University with letter number 487/UN.16.2/KEP-FK/2021.

## RESULTS

**Table 1. Characteristics of Respondents**

No	Respondent Characteristics	n	%
1	Gender		
	Man	99	47.1
	Woman	111	52.9
2	Comorbidities		
	None	80	38.1

	Hypertension	78	37.1
	Strokes	2	1.0
	Respiratory disorders	4	1.9
	Heart Disorders	7	3.3
	Kidney disorders	1	0.5
	Visual Impairment	1	0.5
	Other	37	17.6
3	Suffering from DM for a long time		
	Less than 5 years	113	53.8
	More than 5 years	97	46.2
	Amount	210	100.0

Based on the characteristics outlined in the table, it is evident that the majority of survey respondents are female, comprising 52.9% of the total. Examining respondents' characteristics concerning comorbidities, the research findings indicate that a substantial portion, specifically 38.1%, can boast of being free from any comorbid conditions. In contrast, the most prevalent comorbidity among respondents is hypertension, affecting 37.1% of the surveyed individuals.

Shifting our focus to the duration of diabetes mellitus among respondents, a significant 53.8% have grappled with the condition for less than 5 years. This temporal aspect provides valuable insight into the distribution of experiences among respondents, shedding light on the prevalence of relatively recent diagnoses.

This explicit analysis of gender distribution, health conditions, and the temporal dimension of diabetes mellitus offers a detailed and comprehensive portrait of the respondents' health profiles.

**Table 2. Characteristics of Respondents Based on Age and Blood Glucose Levels**

No	Respondent Characteristics	Mean	SD	Min	Max
1	Age	53.31	8.62	31	72
2	Blood Glucose Levels	228.72	83.36	61	456

Based on the table, the average age of respondents in this study was 53.31 years, while the average blood glucose level of respondents was 228.72 mg/dl.

**Table 3. Frequency Distribution of Dietary Regulation and Quality of Life**

No	Variable	n	%
1	Dietary Regulation		
	Bad	7	3.3
	Needs improvement	106	50.5

	Good	97	46.2
2	Quality of Life		
	Good	165	78.6
	Bad	45	21.4
	Total	210	100.0

Based on the table, the majority of respondents' dietary regulation are in the need for improvement category, namely 50.5%, while regarding quality of life, the majority of respondents are in the good quality of life category, namely 78.6%.

**Table 4. Hypothesis Test Results, Path Coefficient Value, F<sup>2</sup> Value and Q<sup>2</sup> Value**

	r value	T value	P value	F <sup>2</sup> value	Q <sup>2</sup> value
Dietary regulation > Quality of life	0.236	3,947	0,000	0.095	0.232

Based on the table, dietary regulation has a significant influence on quality of life. This influence is positive, which means that the better the diet, the better the quality of life (r= 0.236; t= 3.947; p= 0.000). This predictive factor has a good ability to predict quality of life and has an *effect size* on quality of life (Q Square = 0.095; F Square = 0.232).

**Table 5. Model Feasibility Analysis Results**

	Saturated Model	Estimated Model
SRMR	0.099	0.099
NFI	0.540	0.540

Based on the table, it can be concluded that the feasibility of the resulting model is at a moderate level (NFI value= 0.540), whereas according to the SRMR value this model is considered feasible or suitable in explaining the relationship between variables (SRMR value= 0.099).

## DISCUSSION

Based on the results of this research, it was found that diet is a predictive factor that has a direct influence on quality of life. The predictor value resulting from this variable is 0.236, which means that for every 1 unit increase in diet, the quality of life will increase by 23.6%. The results of the research show that the better the diet of type 2 DM sufferers with peripheral neuropathy, the better their quality of life. The dimensions assessed in this eating pattern consist of the amount of food, regularity and type of food.

Controlling diet in type 2 DM sufferers with peripheral neuropathy is a lifestyle intervention that has been proven to be effective in improving the sufferer's health status. This improved health status can take the form of good blood sugar control, more stable body weight, reduced pain and can also improve quality of life. This is in accordance with the results of research conducted by Bunner (2015) and Storz & Kuster (2020) which stated that regulating a diet with plant-based ingredients can control body weight, control blood sugar levels and reduce the pain scale in diabetic neuropathy sufferers<sup>19,20</sup>.

The application of dietary regulation for each person can be measured based on the amount of food, the regularity of eating and the type of eating. Amount of food means how much food is consumed at each meal, both main meals and snacks. Eating regularity means the frequency of main meals 3 times a day and can also be accompanied by snacks 2 times a day. Type of food means the content and composition of the food consumed at each meal.

Setting a healthy eating pattern will help maintain ideal body weight. Food intake has a strong correlation with obesity. The occurrence of obesity is not only related to the amount and frequency of food, but the type of food also plays an important role in the occurrence of obesity<sup>21</sup>.

Dietary management is the main management for diabetes mellitus sufferers. The aim of this food management is to achieve and maintain ideal body weight, achieve normal glycemic levels, prevent worsening of diabetes mellitus, meet nutritional needs and also maintain the sufferer's sense of comfort. The final result of this eating management is the achievement of an optimal quality of life<sup>22-24</sup>.

Managing diet by regulating the composition and frequency of meals is often a problem for people with diabetes mellitus. Diabetes mellitus sufferers' old habits of eating large amounts often become a problem when they are asked to adjust their eating to new existing rules. This can trigger a decline in the quality of life of diabetes mellitus sufferers and it is not uncommon for these sufferers to refuse to follow this rule. This is in accordance with the opinion of Chong (2017) who states that most diabetes mellitus sufferers will return to their original lifestyle after 2 years of suffering from diabetes mellitus<sup>25</sup>).

However, if the diet is acceptable. So this eating pattern has a significant relationship with quality of life. As stated by Purwandari and Susanti (2017), adherence to dietary patterns has a positive relationship with the quality of life of diabetes mellitus sufferers with moderate relationship quality. On the other hand, if you eat too much, it will reduce your quality of life. As stated by Nilsson (2012), a diet containing more red meat is a negative factor in the quality of life in type 2 DM sufferers<sup>26,27</sup>.

Diet will also be related to weight gain in DM sufferers. Where an increase in body weight of 5 kg more often results in a decrease in quality of life compared to a decrease in body weight of 5 kg<sup>28</sup>.

The same thing also applies to type 2 DM sufferers with peripheral neuropathy, that adjusting their diet can improve their quality of life. However, the application of dietary regulation is still difficult to implement well in type 2 DM sufferers with peripheral neuropathy. Dietary management in type 2 DM sufferers with peripheral neuropathy is worse than in type 2 DM sufferers without peripheral neuropathy<sup>29</sup>.

## CONCLUSIONS

Diet is a good predictor variable for quality of life. The predictor value resulting from this variable is 0.236, which means that for every 1 unit increase in diet, the quality of life will increase by 23.6%. Dietary regulation is important to maintain properly in type 2 DM sufferers with peripheral neuropathy. So that the sufferer's quality of life can be maintained in an optimal condition for as long as possible. The role of various parties such as health workers, care givers and families is needed so that type 2 DM sufferers with peripheral neuropathy are still able and willing to maintain their diet.

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## ***Impact of Policies and Supervision on Health Worker Satisfaction at Bahteramas Hospital***

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### **ABSTRACT**

*Providing quality services is inseparable from human resources that produce good performance and achievement. One of the factors related to the performance or work performance of nurses is the low satisfaction of a person with their job. Currently, it is known that the main problem that often arises in human resource management is how to find the best way to achieve employee job satisfaction. Employee complaints about supervision that is very rarely carried out. This makes employees feel that their work is not supervised. This study aims to study the relationship between organizational policies and supervision with the satisfaction of health workers in the BLUD inpatient room of Bahteramas Hospital. This research is a quantitative study with a cross-sectional study approach, and research was conducted on February 2023 in the inpatient room of Bahteramas Hospital. The population in this study were all health workers who worked in the BLUD inpatient room of Bahteramas Hospital, totaling 213 people with a sample of 139 respondents. Data analysis was carried out computerized using the SPSS version 25.0 program, to analyze the relationship between the independent and dependent variables together, the Logistic Regression test was used. Results of the analysis show that all variables that have a probability value (p-value) <0.05 include organizational policies (p=0.141), and supervision (p=0.032). These results indicate that the supervision variable has a significant relationship. Meanwhile, the organizational policy variable does not have a significant relationship with the satisfaction of health workers in the BLUD Inpatient Room of Bahteramas Hospital. There is a moderate relationship between organizational policies and supervision with the satisfaction of health workers in the BLUD Inpatient Room of Bahteramas Hospital.*

**Keywords:** Organizational Policies, Supervision, Workers Satisfaction

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## **INTRODUCTION**

The current era of globalization suggests that market mechanisms will be increasingly dominated by business organizations that provide services or produce superior products that have good competitiveness and take advantage of market opportunities<sup>1</sup>. Providing quality services is inseparable from human resources that produce good performance and achievement<sup>2,3</sup>. One of the factors related to nurses' performance or work performance is the low satisfaction of a

person with their job<sup>4</sup>.

Currently, it is known that the main problem that often arises in human resource management is how to find the best way to achieve employee job satisfaction<sup>5,6</sup>. Thus, problems related to job satisfaction need to receive attention and be handled seriously. This is an effort to avoid negative impacts that the hospital may face due to these problems<sup>7</sup>.

The existence of job dissatisfaction of health workers is influenced by unfavorable working conditions such as employee complaints of boredom and discomfort in the

work environment<sup>8</sup>. Where, in this case there is disharmony in interpersonal relationships between employees<sup>9</sup>.

Employee complaints about supervision that is very rarely carried out. This makes employees feel that their work is not supervised. Thus, no matter how good the work they do, they will not receive rewards, which can actually increase their desire to work better<sup>10</sup>.

Research conducted by Nasution I, Rosanti R. 2020 at RSU dr. Piringadi Medan that more nurses performed poorly in care actions for post-surgical patients, namely 45.5%<sup>11</sup>. This is because nurses have not attended training held by the hospital.

Another study by Suspahariati S, Susilawati R. 2020 shows that 28.6% of employees are satisfied with the unit where they work and 71.4% are dissatisfied with the unit where they work. Meanwhile, for the working conditions variable, 37.3% were satisfied with the working conditions and 62.7% were dissatisfied with the conditions in which they worked<sup>12</sup>.

Based on the above background, the authors are interested in conducting research on "the relationship between organizational policies and supervision with the satisfaction of health workers in the BLUD inpatient room of Bahteramas Hospital."

The purpose of this study is to study the relationship between organizational policies and supervision with the satisfaction of health workers in the BLUD inpatient room of Bahteramas Hospital.

## METHOD

This research is a quantitative study with a cross sectional study approach. The design is intended to determine the relationship between organizational policies, supervision and job satisfaction of health workers in improving the quality of health services at BLUD Bahteramas Hospital. This research was conducted on February 2023 in the inpatient room of Bahteramas Hospital.

The population in this study were all health workers who worked in the BLUD inpatient room of Bahteramas Hospital, totaling 213 people.

The sample in this study were some of the health workers who worked in the BLUD inpatient room of Bahteramas Hospital. How to

determine the number of samples the author uses the formula proposed by Slovin so that 139 respondents are obtained, as for the sample in this study, the author uses the Cluster Random Sampling technique, this technique is used because the population is not homogeneous.

The inclusion criteria for sample selection in this study are: 1) Health workers who work in the inpatient room of BLUD Bahteramas Hospital, 2) Civil servants or permanent employees, 3) Working period  $\geq 2$  years, 4) Willing to be interviewed, 5) Able to communicate well: 1) Status of honorary or non-permanent employees (contract), 2) Not willing to be interviewed.

Data were obtained directly from respondents by utilizing questionnaires and data from agencies related to the study. Data obtained from direct interviews in the field using questionnaires and measurement results were processed using a computer through the stages of editing, coding, scoring, tabulating, and presenting data.

Data analysis was carried out computerized using the SPSS version 25.0 program, to analyze the relationship between the independent and dependent variables together, the Logistic Regression test was used<sup>13</sup>. Decision making on whether there is an influence of the independent variable on the dependent variable, determined by the following criteria: 1) If  $p > 0.05$ : there is no influence of the independent variable on the dependent variable, 2) If  $p \leq 0.05$ : there is an influence of the independent variable on the dependent.

## RESULTS

Table 1 shows that of the 37 respondents who had appropriate organizational policies, 20 respondents (53.1%) had satisfied job satisfaction. Meanwhile, out of 102 respondents who have inappropriate organizational policies, there are 29 respondents (28.4%) with dissatisfied job satisfaction. This shows that more respondents with appropriate organizational policies have satisfied job satisfaction.

The results of the chi square statistical test at the 95% confidence level ( $\alpha = 0.05$ ) show that the p value = 0.005 because  $H_0$  is rejected or  $H_a$  is accepted, which means that there is a relationship between organizational policies and health worker satisfaction in the

Bahteramas Hospital BLUD Inpatient Room.

Based on the analysis of the relationship closeness test, the p-value =0.237 was obtained. This figure shows a moderate relationship. Thus, it can be interpreted that organizational policies have a moderate relationship with the satisfaction of health workers in the BLUD Inpatient Room of Bahteramas Hospital

**Table 1. Organizational Policy and Health Worker Satisfaction**

Policy	Worker satisfaction				Total	
	Satisfied		Less Satisfied			
	n	%	n	%	n	%
As per	20	53,1	17	45,9	37	26,6
Not quite right	29	28,4	73	71,6	102	73,4
Total	49	35,3	90	64,7	139	100

Table 2 shows that of the 52 respondents who had good supervision, 28 respondents (53.8%) had satisfied job satisfaction. Meanwhile, out of 87 respondents who had poor supervision, there were 21 respondents (24.1%) with dissatisfied job satisfaction. This shows that more respondents with good supervision have satisfied job satisfaction.

The results of the chi square statistical test at the 95% confidence level ( $\alpha = 0.05$ ) show that the p value = 0.001 because  $H_0$  is rejected or  $H_a$  is accepted, which means that there is a relationship between supervision and health worker satisfaction in the Bahteramas Hospital BLUD Inpatient Room.

Based on the analysis of the relationship closeness test, the value p =0.301 was obtained. This figure shows a moderate relationship. Thus, it can be interpreted that supervision has a moderate relationship with the satisfaction of health workers in the BLUD Inpatient Room of Bahteramas Hospital.

**Table 2. Supervision with Health Worker Satisfaction in the BLUD Inpatient Room of Bahteramas Hospital**

Surveillance	Worker satisfaction				Total	
	Satisfied		Less Satisfied			
Good	8	3,8	4	6,2	2	37,4
Not so good	1	4,1	6	5,9	7	62,6
Total	9	35,3	0	4,7	39	100

The results of logistic regression analysis of factors related to health worker

satisfaction in the BLUD Inpatient Room of Bahteramas Hospital are presented in the following table.

**Table 3. Factors Associated with Health Worker Satisfaction in the BLUD Inpatient Room of Bahteramas Hospital**

Independent Variable	B	p-value	Exp.B	CI (95%)	
				Lower	Upper
Organization Policy	.877	.141	2.404	.749	7.719
Surveillance	1.133	.032	3.105	.105	8.724

Table 3 shows that based on the results of the analysis, it can be seen that all variables that have a probability value (p-value) <0.05 include, organizational policies (p=0.141), supervision (p=0.032).

These results indicate that the supervision variable has a significant relationship. Meanwhile, the organizational policy variable does not have a significant relationship with the satisfaction of health workers in the BLUD Inpatient Room of Bahteramas Hospital

## DISCUSSION

### 1. Organization Policy

The data clearly demonstrate a substantial difference in job satisfaction between health workers with appropriate and inappropriate organizational policies. Among those with appropriate policies, 53.1% expressed job satisfaction, whereas only 28.4% of those with inappropriate policies reported satisfaction. The statistical test, utilizing a chi-square analysis, supported the observed disparities, yielding a p-value of 0.005 at a 95% confidence level. The rejection of the null hypothesis ( $H_0$ ) and acceptance of the alternative hypothesis ( $H_a$ ) underscores the presence of a statistically significant relationship between organizational policies and health worker job satisfaction. These results align with existing research that has consistently shown a strong link between organizational policies and employee satisfaction, with the current findings reinforcing this association within the context of a hospital setting<sup>14</sup>. Based on the problems that occur in the field, it is known that there are employees who complain about the injustice of hospital management in providing organizational policies to their employees, such as policies in providing education and training

activities and policies related to career promotion<sup>15</sup>.

Factors outside of organizational policies, such as interpersonal relationships, workload, and personal preferences, may also influence job satisfaction. Thus, the strength of this relationship implies that improvements in organizational policies can contribute significantly to enhancing job satisfaction but may need to be complemented by other measures for a comprehensive approach to improving employee well-being<sup>16</sup>.

The findings of this study have practical implications for healthcare institutions, including Bahteramas Hospital, and can inform human resource management and policy decisions. Recognizing the impact of organizational policies on health worker job satisfaction, hospital administrators and policymakers should prioritize the development and implementation of policies that promote a supportive and conducive work environment<sup>17,18</sup>. Regular evaluations and adjustments to policies may be necessary to meet the evolving needs and expectations of the workforce<sup>19,20</sup>. Moreover, this study highlights the importance of continuous monitoring of employee satisfaction and making data-driven decisions to address concerns and improve the overall work experience.

## 2. Surveillance

The data reveal a substantial difference in job satisfaction between health workers who receive good supervision and those who experience poor supervision. These findings corroborate prior research emphasizing the pivotal role of supervision in shaping job satisfaction and overall employee well-being<sup>21,22</sup>.

Moderate relationship, indicating that the quality of supervision has a noticeable impact on job satisfaction but does not account for all the variations in job satisfaction. Other factors, such as organizational policies, workload, and personal attributes, may also contribute to health worker job satisfaction<sup>23,24</sup>. Therefore, while supervision is an important factor, it should be considered within the broader context of work-related determinants<sup>25</sup>.

## CONCLUSION

Based on the research and discussion that has been proposed in this study on factors

related to the satisfaction of health workers in the Bahteramas Hospital, it can be concluded that there is a moderate relationship between organizational policies and the satisfaction of health workers in Bahteramas Hospital, and there is a moderate relationship between supervision and the satisfaction of health workers in Bahteramas.

The data underscore the importance of effective supervision in fostering job satisfaction among health workers. According to several studies it is critical for healthcare organizations to prioritize training and development programs for supervisors, emphasizing their role in employee engagement and well-being. role in employee engagement and well-being<sup>26,27,28,29</sup>. Regular feedback mechanisms and evaluations should be implemented to ensure that supervisors maintain a high level of competence and can adapt to the evolving needs of their teams<sup>30,31</sup>. The study also highlights the importance of communication, support, and mentorship in the supervisory relationship

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## CONFLICTS OF INTEREST

The authors declared that there is no conflict of interest for this article.

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Original Article

## ***The Relationship Between Nutritional Status and The Quality of Life of Chronic Kidney Disease Patients Undergoing Hemodialysis***

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### ***ABSTRACT***

Patients undergoing hemodialysis for a period of more than 3 years tend to experience malnutrition due to inadequate food intake, diseases of the digestive tract, eating restrictions, drugs that cause impaired nutrient absorption, inadequate dialysis, and comorbidities. This study aimed to determine the relationship between nutritional status and the quality of life of chronic kidney disease patients undergoing hemodialysis in Palu. This study used a cross-sectional design to determine the correlation or relationship between 2 variables. Data were analyzed using the Pearson correlation test. The sampling formula determined the number of samples to test the hypothesis on the average of two populations with 108 respondents. This study was carried out in 2 hemodialysis units in Palu. The samples involved in this study were selected by simple random sampling. The results of this study show that most respondents are in the age range of > 55 years, with 41 people (48.1%); are female, with 56 people (51.9%); have a high school education, with 46 people (42.6%); are working, with 81 people (75%) while the remainings are retirees and housewives; and have hypertension as their comorbid disease, with 56 people (51.9%). There is a relationship between nutritional status and overall quality of life, based on the SGA p-value of 0.016 (p-value < 0.05) and based on the MIS p-value of 0.004 (p-value < 0.05), with the strength of the relationship being weak. The conclusion is there is a relationship between nutritional status and the quality of life of CKD patients undergoing hemodialysis. It is hoped that nurses can pay more attention to the nutritional status of CKD patients undergoing hemodialysis.

**Keywords:** *Nutritional Status, Quality of Life, CKD Patients, Hemodialysis*

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## **INTRODUCTION**

Hemodialysis (HD) is the main therapy performed on patients with chronic kidney disease (CKD) to replace damaged kidney function. Stage 5 CKD patients undergoing hemodialysis are at risk of experiencing abnormalities in nutritional and metabolic

status, including protein-energy wasting (PEW), obesity, nutritional deficiencies, electrolyte disorders, and accumulation of metabolic waste<sup>1</sup>. The National Kidney Foundation Disease Outcomes Quality Initiative (KDOQI) has issued a guideline for assessing and managing nutrition for CKD patients, especially those undergoing

hemodialysis therapy <sup>2</sup> and this guideline was updated in 2021.

Patients undergoing hemodialysis for a period of more than 3 years tend to experience malnutrition due to inadequate food intake, diseases of the digestive tract, eating restrictions, drugs that cause impaired nutrient absorption, inadequate dialysis, and comorbidities <sup>3</sup>. <sup>4</sup>state that the longer the HD time affects the patient's body composition—and decreases their nutritional status and food profile. The nutritional status of hemodialysis patients is measured using Subjective global assessment (SGA) and Dialysis Malnutrition score (DMS) <sup>2</sup>.

The quality of life of hemodialysis patients tends to decrease at each stage of CKD as they experience pain and a decline in bone function, fitness, and social function<sup>5</sup>. The quality of life of hemodialysis patients is important to measure because it provides an overview of how CKD affects the patient's long-term life <sup>6,7</sup>. The questionnaire on HD patient quality of life measures physical function, mental status, and social interaction abilities <sup>8</sup>. Management of hemodialysis patients requires multidisciplinary involvement to provide holistic care, reduce mortality, and reduce costs. In Canada, Taiwan, the United States, and the United Kingdom—this multidisciplinary management of hemodialysis patients is commonly done but, in developing and low-income countries, this is rarely done, especially in Indonesia <sup>9</sup>. Health workers carry out their respective duties. Based on the background, this study aimed to determine the relationship between nutritional status and the quality of life of chronic kidney disease patients undergoing hemodialysis.

## **METHOD**

This study used a cross-sectional design to assess the correlation or relationship between nutritional status and the quality of life of chronic kidney disease patients undergoing hemodialysis (hemodialysis patients). The populations in this study were chronic kidney disease patients undergoing hemodialysis in 2 hemodialysis units in Palu, namely RSUD Undata (Undata Regional Hospital) and RSUD Anutapura (Anutapura Regional Hospital).

Respondents who participated in this study were 108 people. This study was carried out from June 24, 2023 to August 1, 2023. Data were collected by enumerators by asking respondents directly. The independent variable in this study was nutritional status of CKD patients undergoing hemodialysis measured using the SGA and MIS methods and the dependent variable was the quality of life of CKD patients undergoing hemodialysis.

Data were collected by filling in the questionnaire directly. In addition, data on respondents' characteristics were collected in the form of age, gender, occupation, education level, comorbid diseases, duration of undergoing hemodialysis, nutritional status measured using the SGA and MIS methods.

Data were analyzed univariately to collect demographic data and bivariately using the Pearson correlation test to determine the relationship between nutritional status and the quality of life of chronic kidney disease patients undergoing hemodialysis. This study has passed the ethical test from the Ethics Committee of Poltekkes Kemenkes Palu with number 0058/KEPK-KPK/III/2023.

## **RESULTS**

The results of this study are described with demographic data. The results of this study show that the youngest age range of the respondents is 27 years old and the oldest age range of the respondents is 73 years old. However, most respondents are in the age range of >47 years old, with 80 people (62%). Next, the results of this study show that there are slightly more female respondents than male respondents, with 56 people (51.9%). Most respondents have a high school education, with 46 people (42.6%). Also, there are more working respondents than non-working respondents, with 81 people (75%). All respondents undergo hemodialysis 2 times a week, which means they undergo hemodialysis 10 hours per week. Yet, most respondents experience inadequate HD adequacy, with 66 people (61.1%).



**Table 1. Demographic data of CKD patients undergoing hemodialysis**

Characteristics	N	Percentage (%)	± SD	Quality of life	
				Good	Not enough
Age (years)					
26-35 years old	9	8.3	0.50	25 (44.6)	31 (55.4)
26-45 years old	19	17.6	0.50	29 (55.8)	23 (44.2)
46-55 years old	39	36.1	0.50		
≥55 years old	41	48.1	0.50		
p-value	0.06				0.336
Gender					
Female	56	51.9	0.50		
Male	52	48.1	0.50		
Level of education					
Elementary School	12	11.1	1.4		
Junior High School	9	8.3	1.4		
Senior High School	46	42.6	1.4		
D3	4	3.7	1.4		
S1	32	29.6	1.4		
S2	5	4.6	1.4		
Work					
Work	81	75	0.43		
Doesn't work	27	25	0.43		
Comorbid Diseases					
DM	41	38	0.64		
Hypertension	56	51.9	0.64		
Other	11	10.2	0.64		
Duration of Hemodialysis					
New < 191 times	54	50	0.50	26(48.1)	28(51.9)
Old >191 times	54	50	0.50	28(51.9)	26(48.1)
p-value				0.700	
SGA value					
Good nutrition	51	47.2	0.50		
Malnutrition	57	52.8	0.50		
p-value	0.074				
MIS value					
Not Malnourished	57	52.8	0.50		
Malnutrition	51	47.2	0.50		
p-value	0.200				
Hemodialysis Adequacy (Kt/V)					
Adequate	42	38.9	0.490		
Inadequate	66	61.1			
p-value	0.01				
Quality of Life KDQOL-SF36					
Health problems	71.53		17.43		
Effects of kidney disease	67.20		20.43		
Burden of kidney disease	32.64		26.37		
Physical health	35.96		7.72		
Mental health	45.47		9.86		
p-value	0.183				

**Table 2. The Relationship between Nutritional Status and the Quality of Life of CKD patients undergoing hemodialysis**

<b>KDQOL-SF36 domains Based on SGA Measurements</b>	<b>p-value</b>	<b>R</b>	<b>The strength of the relationship</b>
S-12 Physical	0.019	0.225	Weak relationship
S-12 Mental	0.11	0.154	Weak relationship
Overall quality of life	0.016	0.231	Weak relationship
<b>Based on MIS measurements</b>			
S-12 Physical	0.0005	0.409	Adequate relationship
S-12 Mental	0.067	0.177	Weak relationship
Overall quality of life	0.004	0.276	Weak relationship

Source: Primary data, 2023

Table 2 describes the relationship between nutritional status and the quality of life of CKD patients undergoing hemodialysis. Nutritional status is associated with 3 quality of life variables, namely physical health, mental health, and overall quality of life. From the three results of the correlation test using SGA, MIS, and hemodialysis adequacy with quality of life, it was found that there is a relationship between nutritional status and physical health and overall quality of life. However, there is no relationship between nutritional status and mental health. Likewise, there is no relationship between HD adequacy and mental health.

## DISCUSSION

The results of this study show that the youngest age range of the respondents is 27 years old and the oldest age range of the respondents is 73 years old. However, most respondents are in the age range of >47 years old, with 80 people (62%). Next, the results of this study show that there are slightly more female respondents than male respondents, with 56 people (51.9%). Most respondents have a high school education, with 46 people (42.6%). Also, there are more working respondents than non-working respondents, with 81 people (75%). All respondents undergo hemodialysis 2 times a week, which means they undergo hemodialysis 10 hours per week. Yet, most respondents experience inadequate HD adequacy, with 66 people (61.1%). This demographic data is different from 2 previous studies (10,11) where they found that most respondents were male respondents who were working. In the 2 previous studies, it was also found that most respondents had comorbid

diseases, namely DM and hypertension, with more respondents having diabetes mellitus as comorbid disease, with 41 people (38%) compared to hypertension, with 56 people (51.9%) while the remainings had other diseases. The results on comorbid diseases in this study and the 2 previous studies (10,11) are also different, as this study show that the most common comorbidity is hypertension, whereas the 2 previous studies found that the most common comorbidity was diabetes mellitus. All of the demographic factors mentioned have a positive effect or influence on CKD patients undergoing hemodialysis to maintain a good quality of life (12,13).

Research on nutritional status using SGA and MIS provides two different results. Assessment using the SGA method show that most respondents experience malnutrition, with 57 people (52.8%), however, assessment using the MIS method show that most respondents have good nutritional status, or in other words, 57 people (52.8%) do not experience malnutrition.

The difference between these two questionnaires is that they both measure the nutritional status of hemodialysis patients who often experience protein energy wasting (PEW) which is caused by loss of protein and body mass accompanied by a decrease in functional capacity (14). Assessment using the SGA method is a nutritional assessment recommended by the NKF KDOQI which uses physical examination and history as the basis. This assessment is easy to do (14,15). Apart from that, assessment using the MIS method have also been developed which are cheaper and easier to carry out. Because the MIS method

uses 7 SGA components plus 3 new components, namely BMI, serum albumin, and TIBC. These two assessments are equally good for assessing PEW in hemodialysis patients because they both describe the state of energy and protein deficiency in CKD patients (16), although to describe the actual situation, the MIS method is more able to prevent malnutrition because there is the addition of 3 new component values of BMI, serum albumin, and transferrin (17). To conclude, both methods can be used equally well (18,19).

Nutritional status is associated with 3 quality of life variables, namely physical health, mental health, and overall quality of life. From the three results of the correlation test using SGA, MIS, and hemodialysis adequacy with quality of life, it was found that there is a relationship between nutritional status and physical health and overall quality of life. However, there is no relationship between nutritional status and mental health. Likewise, there is no relationship between HD adequacy and mental health. This study is in line with a previous study (20) stating that there is no relationship between hemodialysis adequacy and quality of life. So, it can be concluded that there is no significant relationship between inadequate HD adequacy and poor quality of life, especially in mental status, but for physical health and overall quality of life, there is a relationship. From a deeper examination of the assessment items, it can be seen that respondents have the lowest scores on burden due to kidney disease and physical health. Meanwhile, mental health is still better. This is in line with a previous study (10) stating that physical health scores were lower than mental health indicating the patient's adaptability to their physical health. As physical health declines, the quality of life will also decline.

This is in contrast to mental health status. The longer a patient undergoes hemodialysis, their mental health will improve. This may be because the patient can manage themselves well and adapt to their illness, so their mental health improves (21). Patients will adapt to their illness, get sufficient support from their environment, especially support from the family and fellow patients. The longer a patient undergoes hemodialysis, it is the physical aspect of their quality of life that will decrease, not the mental aspect. Good mental health is thought to be related to a person's personality which is basically good (22). Furthermore (22)

state that the negative emotions felt by CKD patients appear to be due to the effect or influence of high creatinine values which are a biomarker for negative emotions. A person with a positive personality may one day feel bored with long-term hemodialysis treatment, so support from a multidisciplinary team and intervention done to improve mental health is needed to keep the mental health of hemodialysis patients maintained or positive.

The quality of life of hemodialysis patients is influenced by the stage of CKD, age, gender, DM, and cardiovascular disease (23). Anemia and the use of blood pressure lowering drugs will cause a decrease in quality of life (13). Apart from that, the type of kidney replacement therapy also affects the quality of life where the best quality of life is felt by patients who have undergone kidney transplantation, stages 3-5 CKD patients who have not undergone hemodialysis, and finally patients who have undergone hemodialysis (23). Patients who have a good quality of life tend to be more compliant with treatment, and have better physical health (24). In turn, they will have better self-management and will be willing to accept intervention or education provided by health workers (25).

The overall quality of life of stages 3-5 CKD patients who have undergone hemodialysis will decrease or be less good, and mental health will be lower than physical health. This condition is influenced by low socioeconomic status due to the expensive cost of hemodialysis, reduced opportunities for patients to earn a living because part of their time is spent going to the hemodialysis unit for 10 hours per week, and the presence of comorbidities (26), physical limitations, sexual problems, and dietary and nutritional restrictions (27).

Actions that can be taken to overcome this include support from the government, psychologists, or psychiatrists to provide reinforcement so the patient's mental health is maintained. The absence of a relationship between mental health and the quality of life of CKD patients undergoing hemodialysis in developing countries may be due to the greater impact of the burden of disease on physical problems, so health workers often ignore mental problems and do not focus too much on the patient's mental health as they focus more on the patient's physical health (26). Apart from being often ignored by health workers, the

patient's family also tends to ignore the patient's mental health. CKD patients undergoing hemodialysis need strong support from their family (27,28), the family needs to play an active role in the treatment. All of the above supports the patient's independence to be able to carry out independent self-management (29).

Hemodialysis adequacy is a general condition felt by the patient when they feel well, feel comfortable, and feel no signs of uremia—this will prolong the patient's life. Pernefri Indonesia recommends the Kt/V(30) value or urea clearance ratio and hemodialysis time measured on the machine. For hemodialysis carried out 4-5 hours with a frequency of 2 times a week, the kt/V target achieved is >1.8.

## CONCLUSION

There is a relationship between nutritional status measured using SGA and MIS on the total quality of life of CKD patients. The strength of the relationship is weak. It can be concluded that patients who have good nutritional status will have a good quality of life. Suggestions are given for health workers to be more intensive in providing education related to nutrition and taking regular measurements. This is because according to the majority of respondents and nurses working in hemodialysis units, health workers in this case nutrition officers, rarely measure patients' nutritional status and provide health education. According to nutrition officers, they only provide counseling on nutritional status once and rarely remeasure it because this disease is classified as a chronic disease where patients undergo repeated treatments, so they think there is no need to provide repeated counseling.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Original Article

***PROSES (Waste Alms Program) As an Alternative Innovation for Household Waste Management***

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***ABSTRACT***

Bengkulu Province annual waste accumulation reaches 38,417.16 tons/year, and the volume of waste in Bengkulu City is increasing every day. The total waste entering the Landfills is 648.85 M3, and the condition of the TPA which has been operating for 32 years is expected to decline over the next year. Careless waste disposal will cause water to clog, which further leads to flood. Based on the 2020 Indonesian Disaster Risk Index, Bengkulu province is at the second highest risk for flood after West Sulawesi. This condition will even get worse if the water flow is blocked by waste. Simple action can turn waste into useful objects through waste donation. This study aims to implement waste donation program as an alternative innovation in managing household waste. This was a community-based study with a cross-sectional research design carried out in June and July 2023. The population involved family households in Bengkulu City in 2021. The study samples were selected using a simple random sampling technique which found 542 households. This study has obtained a certificate of ethical approval from the Bengkulu Health Polytechnic Number No. KEPK.BKL/416/06/2023 dated June 30, 2023. Data were analyzed through univariate analysis and analysis of interview results. Most households in Bengkulu City were aged 29-58 years, married, had less than a high school education, unemployed, and had poor levels of knowledge, attitude, and behavior regarding household waste management. There is a need for commitment from the Environmental Service, District, Village, Head of Neighborhood Units (RT), LPM and Community Figures regarding the implementation of the Waste donation Program. The support of the smallest community unit, namely the Chairman of the Neighborhood Unit, is the key to the success of household waste management among households, especially in sorting organic and inorganic waste. Such practice will help make the waste donation program a success. Waste donation can be an alternative for households in worship and also help reduce the accumulation of waste in Landfills. It is recommended cooperation between the Village Community Empowerment Institution and the Waste Bank in providing routine assistance to the Waste donation Program.

**Keywords:** *Management, Waste, Donation, PROSES*

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**INTRODUCTION**

Waste is the residual of human activities in solid and liquid states, both in the form of organic and inorganic substances that

can or cannot be decomposed and are considered no longer useful, so they are simply thrown into the environment. Waste can also be interpreted as unwanted material after processing and use (Hutagalung, 2021). Waste is generated every day by households, both

organic and inorganic waste. There is still a lot of waste that is deliberately thrown out of place, even on the side of the main road, resulting in a pile of waste which has an impact on damage to the surrounding environment (Yuwana, 2021). The environment becomes slums and dirty. Waste also causes flooding during the rainy season and can easily catch fire during the dry season which causes environmental pollution and disrupts settlements.<sup>1</sup>

Organic waste can be said to be environmentally friendly waste and can even be reprocessed into something useful if managed properly. 70% of waste thrown at Landfills is organic waste. Organic waste in landfills causes unpleasant odors in the environment, reduces plastic recycling rates, and poses a risk of landfill explosions.<sup>2</sup> There have been many innovations in waste management methods, including the application of the 3-R, 4-R, or 5-R principles and the method of applying biopore holes. 3-R method is the concept of waste management by Reducing, Reusing, and Recycling. 4-R method is 3-R method plus Replace starting from the source. Furthermore, 5-R method is 4-R method plus Replanting. 4-R waste management is very important to implement in the context of efficient and effective urban solid waste management, so that it is expected to reduce waste management costs.<sup>3</sup> An example of inorganic waste usage is making plastic sachets for coffee and tea packaging combined with plastic bottles into handicrafts that have economic value. Community is the target unit as the subject or the center of social change as well as creating and controlling such change (Siswati, et al, 2022).

Bengkulu Province annual waste accumulation reaches 38,417.16 tons/year. An innovation previously performed by the Bengkulu City Government was "Merdeka Sampah Bisa 2022" by issuing a Circular Letter of the Mayor of Bengkulu No: 660/87/DLH/2021 concerning Environmental Cleanliness which involves the Heads of Regional Apparatus Organizations, Sub-districts and Villages to appeal and socialize it to all Neighborhood Units, community figures, Community Empowerment Institutions as well as the community to maintain environmental cleanliness. The work programs involved the provision of waste banks, 34 containers placement in several areas of Bengkulu City, and sub-district level cleanliness competitions.

Regional Regulation Number 12 of 2011 concerning Waste Processing requires every household to provide organic and inorganic waste closed containers (sorting) to be placed and transported by officers.

Household waste management should start from the source, namely the household. Every household needs to manage their waste both individually and as a group in their respective living environments. Community-based waste management uses the 5M concept, namely reducing waste, sorting waste, utilizing waste, recycling waste and saving waste. In light of environmental aspect, the benefits of the 5M waste management system are reducing the amount of waste to be disposed of in landfills, helping to reduce air pollution due to burning waste, and helping to create a healthy and clean environment.<sup>4</sup> Changing the behavior of city residents is the key to solving the city's waste management problem. Nothing can be done if they are not aware of the harm due to their actions. The result of previous study showed that if the city government intended to reduce the volume of solid waste at the source, it would be better to provide training to women on waste management. When women manage household waste, there was an increase in waste sorting about 9% compared to providing training to men on waste management (with a mean sorting rate of 65%). Such finding indicated that women tended to throw away more than men, which contributed around 80% of total household waste.<sup>5</sup>

Inadequate optimization of waste management causes various environmental problems, namely poor environmental sanitation, the emergence of disease due to flood, piles of waste, the organic content of agricultural land decreasing as a result of the use of chemicals, as well as the impact of global warming due to waste burning (Yuwana, 2021). We can turn waste into powerful objects to provide benefits through simple actions. One of beneficial movements is waste donation. Donation is a form of worship that is highly recommended, because donation is a means of achieving blessings. Donation does not have to involve luxury goods. Unused objects, household waste, especially inorganic waste, can be used as donations. The advantage of donation is that it creates awareness and care for the environment. By not throwing away non-decomposable waste, we are helping to keep the environment clean. Maintaining environmental



sustainability is a form of awareness, concern, responsibility and gratitude for the blessings of Allah SWT. Waste donation is a social movement that aims to reduce the volume of waste. This activity is expected to be able to move community members to care more about their environment. Through the waste donation movement, the community can, in addition to performing waste management, be able to do alms by donating their waste through waste donation groups. The waste donation program is a solution for community-based waste management through a health and religious approach.<sup>6</sup>

Biopore has the function of processing biodegradable waste. Biodegradable waste is put into the hole to empower underground decomposers (such as worms and microorganisms). Furthermore, the worms will form pores in the soil, or so called biopores, to accelerate the creation of water absorption and provide oxygen in the biopore holes. Moreover, Biopore Holes can help reduce the city's vulnerability to floods, drought due to lack of water sources and help reduce the burden of organic waste.<sup>7</sup> Heat is very important in fast composting, the high temperature at the start of the composting process is caused by the activity of microorganisms which are degrading organic material. Microorganisms release heat energy which is a product of the carbonation process. Microorganisms in compost material actively decompose organic material into ammonia, carbon dioxide, water vapor and heat through a metabolic system with the help of oxygen. As the days go by, the temperature of the mound gradually decreases until it reaches normal temperature and will return to being like soil, this can happen due to the large amount of organic material in the compost material in the natural phase of composting.<sup>8</sup>

Two kinds of policies are needed; (i) awareness raising policy and (ii) economic incentives policy. Such economic incentives will be replaced with alms or donation. At every level of the city system for waste management, creativity and innovation are aimed at encouraging behavioral changes in society.<sup>9</sup> This waste donation is part of an alternative in waste management. This innovation method is simple to implement since it does not require human resources with certain potentials, simply by sorting the waste according to its type, then collecting it to the head of the neighborhood unit, then delivering it over to the collector or

via an online application. Income from the sale of inorganic waste are handed back to the head of the neighborhood unit to be used as cash, operations and alms for poor residents or who those have BPJS Health arrears. Waste donation should not differentiate between rich and poor people to do it because it can be done anywhere, anytime and by anyone. However, in reality it is not widely done because it is not so visible as an act of alms. For this reason, the current study aims to implement waste donation program as an alternative innovation in managing household waste in Bengkulu City. Waste donation starts from the household as an alternative to problems in managing household waste.

## RESULTS

This was a community-based study that applied a collaborative approach. The study involved researchers along with all stakeholders, namely the community, in a balanced manner throughout the study process (Susilawaty, 2016). Cross sectional design with primary data analysis as a quantitative study was conducted in June and July 2023.

The population involved family households in Bengkulu City in 2021m with a total number of 109,975. The study samples were selected using a simple random sampling technique which found 542 households who met the inclusion and exclusion criteria. The independent variables in this study were age, marital status, education, employment status, knowledge, attitude and behavior in managing household waste. The dependent variables in this study were community participation with indicators of contribution in household waste management, community support, commitment, cooperation and expertise of environmental cadres and RT heads collaborated with the Bengkulu City Environmental Service. The qualitative informants were the RT Heads and Environmental Cadres in Bengkulu City. This study has obtained a certificate of ethical approval from the Bengkulu Health Polytechnic Number No. KEPK.BKL/416/06/2023 dated June 30, 2023. Data that had been collected were further processed through the stages of editing (rechecking the collected data), coding (simplifying data in the form of numeric codes or symbols), and tabulation (organizing data through tables). Furthermore, the data were

analyzed univariately (frequency distribution analysis). The results of quantitative data analysis were analyzed qualitatively through

the stages of reduction, display, matrix and conclusion as the final outcome.

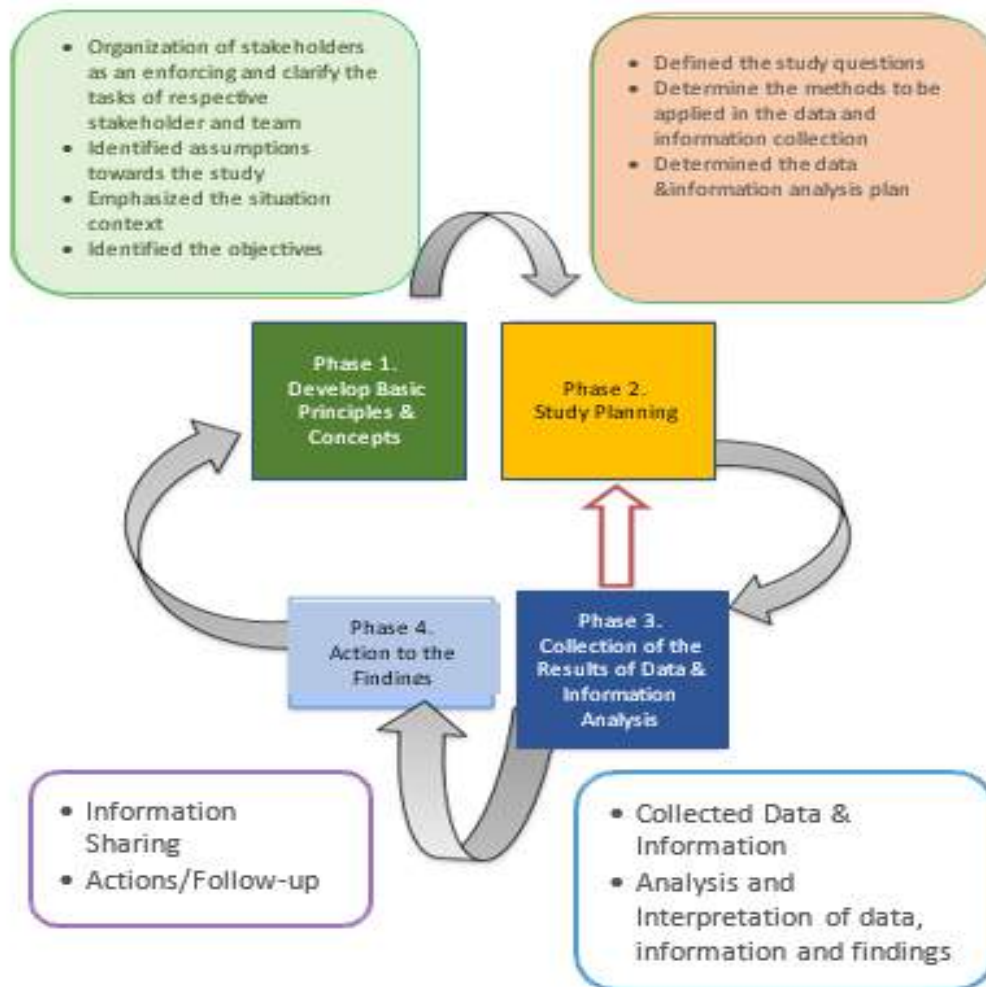


Figure 1. Study Flow

## RESULTS

Table 1. Characteristics of Respondents

Characteristic	N	%
Gender		
Male	86	15.9
Female	456	84.1
Age (years)		
19-28	85	15.7
29 - 38	107	19.7
39 - 48	142	26.2
49 - 58	106	19.6
59 – 68	79	14.6
69 – 78	22	4.1
79 – 88	1	2
Marital Status		
Unmarried	47	8.7
Married	481	88.7

Divorce	14	2.6
Education		
≤ SHS	409	75.5
Undergraduate - Graduate	133	24.5
Employment Status		
Employed	120	22.1
Unemployed	422	77.9
Availability of Dustbin		
Available	542	100
Waste Disposal Condition		
Closed	542	100
Waste Disposal Location		
Outside the House	542	100
Waste Sorting		
No	542	100
Daily Waste Disposal		
No	542	100
Waste are thrown in Landfill		
Yes	542	100
Processing of Used Goods		
Yes	542	100
Bring Own Bag when Shopping		
Tidak	542	100
Buy Packaged Materials		
Yes	542	100
Waste are Used for Animal Feed		
Yes	542	100

Source: Study Findings, 2023

The results of frequency distribution analysis in this study can be seen in table 1 above. Most of respondents were female (84.1%). 409 people (75.5%) were graduated from Undergraduate or Graduate Degree, 422 people (77.9%) were unemployed. Furthermore, most of them were married as many as 481 people (88.7%). All households had closed rubbish bins located outside the house and performed daily waste disposal into temporary dustbin. Households did not separate organic and inorganic waste, did not bring own bag when shopping, and often bought packaged materials. However, household food waste was used as animal feed.

Based on the results of interviews with the RT Heads regarding household waste management it was found that monthly payment in the sub-district was IDR 25,000 to RIDR 30,000, which was deposited to be paid to NGOs. One of the residents' houses already had a 40 liter barrel, so the residents could put the organic waste in the large barrel to make organic fertilizer. According to the results of interview with the RT Heads, it was revealed that the waste to be donated existed. Previously the

residents had independently made organic trash cans, because it was a donation from Perban Nusa. It is a kind of NGO related to waste, so they were actively proactive in waste management. They worked together with the community. There was a 40 liter barrel available in front of the house of Mrs. Titi for local residents if they wanted to donate their organic waste. The community made the sale of handicrafts made of Ale-Ale tea glasses. Furthermore, Le Minerale Bottles were turned into tissue holders, and Aqua bottle were turned into hats. Thank God, we sold them to other women. The plastic hats was sold for IDR 50,000.

It was very difficult to sort waste between organic and inorganic waste. People tended to put organic and inorganic waste together in one plastic, then just threw it into the trash can to be transported it to the landfill. The residents there were reluctant to sort the waste. The informant said, "So, take a look at the community gathering. It's just a social gathering or recital, but later we will try to encourage the residents to sort their household waste". Some residents were already using compost fertilizer

from organic waste for rice fields. "So, those who have rice fields use compost fertilizer made of organic fertilizer from household waste. They use it for their rice fields so they can reduce the use of chemical fertilizers. Previously, they used to use 50 kilos chemical fertilizer. But now, they only use 30 kilos of chemical fertilizer, 20 kilos of liquid fertilizer." "However, the community has not made optimal use of waste, both organic and inorganic waste. If you look at the front, there is a security post. It's from bottles. Naba, it's really from the residents. Those are just sticks on the bottles, they're not from bottles, they don't come with the house, ma'am. Oh, I think those bottles are house paint, the bottles are Ridwan Kamil's house. That's right. No, those are the bottles that are just stuck on." For the houses of residents. If they have land behind or next to the house, the waste is still being burned or given to animals for animal feed. "So our waste is here, ma'am, because it's close to the ditch. Well, sometimes we still throw waste next to us, ma'am, because it's close to the ditch. So we sometimes still throw waste next to here, but sometimes we burn it too." It turned out that there is still one RT that doesn't have a waste bank "Well, for the waste bank, for the RT waste bank, there isn't one, ma'am. Well, it's finished straight away. There will be a meeting in the future, for sharing formation regarding the waste bank, ma'am. The problem with biopore is that the majority of people's land has been cemented and ditches have been made for drainage. So we often have floods here, Ma'am, because the cement ditch has no more soil for infiltration. Well, in fact, I agree with biopore. That's it, ma'am, but earlier, ma'am, there's no place for this biopore anymore, everything has become a ditch, closed ditch".

Based on the results of the interviews, there was a commitment from the RT regarding waste donation as an alternative waste management. The RT and residents agreed with the existence of a waste donation program to help reduce waste in urban areas. Through this program, residents can be wiser in choosing waste, starting from home. The proceeds from the waste donation also go back to the residents and go into their respective RT cash to help residents who have BPJS arrears on or can be used for other purposes. Apart from being beneficial for the world, waste donation is also beneficial for the afterlife. "So we support this activity of giving waste donation, but we can't force it on the residents because we know that a

lot of people are reluctant. However, there are also those who support such program. Unwilling to sort the waste because of reluctant is complicated. Maybe we can encourage them to sort which one is good trash to use as fertilizer, which one to be donated, in a simple words like that."

## DISCUSSION

Households did not throw away rubbish every day. Such finding showed that residents did not care about the use of organic waste. This should be the case when the organic fertilizer composting process is a decomposition process carried out by microorganisms on organic materials. The aim of composting is to convert complex organic materials into biologically stable materials.<sup>10</sup> Organic waste has positive value if it is processed properly and correctly, organic waste can be used as compost and a substitute for chemical fertilizers. Apart from making the soil fertile, compost made from the use of organic waste can save farmers, because farmers do not need to spend money to buy chemical fertilizers.<sup>11</sup> The main purpose of organic fertilizer application is to supply nutrients to plants and improve the physical properties of the soil both physically, chemically and biologically. Providing compost fertilizer is an alternative solution or solution to limit the possible negative impacts resulting from the application of inorganic fertilizer. Using compost or organic fertilizer is more environmentally friendly and sustainable.<sup>12</sup>

The study finding revealed that households did not sort waste it was not disposed every day. Thus, there must be an empowerment of the role of the community which is expected to to reduce the volume of waste, but also to process waste to improve the economic value. One of the efforts to be performed is through community waste bank with the aim of maximizing the value of waste in order to create a healthy, clean, green and beautiful environment and most importantly to reduced waste disposal to landfills.<sup>13</sup> All households who were respondents in the Bengkulu city did not sort their waste, which is in line with the results of interviews which showed a lack of internal desire to change their waste sorting behavior. There were still many people who did not sort their waste because so far, they did not know about the benefits of household waste. Managing household waste was felt to be very difficult

because family members were committed to starting from home and there was no natural awareness of the intentions in their hearts. There should be educational and training activities on sorting of waste that can still be used as well as processing household waste. It is expected to provide direct experience to the community on how to sort waste and make a decomposer and its application to make organic fertilizer.<sup>14</sup> There is no sorting towards organic and inorganic waste at home. In addition, un-routine waste disposal may result in a piles of household waste. Improper waste management will certainly have health impacts on family members, namely the emergence of various diseases such as malaria and diarrhea.<sup>15</sup>

In accordance with the study finding, households processed used goods but had not performed it to find the best economic use. Residents used completely organic food for livestock. Recycling organic waste, such as food scraps, leaves and plant waste should also have important benefits, including: 1) Reducing the Volume of Waste. Recycling organic waste can reduce the volume of waste that must be disposed in Landfills or processed conventionally. Organic waste usually makes up a significant proportion of household waste. Furthermore, by recycling, we can reduce the burden of waste that rots and produces greenhouse gases in landfills. 2) Organic Fertilizer Production. Organic waste can be converted into organic fertilizer through the

composting process. This organic fertilizer is a good source of nutrition for plants and can increase soil fertility. By recycling organic waste into fertilizer, we can reduce dependence on chemical fertilizers which can pollute soil and water. 3) Reducing greenhouse gas emissions. When organic waste decomposes naturally in landfills, they produce methane gas, which is a greenhouse gas that contributes to climate change. By recycling organic waste through composting or composting, we can reduce methane gas emissions and its negative impact on global warming. 4) Reducing the use of chemical fertilizers. Chemical fertilizers which are generally used in agriculture can pollute soil and water. 5) Making the soil more alive. Organic fertilizer produced from organic waste can improve soil quality by increasing the organic matter content, increasing water retention, and increasing microbial activity in the soil. This helps create better conditions for plant growth and maintains a sustainable agricultural environment. 6) Environmental education. The practice of recycling organic waste can also be used as a tool for environmental education and awareness. Teaching and involving the community in the process of recycling organic waste can increase understanding of natural cycles and the importance of sustainable waste management.<sup>16</sup>

The current study produced the following waste donation innovation model:

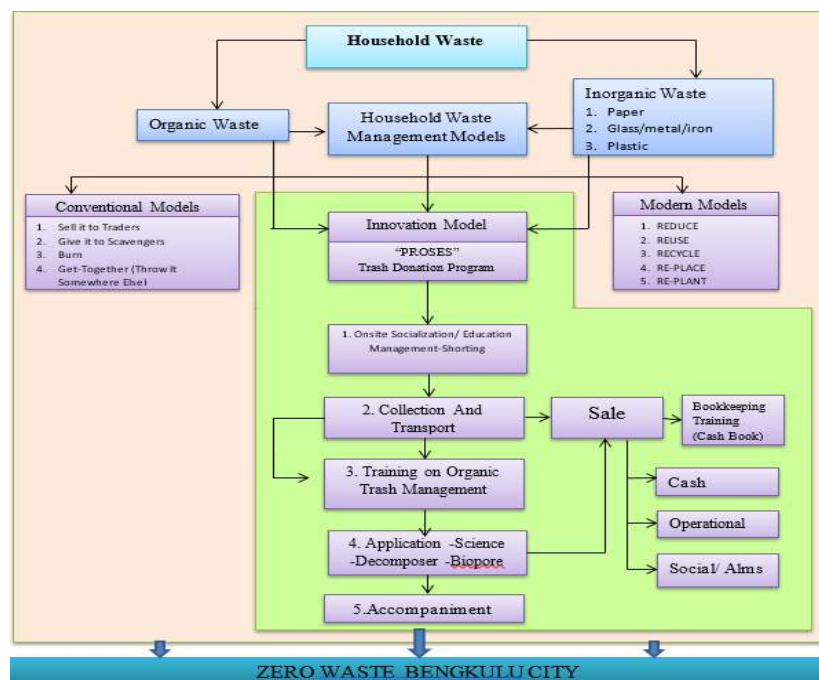


Figure 2. Waste donation Innovation



Food waste is not only an environmental problem but also a social, financial and moral problem. Reducing the amount of waste sent to landfill is a challenge. One solution to improve environmental sustainability is through waste donation.<sup>17</sup> The waste donation movement is an effort to handle environmental problems by utilizing waste, where this waste management is performed through the 5M process or system (socializing, collecting, sorting, selling, and giving). This concept provides a waste management system that is easy and blessed. With the ease of waste management and the active role of residents, it is expected that this will become a sustainable and beneficial program for the community. The forms of waste that can be donated are non-organic types of waste, such as paper, cardboard, plastic bottles, glass bottles, syrup bottles, metal items, plastic items and others.<sup>18</sup> Utilizing resalable waste is a choice for residents to help the family's economy compared to solid waste that is burned, thrown in public places or even thrown away carelessly.<sup>19</sup>

In accordance with the results of interviews with the RT heads and environmental cadres, they were committed and supportive towards waste donation. This program invites residents to not only think about worldly matters but also the hereafter by helping others by giving alms through waste. The study finding is in line with the socialization of the waste donation movement which focused on four aspects: (1) instilling a spiritual-transcendental-based social spirit; (2) technical skills in waste sorting and processing; (3) technical skills in selling waste processing products; and (4) utilization and accountability for the use of the money generated. Waste donation also expands the scope of philanthropy. Conventionally, alms is defined as giving donations in the form of money so that only rich people or those who have excess money can give alms. In the concept of Waste donation, everyone, whether rich or poor, produces waste from their daily life activities. So, basically everyone can give alms.<sup>20</sup> Our opportunity to care for each other in management and processing waste into

something of value is an inevitability that we must realize. Waste management with good management will provide great benefits for ourselves, our children and grandchildren and the nature around us, of course this is an activity that is worth worship in the sight of Allah Ta'ala. Therefore, we are commanded by Allah Ta'ala to take part in all activities which provides benefits, including waste management. It is good to encourage people to reduce, utilize and manage waste in an integrated manner. Integrated waste management is a reflection of piety through increasing personal, social and natural piety, as well as a reflection of Islam as a blessing for all of nature (rahmatan lil 'âlamîn). Efforts to mobilize community-based waste management is based on the Fatwa of the Indonesian Ulema Council Number 47 of 2014 concerning Waste Management to Prevent Environmental Damage, as well as a response to various cases of environmental pollution and health threats resulting from the waste management crisis. Such condition includes various types of waste that was thrown into the sea and damages our marine ecosystem in the long term. The waste problem is closely related to our behavior as the main source of waste. Here, a religious approach can play a role through religious guidance to awaken the spirit of spirituality. This guidance is in line with the national strategy for sustainable waste management through preventing waste generation by each individual, followed by attitudes towards limiting waste generation, reusing waste and recycling waste (Hatta et al., 2021). This study showed that waste donation was one of the commitments in waste management to prevent waste accumulation, in accordance with a study conducted by Norum, 2015 which concluded that youth (18-34 years) were more committed to donating the waste produced compared to those aged over 55 years. Their desire to donate tended to go directly to charities and used goods sellers<sup>21</sup>. Such finding indicated that waste donation could be performed if there was commitment and sincere intentions from family members.

## CONCLUSION

Most households in Bengkulu City were aged 29-58 years, married, had less than a high school education, unemployed,

and had poor levels of knowledge, attitude, and behavior regarding household waste management. There is a need for commitment from the Environmental Service, District, Village, Head of Neighborhood Units (RT), LPM and Community Figures regarding the implementation of the Waste Donation Program. The support of the smallest community unit, namely the Chairman of the Neighborhood Unit, is the key to the success of household waste management among households, especially in sorting organic and inorganic waste. Such practice will help make the waste donation program a success. Waste donation can be an alternative for households in worship and also help reduce the accumulation of waste in Landfills. It is recommended cooperation between the Village Community Empowerment Institution and the Waste Bank in providing routine assistance to the Waste Donation Program. Waste management starts from the household and needs the support of facilities and infrastructure, for example with decomposers or biopores in managing organic waste and training in the use of inorganics as the solutions in changing people's behavior regarding waste management. It is expected that a clean and healthy environment with economic value can be created.

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#### CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Original Article

## Characterization of DNA Quality, TPOX Locus, TH01 Locus in Seawater Soaked Nails in Forensic Identification

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### ABSTRACT

Forensic science is multiplying. One of them is the identification of events at sea. Of course, the victim's body can be submerged in seawater for days so that components in seawater can affect the victim's body. This research aimed to see the effect of storage time on the level and purity of DNA in nail samples. Identification of nail DNA using the Polymerase Chain Reaction (PCR) method. The DNA purity test examines nail samples using a spectrophotometer read at 260 and 280 nm wavelengths. Measurement of DNA levels using the PCR instrument on the STR TPOX locus, the result was 32.02 ug/uL on positive control, 36.73 ug/uL in seawater immersion on the 2nd day, 35.35 ug/uL in seawater immersion on the 7th day, and 34.5 ug/uL in seawater immersion on the 20th day. At the STR TH01 locus, the result was 32.155 ug/uL on positive control, 38.05 ug/uL on the 2nd day of immersion in seawater, 35.18 ug/uL on the 7th day, and 33.88 ug/uL on the 20th day. Results Examination of the Total Plate Number of seawater on the 2nd day, 7th day, and 20th day of immersion found no colonies of germ colony growth. This study obtained sufficient DNA purity from the 2nd day, 7th day and 20th day. So that the samples could be analyzed for DNA levels, the result obtained from the study showed a decrease in DNA levels at the TPOX Locus and TH01 Locus from the 2nd day, 7th day, and 20th day.

**Keywords:** DNA, Locus, TPOX, TH01, Seawater

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### INTRODUCTION

The geographical factors above provide a problem and a challenge in every incident. Of course, fast and precise transportation is needed to connect islands using air and sea transportation, so air and sea traffic will become crowded with this trip <sup>1</sup>. Seawaters have a wide variety of areas and have different characteristics from each of its waters. Of course, this will significantly impact everything that might happen, like the plane crash and ship

accident <sup>2</sup>. Airplanes often cross the ocean, and the State of Indonesia is an archipelago. However, this flight route has been carefully chosen by experienced experts because there are not just any places that airplanes can fly over <sup>3</sup>. Airplane that are usually used as flight routes are usually routes with calm winds, rarely have storms, and are far from dangerous mountains. An airplane crash is an event that is certainly not desirable, the causes of which are, of course, also from many factors. The location of the accident can be in the air, land, or sea; of course,

retrieving the debris from the accident will be more challenging if the accident is at sea <sup>4</sup>.

In another study, forensic analysis using nail material is an essential source of DNA. This relates to the composition and structure of the nail DNA located in the cells' keratin. The DNA extraction is more complex than those commonly used with fresh somatic cells <sup>5</sup>.

Seawater's composition, a mixture of 96.5% pure water and 3.5%, consists of dissolved mineral salts such as sodium, calcium, magnesium, Chloride, and sulfate. Seawater tastes salty because it contains a salt/salinity level of 3.5%, and the content of each sea is different. It is from the composition contained in seawater that it is possible to influence the identification of the victim's body parts. This is supported by other studies so that seawater pH levels are 5.50 and NaCl levels are 1,652.93 mg/L <sup>6</sup>.

Seawater affects the decomposition of corpses and creates a potential difference due to the salt content in the water. Odontological identification can be in the form of DNA analysis of the dental pulp because the dental pulp is protected by hard tissues such as dentine and enamel, which makes the pulp able to protect DNA. Still, enamel is semipermeable, which can affect the degree of extraction of DNA and its purity. Of course, teeth are one of the possible pieces of the victim's body that can be found. This possibility can happen to other body parts, such as nails <sup>7</sup>.

The percentage of success in DNA analysis of nail samples soaked in distilled water and sea water showed 100% results from 5 individual samples with a research period of 1-3 months <sup>8</sup>.

The Federal Bureau of Investigation (FBI) and the world's forensic expert community designed 13 locus as a national forensic identification system that synergizes with the Combined DNA Index System (CODIS) database. For personal identification, the researcher chose the TPOX and TH01 locus because several studies have shown that the TPOX and TH01 locus have strong discriminating power in Asian populations <sup>9</sup>.

This research aimed to see the effect of storage time on the level and purity of DNA in nail samples.

## METHOD

The research material comes from the nails of one individual, a living human female. They have collected nail clippings every week for several months. The nail samples were immersed in seawater in glassware at room temperature. On the 2nd day, a portion of the sample was taken as the 2nd day immersion treatment. On the 7th day, a portion of the sample was taken as the 7th-day immersion treatment; on the 20th day, a portion of the sample was taken as the 7th-day immersion treatment 20th. A positive control was also carried out, i.e., nails without seawater immersion. Negative control in this research using seawater. All the test materials above were placed in different mortars and crushed until smooth. The tested materials that had been refined continued to be analyzed quantitatively and molecularly together on the 20th day.

In this study, the spectrophotometer instrument model Maestronano SN 667100070821 brand Maestrogen was used to analyze the purity of DNA. Meanwhile, to analyze the quantity of DNA, a PCR instrument was used with the CFX Opus 96SN 795BR03572 model, the Bio-Rad brand.

## RESULTS

### Overview of DNA quality

In testing the purity of the nail DNA samples, the spectrophotometric method was used with a spectrophotometer with the Maestronano model, which was read at a wavelength of 260 nm and 280 nm.

**Table 1. DNA Purity Test of nail samples**

Treatment	Day	DNA Purity		
		A260	A280	A260/A280
Seawater immersion	2	0.022	0.011	1.886
	7	0.015	0.009	1.819
	20	0.027	0.014	1.839

### Quality overview of the TPOX Locus and TH01 Locus

At the STR TPOX locus, the result was 38.93 ug/uL in seawater immersion on the 2nd day, 35.51 ug/uL in seawater immersion on the 7th day and 34.04 ug/uL in seawater immersion

on the 20th. At the STR TH01 locus, the result was 37.09 ug/uL on the 2nd day of immersion in seawater, 34.51 ug/uL on the 7th day of seawater immersion and 34.15 ug/uL on the 20th day.

The positive control (nail without immersion in seawater and examined on the 20th day) for the TH01 locus was 32.15 ug/uL. On the 2nd day of immersion, the results were 38.05 ug/uL, an increase because the nail cells were damaged when exposed to seawater immersion. Even though the DNA content was higher than the positive control, the longer the immersion, the more step by step the DNA content decreased, as was the case on the 7th day of immersion; the DNA level was 35.18 ug/uL, and on the 20th day of immersion, the DNA level was 33.88 ug/uL.

**Table 2. STR CODIS TPOX & TH01 nail samples**

	Day	DNA level (ug/uL)	
		Locus TH01	Locus TPOX
Positive control		31.73	31.42
		32.57	32.62
Seawater immersion	2	38.93	37.09
		37.17	36.37
	7	35.51	36.20
		34.86	34.51
	20	34.08	34.85
		33.68	34.15

The positive control (nail without immersion in seawater and examined on the 20th day) for the TPOX locus was 32.02 ug/uL. On the 2nd day of immersion, the results were 36.73 ug/uL, an increase; this was also because the nail cells were damaged when exposed to seawater immersion. Even though the DNA content was higher than the positive control, with prolonged immersion, step by step, the DNA content decreased as was the case on the 7th day of immersion; the DNA level was 35.35 ug/uL, and on the 20th day of immersion the DNA level was 34.50 ug/uL.

In this study, a quantitative examination was also carried out on STR TPOX Locus and TH01 STR Locus on distilled water as a negative control and quantitative examination of TPOX STR Locus and TH01 STR Locus on seawater as the control variable of this study.

**Table 3. STR CODIS TPOX & TH01 without nail samples in Aqua distillate and Seawater**

Sample	DNA Level (ug/uL)	
	Locus TH01	Locus TPOX
Aqua distillate	0,00	0,00
Seawater	0,00	0,00

The table above shows the results of the CODIS TPOX STR and the CODIS TH01 STR, which result in distilled water and seawater with a value of 0.00. This illustrates that aqua distillate as a negative control does not affect the quantitative results of the test material.

### Analysis of Total Plate Number as a control variable

In this study, control variables were also examined, such as the presence of bacteria that had the potential to grow in seawater media due to the immersion of the nail samples not in the condition of being directly in the sea but conditioned by immersion in seawater in glassware containers stored in the laboratory at room temperature. Results Examination of the Total Plate Number of seawater on the 2nd day, 7th day and 20th day of immersion found no colonies of germ colony growth.

## DISCUSSION

This study uses the time difference on the 2nd day, 7th day and 20th day. The choice of the time difference is based on the 2nd day, namely the start of the identification process at the crime scene. The 2nd day is part of the Submerged Fresh phase, at this stage, the period between the body sinking in the water until it starts to float. Water is at this stage that the body is likely to be found. The 7th day is the latest (maximum) deadline for investigators/police to carry out a series of identification processes at the crime scene after conducting a preliminary examination. This is by the Regulation of the Head of the State Police of the Republic of Indonesia Number 14 of 2012 concerning Criminal Investigation Management <sup>10</sup>.

Meanwhile, the 20th day is the time limit for investigators to conduct investigations. Still, if the case still needs to fill out the complete files, it can be extended for the investigation process at the TKP for a maximum of 40 days with the permission of the public prosecutor <sup>11</sup>.

Short Tandem Repeats (STR) is an uncoding region found in the core DNA and consists of 2-7 nucleotide sequences arranged repeatedly. The size of STR fragments is usually at most 500 bp, therefore, STR can be amplified using a relatively small amount of template DNA and can be used to analyze degraded DNA samples. Using 13-20 STR locus, a person's identity can be determined<sup>12</sup>.

DNA in nails is very easy to extract with commercial DNA extraction kits. Effects of the environment such as exposure to seawater can affect the quantity of DNA in nails. This is because nails become more weathered when submerged in seawater. The cell structure in nail DNA extraction is a separation of DNA from other sample contents to produce pure DNA. Extracted DNA can be sourced from blood, sperm, bones, teeth, hair, saliva, urine, feces, and nails<sup>13</sup>.

Several DNA extraction methods are commonly used, although the basic principle of all these methods is the same: to separate proteins and other materials from DNA molecules. In addition, the basic steps in DNA extraction are, first, releasing DNA molecules by lysing cells, second, separating DNA molecules from other cellular material, third, isolating DNA so that it allows Polymerase Chain Reaction (PCR) amplification to be carried out<sup>14</sup>.

The PCR method can amplify the target DNA sequence in tiny amounts even from a single cell. The results of the above study showed that the quantity of DNA content in nails decreased in proportion to the length of immersion in seawater, this was due to abnormal exposures from the surrounding environment, resulting in irreversible damage to DNA hydrogen bonds. This condition damaged the purine-pyrimidine pair in DNA, where this purine-pyrimidine pair is the main component of the DNA structure<sup>15</sup>.

In this study, the Total Plate Number was also analyzed as a control variable. This was intended because immersion in seawater was carried out in glassware containers stored in the laboratory at room temperature, not in seawater conditions by general field conditions. The total plate number did not find the growth of bacterial colonies, this proves that bacteria have no effect on immersion in seawater with glassware containers stored in the laboratory: 1 mL or 1 gram of sample examined. The Total Plate number uses a pour plate technique

because, in this technique, counting the number of bacterial colonies in nutrient media is more straightforward. It does not collect on one side only when compared to spread technique (spread plate)<sup>16</sup>.

## CONCLUSION

It is concluded that there is an overview of the pattern of degradation of the quality of DNA in nails with time of immersion in seawater, which was analyzed using the spectrophotometric method. There was an illustration of a decreasing pattern of nail DNA levels, amplified at the STR TPOX Locus & STR Locus TH01 by the PCR method.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## ***Designing of a High-Quality CPR Simulation Game Clinical Scenario for Nursing Students: A Qualitative Study***

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### **ABSTRACT**

*Cardiopulmonary resuscitation (CPR) is an important skill for nursing students. The process of learning high-quality CPR with a simulation-based learning method can be developed into a simulation game. In order to develop a CPR HQ simulation game, a clinical scenario that can be used as a guide in carrying out storyboards is needed. This research aims to formulate a simulation scenario that will serve as the basis for developing a high-quality CPR simulation game to increase nursing students' competency. This qualitative research uses a Participatory Action Research (PAR) approach by inviting 15 respondents from the prospective user population, namely Emergency Nursing Lecturers, Emergency Room Nurses, BLS Trainers, and nursing students, to carry out Focus Group Discussions. The study's results revealed clinical scenarios that were arranged based on 4 themes, including 1) suitability of the competency being tested, 2) minimum competency for 5 cycles of CPR, 3) settings in the pre-and intrahospital scope, and 4) choice of patient outcome. These components are crucial when designing simulation scenarios that support students' cognitive processes to achieve High-Quality CPR in nursing students. Thus, the results of this research can then be used as a guide in developing the HQ-CPR game as a learning medium for nursing students.*

**Keywords:** *High-Quality CPR, Scenario for Game Simulation, Simulation-Based Learning, Nursing Education*

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## **INTRODUCTION**

Cardiopulmonary resuscitation (CPR) is an important skill that nursing students in Indonesia need to learn to become competent and confident health professionals <sup>1</sup>. This is stated in the Indonesian National Qualifications Framework regarding the basic competencies of intermediate expert nurses based on Presidential Regulation number 8 of 2012 <sup>2</sup>. At STIKES Bina Usaha Bali, Cardiac arrest is one of the study materials in the semester 6 placement emergency nursing course with the

expected competency being that students are able to master Basic Cardiac Life Support skills, one of the most important competencies is performing high-quality CPR <sup>3</sup>.

Traditionally, CPR training has relied on didactic lectures, written materials, and low-fidelity simulations. However, these methods may not equip students with the skills and knowledge necessary to perform CPR effectively in real-life situations <sup>4</sup>. Even though cardiopulmonary resuscitation is a lifesaving intervention, studies have clearly demonstrated a lack of public knowledge and skills in

providing CPR <sup>5</sup>. To prepare for professional practice, there is a need to improve the provision of a stimulating and safe learning environment for student nurses to practice clinical skills and application of knowledge and clinical decision making, especially in dealing with critical situations such as cardiac arrest patients <sup>6</sup>.

Simulation-based learning (SBL) is a pedagogy widely used to train health care providers and students in academic and clinical settings to improve care delivery and client outcomes. Nursing instructors play an important role in SBL by creating scenarios that stimulate students to develop their cognitive processes, especially decision-making, and problem-solving skills. problems in clinical practice <sup>7</sup>. Simulation enables students to work in an environment closely resembling that of a hospital and helps them to gain healthcare and nursing experiences, even before they start working as professionals. The students are able to put everything they have been taught into practice, cope with any difficulties and problems, and even make mistakes without causing damage, and all that in a safe environment, without any risk <sup>8</sup>.

Several studies have proven the effectiveness of simulation methods in learning CPR. According to <sup>4</sup>, simulation-based training in health courses is effective in enhancing communication skill, self-efficacy and clinical competence. Simulation learning media using videos can remind what has been learned and can be played repeatedly so as to improve nursing students' skills in performing CPR <sup>9</sup>.

From several literature reviews, SBL is a standard method in nursing education that focuses on theoretical content and clinical practice as well as cognitive abilities, such as making clinical judgments and solving problems per individual patient situation and context <sup>7</sup>. In preparing simulation activities, an explanation of the simulation scenario occurs, because this step is one of the most important steps for the success of the teaching strategy <sup>10</sup>.

Simulation scenarios are artificial representations of real-world situations to achieve educational goals through experience-based learning <sup>11</sup>. Simulation scenarios can be defined as clinical situation reports that allow the development of learning objectives. This should not be equated with clinical cases, because clinical cases are used statically, as triggers for theoretical approaches to certain

content, while scenarios of course have participant interaction with didactic instruments. It is therefore important for teaching healthcare professionals using clinical simulations to have the simulation scenarios constructed with methodological rigor, adequate structuring, and, above all, to be validated by specialists in the field, which will provide the necessary reliability for their application in various teaching methods <sup>8</sup>.

This research aims to design a simulation scenario that will be used as a basis for developing a High-Quality CPR simulation game to increase the competency of nursing students.

## METHOD

This research use qualitative methods with a Participatory Action Research (PAR) approach. PAR research is a research model that involves all relevant parties to study an ongoing action in order to make changes and improvements towards a better direction (12). Data collection was carried out using the focus group discussion (FGD) method with the aim of formulating a CPR clinic scenario. The clinical scenario will be used as a guiding point into the direction of using simulations and game-based approaches for resuscitation training to increase authenticity on the one and on the other hand allowing the application of knowledge to the problem context in which it may occur.

The participants involved 15 respondents who came from the prospective user population, namely Emergency Nursing Lecturers, ER Nurses, BLS Trainers, and nursing students. Determining research subjects, researchers took samples with purposive sampling technique. Purposive sampling is a data source sampling technique using certain considerations with the inclusion criteria being nursing lecturers who teach emergency nursing courses, emergency nurses with BTCLS training certification and at least 5 years of work experience in the emergency room, Basic Life Support (BLS) trainers , as well as final semester students who have experienced learning High Quality CPR. As exclusion criteria were nurses who were not members of the Emergency Nursing Association in Indonesia.

This research has been declared ethically sound by the KEPK STIKES Bina Usada Bali health research ethics committee



with Ethical approval number no.234/EA/KEPK-BUB-2023. Before data collection and voice recording, the participants gave written informed consent and had the right to refuse participation or withdraw at any point. Confidentiality and anonymity were protected throughout the study. This research was carried out for 2 weeks from 7 to 19 August 2023. Participants were divided into 2 Focus Group Discussion (FGD) groups and guided by a moderator. To assist in acting on the concerns and to enrich the process, meeting agendas, the first author provided summary documents and new information. The focus group discussion (FGD) guide was developed based on the literature survey along with the specific key words (cardiac arrest, clinical scenario, high quality cardio-pulmonary resuscitation) related to the needs and expectations in developing a simulation game. The developed draft guide was validated by the experts.

The information from audio recordings were transcribed and translated into English. We analyzed the data or information by using thematic analyses manually as outlined by Braun and Clarke<sup>13</sup>. The process of data analysis begins with the researcher writing transcripts based on the results of interviews that have been recorded, reading and reread the transcripts to obtain the overall meaning of the interview results, identifying keywords from specific statements said by participants based on meaningful statements and frequently uttered statements then labelling the statements, eliminate irrelevant statements, classify statements based on the question and related statements, making categories and sub categories of the selected relevant key words and the categories that have been formed will be arranged to form sub-themes which will then be classified in the form of themes, then the researcher recheck with the participants regarding the data that has been collected<sup>14</sup>.

Trust worthiness is achieved by Credibility, Dependability, and Conformability. Credibility was established through peer debriefing, member checking, and triangulation. Peer debriefing was accomplished by checking the transcripts' content with an expert advisory team to ensure the recorded data's accuracy. Data triangulation was achieved in multiple cases using the same

focus group discussion/ in-depth interview guide to improve credibility. As for member checking, the findings were returned to three participants to check the data and verify the findings. Finally, conformability was obtained by establishing an audit trail using field notes, checking and rechecking the raw data with the experts as external auditors, and analyzing and synthesizing data throughout the study<sup>15</sup>.

## RESULTS

This study involved 15 participants with characteristics as in table 1 below:

**Tabel 1. Characteristics of Participants**

No	Age (year)	Gender	Education Level	Position
1	43	Male	Master Degree	BLS Trainer
2	33	Female	Master Degree	Emergency Nursing Lecturers
3	31	Female	Master Degree	Emergency Nursing Lecturers
4	34	Male	Master Degree	Emergency Nursing Lecturer
5	35	Male	Master Degree	BLS Trainer
6	26	Male	Master Degree	BLS Trainer
7	46	Male	Master Degree	BLS Trainer
8	38	Female	Master Degree	ER Nurses
9	21	Female	Under-graduated	Nursing student
10	21	Male	Under-graduated	Nursing student
11	21	Female	Under-graduated	Nursing student
12	21	Male	Under-graduated	Nursing student
13	22	Female	Under-graduated	Nursing student
14	27	Male	Ners	ER Nurses
15	30	Male	Ners	ER Nurses



**Tabel 2. Recapitulation of demographic data participant**

Age (year)	N	%
21-30	8	53.4 %
31-40	5	33.3%
41-50	2	13.3%
Gender		
Male	9	60 %
Female	6	40 %
Education Level		
Under-graduated level	5	33.4 %
Graduated (Ners)	2	13.3%
Post-graduated (Master Degree)	8	53.4%

Based on table 2, it can be seen that the majority of respondents (53.4%) were in the 21-30 year age range and only 2 respondents (13.3%) were in the 41-50 year age range. Most of the respondents (53.4%) had a master's degree, and 60% of the respondents were male. The respondents of this study were designed to consist of potential users of the HQ CPR game that will be developed, namely emergency nursing lecturers, emergency nursing clinical instructors and nursing students. This is in accordance with the paradigm of PAR research include shift away from the positivist model of science is needed to understand participatory methods. This shift can come only after developing an understanding of critical theory and having some familiarity with critical social science <sup>16</sup>.

Based on the results of the thematic analysis, four themes were obtained, in which 1) suitability of the competencies tested, 2) at least 5 cycles of CPR competence, 3) settings in the pre- and intrahospital setting, and 4) patient outcome options after CPR.

### 1. Suitability of the competency being tested

In developing a CPR clinical scenario, the objectives of the scenario must be adjusted to the competency to be tested, namely evaluating how to check the patient's pulse and breath, evaluating participant decision making in determining nursing problems, evaluating the performance of High Quality CPR and the performance of Rescue Breathing. As expressed in the following respondents in group 1:

*"..... like the main goal in our discussion, the scenario must contain basic life support competencies where participants will perform*

*quality compressions and provide breathing assistance during the work stage, but before the work stage there must be a story line for the participants to check their pulse and breath"* (WU , 43 years old)

*"Hm...I think we need to determine the story scenario in detail, whether this story is for the case of an adult patient or a child, including the location of the incident so that it is in accordance with the expected competencies and can be clearly tested"* (KY, 33 years old)

The objective of nursing education, in addition to the acquisition of solid theoretical knowledge, is the acquisition of clinical skills. The scenario in any simulation must be able to form students' competence in thinking critically and making optimal decisions (8)

### 2. Minimum assess the performance of 5 cycles

This theme emerged in both FGD groups with repeated emphasis as expressed by the following respondents:

*"....., 30 compressions 2 times, just 1 cycle of ventilation and a minimum of 5 cycles of CPR for 2 minutes to maintain the quality of compressions (CA, 26 years old, Group 2) .....ideally, after 2 minutes of CPR, we can evaluate the patient's pulse and breathing"* (AS, 46 years old).

*"....Yes...I think so too, at least we can do 5 cycles to memorize the minimum compressions that need to be given to patients in cardiac arrest, because if we go too fast we'll forget the count...hehe (laugh)"* (AD, 22 years old)

The main focus for maintaining high quality CPR is to maintain chest compressions with a constant rhythm, a depth of 5 cm, minimal interruptions and maximum recoil. The compression quality will decrease by around 20% within 2 minutes <sup>17</sup>. High quality CPR includes an average of 100 compressions/minute, compression depth of 5 cm, minimal interruptions, full recoil which is evaluated after 2 minutes <sup>18</sup>.

### 3. Settings in the scope of pre- and Intrahospital

Emergency life-threatening cases such as cardiac arrest can occur anywhere, including

in the hospital or out of hospital as expressed by the following respondents:

*".....cardiac arrest cases can occur anywhere and anytime, therefore nurses must be alert in dealing with various situations"* (GA, 21 years old)

*".....in the hospital, I often find cardiac arrest patients in the inpatient room and emergency room....."* (WP, 31 years old)

*"...Determining the setting where the attack occurs will also determine the scenario we create, so it must be clear whether it is pre-hospital or intra-hospital..."* (DP, 34 years old)

#### **4. Patient outcome options after CPR**

*".....termination stage means that depending on the patient outcome we make whether the patient will ROSC or die"* (MY, 35 years old)

*" .....yes termination can also be done if help arrives, for example in the intrahospital environment the Code Blue team has arrived"* (WU, 43 years old).

## **DISCUSSION**

In game development, simulation scenarios are manifested in the form of text descriptions and supporting artwork such as storyboards and sketches that serve to illustrate scenes, settings, circumstances and situations, as well as possible sequences or choices of future events that make up the game's narrative flow (19). During the FGD it was also formulated that the clinical scenario was divided into 3 phases including the orientation phase, work phase and termination phase. The orientation stage assesses the participant's ability to assess pulse and breathing, the work stage assesses the student's ability to perform High Quality CPR and Resque Breathing and the termination stage depends on the patient's outcome after CPR.

These three phases correspond to Bloom's taxonomy. Bloom's Taxonomy is a theory that guides educators in the elaboration of teaching strategies, as it guides in a clear and structured way the construction of the instructional objectives of the educational activity for an effective and lasting learning. This theory supported the elaboration of the

learning objectives for the simulated activity. The elaboration of the scenarios based on taxonomy made possible the organization of the educational process so that the cognitive development obeys a hierarchical structure of learning, and, in the end, enabling the apprentice to apply and transfer the acquired knowledge to their professional practice, that is to say, the management of the CPR on situations covered in this study. The evaluation of the development of clinical competence, defined as the application of skills in all domains of practice, articulating knowledge, skills and attitudes in different clinical contexts (20).

The ability to perform CPR is also a basic competency that must be possessed by a nurse (9). Theme 1 shows that the competencies to be achieved in developing learning media must be clear. Several studies have proven that student learning outcomes are greatly influenced by the examiner's clinical assessment, therefore, in developing a clinical scenario, the competencies to be tested must be in accordance with the assessment items (7). Bloom's taxonomy can be used as a facilitating mechanism and theoretical-methodological framework in nursing simulation, to obtain the development of clinical competence in its participants. It encompasses the cognitive, psychomotor, and affective criteria, demonstrated by a set of educational objectives (21). Shaukat et al (2023) in their research also stated in their research that having appropriate competencies will foster students' self-confidence in providing help with CPR (22). Thus, the suitability of the competencies to be tested is an important basis for developing an assessment of CPR practice.

The findings highlighted, the clinical scenario not only focuses on the work stage or how to assess student performance in performing HQ-CPR, but also starts from the assessment stage, identifying whether the unconscious patient still has breathing and a pulse. This is consistent with (23), clinical scenario begins with a systematic assessment to determine the patient's physical, mental, emotional needs followed by ongoing assessment to diagnose the level of harm they are experiencing and examine the influence of clinical interventions on the assessment.

The results of this study also confirm that in assessing CPR ability, a minimum of 5 cycles should be evaluated. According to the AHA Guidelines 2020, there are several things

that are recommended in providing quality CPR, namely performing chest compressions at a speed of 100-120x/minute and changing the compressor every 2 minutes (24). Quality of chest compression can be increased by changing the cycle length from 2 to 1 min (25). This is different from the face-to-face and non-face-to-face formats for basic life support training method developed by Cho et al. (2022) using a standard of 7 cycles of 30 compressions, total of 2 minutes (26).

When developing a game scenario, it is very important to consider the level of difficulty of each scenario option. The FGD was formulated in an intra- and pre-hospital setting so that it approached the real situation. This is in accordance with the statement (27) concerning Hospitals, that the scope of emergency services includes pre- and intrahospital. A simulation scenario is an artificial representation of a real-world situation to attain educational goals through experience-based learning (7).

According to Chia (2016) another important thing in formulating a game scenario is ensuring the game is fun and interesting because this affects students' motivation to learn and complete the game. This is stated in theme 4, which focuses on how students complete the HQ-CPR game according to patient outcomes. If a patient has ROSC, the actions taken will definitely be different from the outcome of a patient who dies, or an advance officer comes to take over the assistance.

This research still has limitations during its progress. Researchers are aware of the difficulty of getting all participants to actively express their opinions during this time focus group discussion (FGD).

## CONCLUSION

This study has implications for practice, education and research. Findings highlight to designing the scenario for HQ-CPR game development. To formulate the scenario of High Quality CPR is required the suitability of competencies tested, at least 5 cycles, settings in the pre- and intrahospital, and termination phase based on patient outcome options after CPR. These components are crucial when designing simulation scenarios that support students' cognitive processes to achieve High Quality CPR in nursing students. Finally, the results of this research can then be used as a

guide in developing the HQ-CPR game as a learning medium for nursing students. Further research is needed to improve the limitations of this study.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest of this research.

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## ***Omega-3 Fatty Acids and Vitamin D Combination Affected TG Levels in Rattusnorvegicus with Limited Fat Intake***

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### **ABSTRACT**

*Vitamin D is a group of secosteroids that have fat-soluble properties. Vitamin D regulates calcium absorption, bone growth and remodeling, and regulates metabolic processes and immunity. Omega-3 fatty acids are a type of polyunsaturated fatty acids (PUFAs) that are essential fatty acids for humans. Omega-3 fatty acids have various positive effects on health, especially cardiovascular-related ones. This study aims to determine the effect of omega-3 fatty acid and vitamin D combination on the TG/HDL-C ratio in high fat fed Rattus norvegicus. The research design is experimental study with a post-test-only control group design. This study used 24 male rats aged 3–4 months with a body weight of 250–300 grams which were divided into four groups; negative control group, positive control group; treatment group one; and treatment group two. The high-fat diet (HFD) is an additional (emulsion) feed added to standard feed with increased fat composition. The results showed that increased triglyceride (TG) levels of 83.40 mg/dL and HDL levels of 62.60 mg/dL after consumed high-fat diet. There was a significant decrease in TG levels of 54.15 mg/dL ( $p=0.026$ ) and a decrease in HDL of 53.00 mg/dL ( $p>0.05$ ,  $\alpha=0,05$ ) after administration of Omega-3 and Vitamin D combination. Conclusions in this study is the intake Omega-3 and Vitamin D combination has a positive effect on TG levels. Still, this positive effect must be accompanied by limiting the fat intake to the body. Meanwhile, combining Omega-3 and Vitamin D did not significantly affect HDL levels.*

**Keywords:** Lipid Profile, High Fat, Omega-3, Vitamin D

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## **INTRODUCTION**

Fat is one of the food components that has various effects on the human body. One of the functions of fat in the body is as a source of energy reserves that can be stored in cells, especially in adipocytes. Fat has a vital function

in various metabolic processes in the body <sup>1,2</sup>. Although it has an essential role in various metabolic processes, consuming excess fat can cause various diseases, including an increased risk of developing metabolic syndrome. One of the occurrences of metabolic syndrome is characterized by dyslipidemia, which can lead

to more serious diseases such as heart disease and diabetes.<sup>3-5</sup>

Dyslipidemia is a condition of imbalanced lipid levels in the body. Dyslipidemia is characterized by an increase in triglyceride (TG) and cholesterol levels or both and is also characterized by low levels of *high-density lipoprotein* (HDL-C) cholesterol.<sup>6</sup> High TG levels, also known as Hypertriglyceridemia, can increase the risk of developing coronary artery disease (CAD)<sup>7</sup>. Besides TG, HDL levels are also associated with various diseases, especially metabolism-related diseases. Research states that the ratio between TG/HDL-C is closely related to an increased risk of various diseases related to metabolism, one of them is fatty liver. Fatty liver can increase the risk of other diseases such as type 2 diabetes mellitus (type 2 DM) and chronic kidney disease<sup>8-10</sup>.

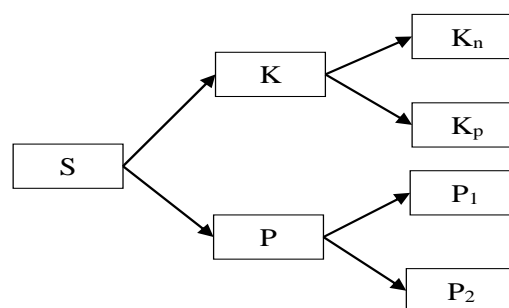
Omega-3 fatty acids are a type of polyunsaturated fatty acids (PUFAs) that are essential fatty acids for humans<sup>11</sup>. Omega-3 fatty acids have been found to have a various positive effects on health, especially those related to cardiovascular<sup>12</sup>. Some literature also states that Omega-3 fatty acids can lower TG levels which is a good effect, especially for people with high plasma TG levels (hypertriglyceridemia)<sup>13,14</sup>.

Vitamin D was first discovered by Elmer McCollum by accident while researching vitamin A in cod liver oil<sup>15,16</sup>. Vitamin D is a fat-soluble vitamin. It has various critical metabolic functions in the body, especially in the mechanism of calcium homeostasis and bone metabolism<sup>17</sup>. Several studies have found that the role of Vitamin D is not only related to calcium and bone metabolism but also has been found to be related to lipid profiles levels in the body<sup>18</sup>. High levels of Vitamin D were found to have a positive relationship with serum HDL-C levels<sup>19</sup>.

Vitamin D and Omega 3 have been widely studied regarding their effects on the body, including those related to fat metabolism. However, very few studies have discussed the effect of combined Omega-3 and Vitamin D intake on plasma lipid levels. Therefore, this research will examine the effect of the combination of Omega-3 and Vitamin D on TG and HDL levels in the plasma of experimental animals.

## METHOD

This research is an experimental study with a post-test-only control group design. This study used 24 male rats aged 3–4 months with 250–300 grams of weigh. The rats were divided into four groups; negative control group (Kn, n=5), positive control group (Kp, n=5), treatment group one (P1, n=7), and treatment group two (P2, n=7). The HFD feed given as an additional feed other than standard feed with increased fat composition. The HFD used in this study was an emulsion of a mixture of lard and chicken egg yolk. The ratio of chicken egg yolk and lard is 1:1. The HFD given as much as 1 mL to each rat with an estimated fat content of 66.28%.



### Description:

S: Research Subject

K: Control

P: Treatment

**Figure 1. Group division scheme.**

The negative control group (Kn, n=5) was the group given only standard feed, while the positive control group (Kp, n=5) was the group that were given standard feed and HFD. The standard feed used in this study was "Pokphand 593", while the HFD used was a mixture of lard and egg yolks and was given as much as 1 mL/rat by sonde.

Treatment group one (P1, n=7) was a group that given a HFD + standard feed and given a combination of Omega-3 and Vitamin D. In contrast, treatment group two (P2, n=7), was a group that were only given combined intake of Omega-3 and Vitamin D as well as standard feed, without giving HFD.

The Omega-3 fatty acids used were Omega-3 fatty acid supplements containing 180 mg of docosahexaenoic acid (DHA) and 120 mg

of eicosapentaenoic acid (EPA). As much as 400 IU Vitamin D supplements were used in this study. The dose of Omega-3 fatty acids is 75 mg/rat, while the dose of Vitamin D is 200 IU (5µg)/rat<sup>20,21</sup>.

Before giving treatment, the Kp dan P1 group was given high-fat feed for two weeks (14 days). Each group was treated according to the scheme with a duration of two weeks (14 days), and measurements of lipid profile levels (TG and HDL) were carried out on the 15th day. Lipid profile examination carried out at the Department of Clinical Pathology, Diagnostic Center (GDC), Dr. Soetomo Hospital, Surabaya, Indonesia. The data were then tested using Shapiro-wilk test for normality test and *Anova* and *Posthoc* to find out the differences in the TG and HDL levels in each group.

## RESULTS

After four weeks of administration

HFD in Kp group, it was found that the TG levels in Kp did not differ significantly compared with Kn. While, there was a significant different in TG levels in P2 group compared with Kp.

In this study, the duration of HFD induction in the Kp group was 28 days, this duration did not significantly increase TG levels. Likewise with HDL, HFD were not able to produce significant different in HDL levels in the Kp and Kn group. This shows that the HFD given has not been able to have a significant effect on TG and HDL levels in experimental animals

However, Table 1 shows that there was a significant difference in the TG levels of the experimental animals in each group after being tested with One-Way Anova ( $p=0.034$ ). From each of these groups, a *Posthoc* Bonferroni test was carried out to find out which groups had significant differences.

**Table 1. The results of examining the TG levels of each group**

Group	Total (N)	Fasting TG Levels (mg/dL)	Std. Deviation
K <sub>p</sub> → Negative Control	5	62.40	10.64
K <sub>n</sub> → Positive Control (High-fat diet)	5	83.40	29.38
P <sub>1</sub> → Treatment 1 (High fat diet + Omega-3 + Vit. D)	7	65.00	9.36
P <sub>2</sub> → Treatment 2 (Omega-3 + Vit. D)	7	54.14	8.23
Total	24	65.12	17.92

**Table 2. The results of examining the HDL levels of each group**

Group	Total (N)	Fasting HDL Levels (mg/dL)	Std. Deviation
K <sub>p</sub> → Negative Control	5	57.60	6.18
K <sub>n</sub> → Positive Control (High-fat diet)	5	62.60	9.86
P <sub>1</sub> → Treatment 1 (High fat diet + Omega-3 + Vit. D)	7	53.86	6.12
P <sub>2</sub> → Treatment 2 (Omega-3 + Vit. D)	7	53.00	6.76
Total	24	56.20	7.70

Post hoc data showed that the group of experimental animals that were given a HFD for 28 days (Kp) had a significant difference from the group of animals that only received a combination of Omega-3 and Vitamin D (P2)

with a significance value of  $p=0.026$ . This result shows that combined intake of Omega-3 and Vitamin D has the potential to have an effect on lowering TG levels in serum.



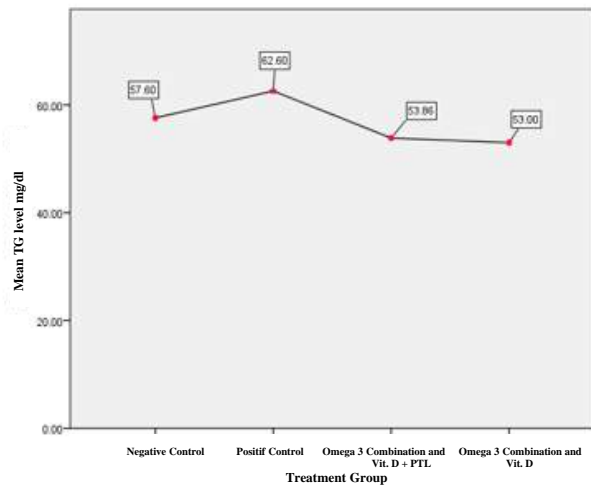
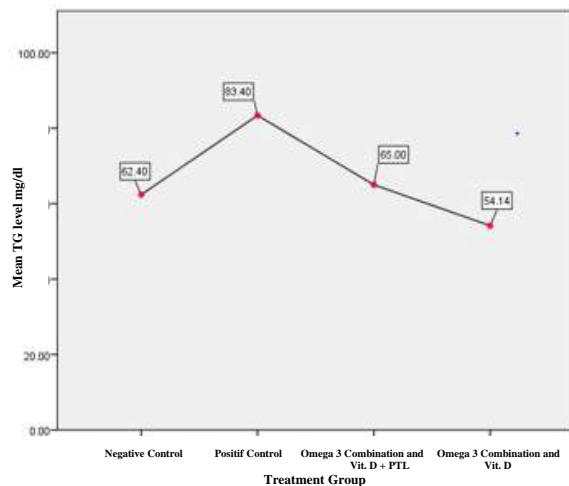


Table 2 shows data on HDL levels of experimental animals in each group. After the *One-Way Anova* test was carried out on the HDL levels of each experimental group, no significant difference was found in the mean HDL levels in each group ( $p=0.135$ ).

## DISCUSSION

### TG Levels and Omega-3 and Vitamin D Combination

Triglycerides (TG) are one of the four groups of lipids found in lipoproteins. In plasma TG accounts for about 16% of total plasma lipids<sup>11</sup>. Increased TG levels in the blood are often associated with excessive food intake, especially foods that contain lots of fat and carbohydrates, although several studies also state that TG levels in the blood can also increase in certain circumstances such as pregnancy<sup>22,23</sup>.

In this study, the treatment group that received an Omega-3 and Vitamin D combination and was still given a high-fat diet (P1) had an average TG level that did not differ much from the positive (Kp) and negative (Kn) control groups. Meanwhile, the group that only received the Omega 3 and Vitamin D combination (P2) showed a significant decrease in TG levels compared to the control group (Kp). This shows that combined intake of Omega-3 and Vitamin D cannot have the maximum effect on TG levels if it is not accompanied by limiting fat intake.

Data on TG levels in this study showed that the intake of a combination of Omega-3 fatty acids and Vitamin D could reduce TG

levels in experimental animals, both in the treatment group 1 (P1) and in the P2 group. However, the intake of Omega-3 and Vitamin D combination in the P1 group did not produce as good results as in the P2 group. The TG levels of these two groups were not significantly different ( $p=1.00$ ).

The TG level of P1 group was lower (65.00 mg/dL) but not different significantly ( $p=0.342$ ) compared to the positive control (Kp). However, P2 group had a significant ( $p=0.026$ ) lower of TG levels by 54.14 mg/dL. Based on these results, it can be noted that the intake of an Omega-3 and Vitamin D combination had a better effect on the group that received standard feed (P2) compared to the group that was given high-fat feed (P1). This is consistent with previous research which showed a relationship between decreased TG levels with intake of Omega-3 fatty acids and serum vitamin D levels<sup>14,18</sup>. However, this study did not compare the effect of reducing TG levels by Omega-3 and Vitamin D separately.

Omega-3 fatty acids are known to reduce TG levels in the blood by modifying various mechanisms related to lipid metabolism, especially those related to decreasing the activity of enzymes that synthesize TG.<sup>14</sup> Omega-3 fatty acids are known to modify various enzymes involved in TG formation by binding to various nuclear receptors. There are four core receptors that can be affected by Omega-3 fatty acids; liver X receptor (LXR); hepatocyte nuclear factor-4 $\alpha$  (HNF-4  $\alpha$ ); farnesol X receptor (FXR); and peroxisome proliferator-activated receptors (PPARs). The bond between Omega-3 and

these receptors can reduce TG levels in the blood<sup>24</sup>.

In contrast to Omega-3 fatty acids, the mechanism underlying the effect of Vitamin D intake on reducing TG levels is remain unclear. However, some literature states that Vitamin D can have indirect effects on lipid profiles, including reducing lipid absorption in the intestine and lipid synthesis<sup>25</sup>.

### **HDL Levels and Omega-3 and Vitamin D Combination**

High-density Lipoprotein (HDL) is a form of Lipoprotein in the body. HDL Lipoprotein is known as Lipoprotein which has anti-atherogenic effect. Lipoprotein HDL is a lipoprotein with a high protein content, which is around 45-55% of the total HDL content itself<sup>26</sup>. Various studies have found that HDL plays a role in various mechanisms in the cholesterol transport process<sup>26,27</sup>. In addition, HDL has also been studied for its role in inflammatory mechanisms and oxidative signaling. In the inflammatory mechanism, HDL was found to be able to suppress the inflammatory response, by inhibiting the induction of cytokines which play a role in increasing the inflammatory response. Meanwhile, in oxidative signaling, HDL was found to inhibit lipid peroxidation<sup>27</sup>.

In several studies, intake of Omega-3 was found to reduce the risk of suffering from cardiovascular disease and diabetes. Omega-3 fatty acids, both EPA and DHA, were found to increase HDL-Cholesterol levels. Increased HDL by Omega-3 intake is mediated by increased activity of lipoprotein lipase (LPL). Increased LPL activity by Omega-3 can reduce levels of Intermediate-density lipoprotein (IDL), and Very low-density lipoprotein (VLDL), which causes an increase in TG hydrolysis and then increases HDL levels<sup>28</sup>.

Although several studies have stated that there is an effect of intake of Omega-3 fatty acids on HDL, in this study there was no significant difference in HDL levels in the group that received Omega-3 and Vitamin D combination when compared to the control group (Kn and Kp). This can be caused by the source of Omega-3 given. Research by Zibaenezhad (2017) found that there were differences in the effect of Omega-3 intake from different sources on lipid profiles. In the research, it was found that intake of Omega-3 obtained through consumption of fresh fish will have a better effect on reducing LDL levels, and

other lipid profiles, including the ratio of LDL/HDL. The study was also found an increase in LDL levels in the group consuming Omega-3 supplementation, but on the contrary there was a decrease in LDL levels in the group consuming fresh fish<sup>29</sup>. However, this needs to be investigated further in order to find out the reasons for this difference.

Administration of Omega-3 and Vitamin D combination for only 2 weeks is also thought to have an effect on the results obtained. Several studies have stated that giving Omega-3 intake for more than 1 month can have a beneficial effect, both on the immune response and against cardiovascular disease<sup>29,30</sup>. Research regarding the duration of Omega-3 intake on lipid profiles needs further investigation.

Vitamin D is a type of vitamin that is widely consumed by the public. Vitamin D is generally associated with calcium homeostasis. Vitamin D in the form of *calcidiol* (25(OH)D), circulates in the blood and will pass through the kidney proximal tubules to become calcitriol(1,25(OH)2D), where calcitriol is the active form of Vitamin D<sup>16,17</sup>.

Apart from playing a role in the process of calcium homeostasis, Vitamin D also has various effects on processes in the body, including the inflammatory response and various processes related to an increased risk of metabolic syndrome<sup>17,31</sup>. Research has also found that Vitamin D is related to serum lipid profiles. Increased levels of Vitamin D in the form of calcidiol (25(OH)D), were found to reduce TG and LDL-C levels, both in men and women<sup>32</sup>.

Although it was found to have a significant effect on lipid profiles, especially those associated with metabolic syndrome, the administration of Vitamin D combined with Omega-3 in this study was found to have no significant effect on HDL levels. The mechanism underlying the effect of vitamin D on serum lipid levels is remain unclear<sup>33</sup>. The data in this study can be used as a reference and additional data for subsequent research to reveal the mechanism underlying the relationship between Vitamin D and lipid profile

In this study, intake of Vitamin D in the form of *calcidiol* (25(OH)D) of 400 IU for 2 weeks was not able to have a significant effect on serum HDL levels in experimental animals. In addition, this study also did not examine other lipid levels, such as LDL, and Total

Cholesterol (TC), which can be used as a comparison for HDL levels.

### **HDL-TG Levels and Combination Omega-3 + Vitamin D**

A high-fat diet can reduce the activity of the lipoprotein lipase enzyme in the blood circulation. A decrease in the lipoprotein lipase enzyme can reduce the breakdown of triglycerides into fatty acid and glycerol molecules. This decrease results in the accumulation of visceral fat thereby increasing TG levels<sup>34</sup>.

The high-fat diet also increases the enzyme 3-hydroxy-3-methylglutaryl coenzyme A reductase (HMG-CoA reductase). HMG-CoA Reductase is an enzyme in the liver that plays a role in synthesizing cholesterol levels, Very Low-Density Lipoprotein (VLDL) apolipoprotein-B100 (ApoB100), and increasing Low-Density Lipoprotein (LDL) receptors found on the surface of the liver and cells. Increased HMG-CoA Reductase due to a high-fat diet can result in increased levels of cholesterol, VLDL, LDL and Apolipoprotein B<sup>35</sup>.

A high-fat diet can increase TG levels<sup>35</sup> through a decrease in the enzyme lipoprotein lipase and the accumulation of visceral fat. As a result of this accumulation, it can increase Free Fatty Acid (FFA) thereby inducing an increase in the concentration of glucose produced by the liver into the blood circulation which results in insulin resistance<sup>36</sup>. Insulin resistance can also be caused by excessive food intake, causing glucose intolerance and hyperglycemia. In the pre-diabetic stage, there is a decrease in  $\beta$ -cell levels due to several risk factors, such as glucotoxicity, lipotoxicity, and increased inflammation.<sup>37</sup> Previous literature studies have shown an increase in triglyceride (TG) levels, fasting blood sugar (GDP) and a decrease in HDL cholesterol in high-fat animal models<sup>38</sup>.

Vitamin D is a group of *secosteroids* which have fat soluble properties. Vitamin D plays a role in regulating calcium absorption, bone growth and remodeling, regulates metabolic processes and immunity. Recent studies support that vitamin D plays a relevant role in islet dysfunction and insulin resistance<sup>39</sup>. The results of this study indicated that there was a decrease in TG levels after administration of omega 3 and vitamin D

combination. The results of this study were supported by previous studies which showed that experimental animals of *Rattus norvegicus* were induced on diets rich in vitamin D3 within 3 weeks, there was an increase in subcutaneous and visceral fat.<sup>40</sup>, whereas mice fed calcitriol via continuous pump showed reduced adipose weight. While the experimental animal *Rattus norvegicus* model of Vitamin D Receptor (VDR) showed a decrease in white adipose tissue mass, serum triglyceride (TG) concentration and total cholesterol<sup>41</sup>.

Vitamin D plays a role in stimulating insulin secretion in obesity due to a high-fat diet<sup>40</sup>. Both Vitamin D and Vitamin D Receptors (VDR) directly play a role in regulating functional genes, including genes that play an important role in the metabolism, secretion and action of insulin. Vitamin D also acts as an anti-inflammatory hormone that helps tissues to reduce local and systemic inflammation, thereby preventing islet, liver and muscle dysfunction.<sup>37</sup> Trans fatty acids contained in high-fat diets can increase LDL (Low Density Lipoprotein) cholesterol concentrations, triglycerides (TG), reduce HDL (High Density Lipoprotein) cholesterol concentrations, and increase the LDL/HDL cholesterol ratio. Trans fatty acids can also increase the LDL/HDL cholesterol ratio two times higher than saturated fatty acids<sup>42</sup>. Previous literature studies showed that there was a decrease in glucose levels in experimental animals that had been given a combination of vitamin D and L-cysteine supplementation<sup>43</sup>.

Omega-3 can increase the activity of the lipoprotein lipase enzyme<sup>35</sup>. Increased activity of lipoprotein enzymes can increase the breakdown of triglycerides (TG) into fatty acids and glycerol which results in a decrease in TG levels circulating in the blood<sup>44</sup>. The fatty acids and glycerol that are formed are then needed as fuel by cells to form energy (ATP) such as water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>) to produce energy<sup>34</sup>. Increased lipoprotein lipase activity also increases the inhibition of exogenous pathways of lipid metabolism by increasing the absorption of fat in the small intestine so that the concentration of cholesterol and triglycerides in the blood decreases<sup>45</sup>.

This event can increase the risk of atherosclerosis and CHD, compared to

measurements of total cholesterol or LDL cholesterol concentrations, respectively. In a 1% increase in total energy derived from trans fatty acid intake, there is a decrease in HDL cholesterol concentration of 0.013 mmol/liter and an increase in LDL cholesterol concentration (LDL-C) of 0.04 mmol/liter<sup>46</sup>. Previous literature studies have shown that in experimental animals that are made to lose Vitamin D Receptors (VDR) can increase insulin resistance in the liver<sup>47</sup>. In addition, vitamin D can reduce the expression of pro-inflammatory cytokines (IL-1 $\beta$ , IL-6)<sup>48</sup>, secreted by adipocytes thereby suppressing the inflammatory response. A number of studies have shown that vitamin D is involved in lipid metabolism by regulating adipogenesis, lipolysis, and lipogenesis<sup>37</sup>.

## CONCLUSION

In this study, it was found that a combination of Omega-3 and Vitamin D had a positive effect on TG levels. Still, this positive effect must be accompanied by limiting fat intake. In contrast to TG levels, serum HDL levels after administration of Omega-3 and Vitamin D combination did not provide a significant difference between groups. This study did not examine the other cholesterol, such as LDL, VLDL, and iLDL. Thus, HDL level has not been compared to these types of cholesterol to see if the different cholesterol levels were affected.

The effects of Omega-3 and Vitamin D separately were not investigated in this study, so their respective effects on lipid levels cannot be compared. Omega-3 intake has been extensively studied for its relation to lipid profile. Vitamin D was found to be related to lipid profile. Vitamin D intake can affect lipid absorption in the intestine. Nevertheless, much research on Vitamin D still needs to be done in order to answer the mechanisms underlying the effect of Vitamin D on lipid levels.

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## ***Omega-3 Fatty Acids and Vitamin D Combination Affected TG Levels in Rattusnorvegicus with Limited Fat Intake***

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### **ABSTRACT**

*Vitamin D is a group of secosteroids that have fat-soluble properties. Vitamin D regulates calcium absorption, bone growth and remodeling, and regulates metabolic processes and immunity. Omega-3 fatty acids are a type of polyunsaturated fatty acids (PUFAs) that are essential fatty acids for humans. Omega-3 fatty acids have various positive effects on health, especially cardiovascular-related ones. This study aims to determine the effect of omega-3 fatty acid and vitamin D combination on the TG/HDL-C ratio in high fat fed Rattus norvegicus. The research design is experimental study with a post-test-only control group design. This study used 24 male rats aged 3–4 months with a body weight of 250–300 grams which were divided into four groups; negative control group, positive control group; treatment group one; and treatment group two. The high-fat diet (HFD) is an additional (emulsion) feed added to standard feed with increased fat composition. The results showed that increased triglyceride (TG) levels of 83.40 mg/dL and HDL levels of 62.60 mg/dL after consumed high-fat diet. There was a significant decrease in TG levels of 54.15 mg/dL ( $p=0.026$ ) and a decrease in HDL of 53.00 mg/dL ( $p>0.05$ ,  $\alpha=0,05$ ) after administration of Omega-3 and Vitamin D combination. Conclusions in this study is the intake Omega-3 and Vitamin D combination has a positive effect on TG levels. Still, this positive effect must be accompanied by limiting the fat intake to the body. Meanwhile, combining Omega-3 and Vitamin D did not significantly affect HDL levels.*

**Keywords:** Lipid Profile, High Fat, Omega-3, Vitamin D

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## **INTRODUCTION**

Fat is one of the food components that has various effects on the human body. One of the functions of fat in the body is as a source of energy reserves that can be stored in cells, especially in adipocytes. Fat has a vital function

in various metabolic processes in the body <sup>1,2</sup>. Although it has an essential role in various metabolic processes, consuming excess fat can cause various diseases, including an increased risk of developing metabolic syndrome. One of the occurrences of metabolic syndrome is characterized by dyslipidemia, which can lead



to more serious diseases such as heart disease and diabetes.<sup>3-5</sup>

Dyslipidemia is a condition of imbalanced lipid levels in the body. Dyslipidemia is characterized by an increase in triglyceride (TG) and cholesterol levels or both and is also characterized by low levels of *high-density lipoprotein* (HDL-C) cholesterol.<sup>6</sup> High TG levels, also known as Hypertriglyceridemia, can increase the risk of developing coronary artery disease (CAD)<sup>7</sup>. Besides TG, HDL levels are also associated with various diseases, especially metabolism-related diseases. Research states that the ratio between TG/HDL-C is closely related to an increased risk of various diseases related to metabolism, one of them is fatty liver. Fatty liver can increase the risk of other diseases such as type 2 diabetes mellitus (type 2 DM) and chronic kidney disease<sup>8-10</sup>.

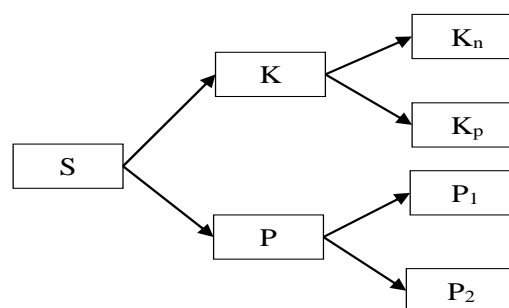
Omega-3 fatty acids are a type of polyunsaturated fatty acids (PUFAs) that are essential fatty acids for humans<sup>11</sup>. Omega-3 fatty acids have been found to have a various positive effects on health, especially those related to cardiovascular<sup>12</sup>. Some literature also states that Omega-3 fatty acids can lower TG levels which is a good effect, especially for people with high plasma TG levels (hypertriglyceridemia)<sup>13,14</sup>.

Vitamin D was first discovered by Elmer McCollum by accident while researching vitamin A in cod liver oil<sup>15,16</sup>. Vitamin D is a fat-soluble vitamin. It has various critical metabolic functions in the body, especially in the mechanism of calcium homeostasis and bone metabolism<sup>17</sup>. Several studies have found that the role of Vitamin D is not only related to calcium and bone metabolism but also has been found to be related to lipid profiles levels in the body<sup>18</sup>. High levels of Vitamin D were found to have a positive relationship with serum HDL-C levels<sup>19</sup>.

Vitamin D and Omega 3 have been widely studied regarding their effects on the body, including those related to fat metabolism. However, very few studies have discussed the effect of combined Omega-3 and Vitamin D intake on plasma lipid levels. Therefore, this research will examine the effect of the combination of Omega-3 and Vitamin D on TG and HDL levels in the plasma of experimental animals.

## METHOD

This research is an experimental study with a post-test-only control group design. This study used 24 male rats aged 3–4 months with 250–300 grams of weigh. The rats were divided into four groups; negative control group (Kn, n=5), positive control group (Kp, n=5), treatment group one (P1, n=7), and treatment group two (P2, n=7). The HFD feed given as an additional feed other than standard feed with increased fat composition. The HFD used in this study was an emulsion of a mixture of lard and chicken egg yolk. The ratio of chicken egg yolk and lard is 1:1. The HFD given as much as 1 mL to each rat with an estimated fat content of 66.28%.



### Description:

S: Research Subject

K: Control

P: Treatment

**Figure 1. Group division scheme.**

The negative control group (Kn, n=5) was the group given only standard feed, while the positive control group (Kp, n=5) was the group that were given standard feed and HFD. The standard feed used in this study was "Pokphand 593", while the HFD used was a mixture of lard and egg yolks and was given as much as 1 mL/rat by sonde.

Treatment group one (P1, n=7) was a group that given a HFD + standard feed and given a combination of Omega-3 and Vitamin D. In contrast, treatment group two (P2, n=7), was a group that were only given combined intake of Omega-3 and Vitamin D as well as standard feed, without giving HFD.

The Omega-3 fatty acids used were Omega-3 fatty acid supplements containing 180 mg of docosahexaenoic acid (DHA) and 120 mg

of eicosapentaenoic acid (EPA). As much as 400 IU Vitamin D supplements were used in this study. The dose of Omega-3 fatty acids is 75 mg/rat, while the dose of Vitamin D is 200 IU (5µg)/rat<sup>20,21</sup>.

Before giving treatment, the Kp dan P1 group was given high-fat feed for two weeks (14 days). Each group was treated according to the scheme with a duration of two weeks (14 days), and measurements of lipid profile levels (TG and HDL) were carried out on the 15th day. Lipid profile examination carried out at the Department of Clinical Pathology, Diagnostic Center (GDC), Dr. Soetomo Hospital, Surabaya, Indonesia. The data were then tested using Shapiro-wilk test for normality test and *Anova* and *Posthoc* to find out the differences in the TG and HDL levels in each group.

## RESULTS

After four weeks of administration

HFD in Kp group, it was found that the TG levels in Kp did not differ significantly compared with Kn. While, there was a significant different in TG levels in P2 group compared with Kp.

In this study, the duration of HFD induction in the Kp group was 28 days, this duration did not significantly increase TG levels. Likewise with HDL, HFD were not able to produce significant different in HDL levels in the Kp and Kn group. This shows that the HFD given has not been able to have a significant effect on TG and HDL levels in experimental animals

However, Table 1 shows that there was a significant difference in the TG levels of the experimental animals in each group after being tested with One-Way Anova ( $p=0.034$ ). From each of these groups, a *Posthoc* Bonferroni test was carried out to find out which groups had significant differences.

**Table 1. The results of examining the TG levels of each group**

Group	Total (N)	Fasting TG Levels (mg/dL)	Std. Deviation
K <sub>p</sub> → Negative Control	5	62.40	10.64
K <sub>n</sub> → Positive Control (High-fat diet)	5	83.40	29.38
P <sub>1</sub> → Treatment 1 (High fat diet + Omega-3 + Vit. D)	7	65.00	9.36
P <sub>2</sub> → Treatment 2 (Omega-3 + Vit. D)	7	54.14	8.23
Total	24	65.12	17.92

**Table 2. The results of examining the HDL levels of each group**

Group	Total (N)	Fasting HDL Levels (mg/dL)	Std. Deviation
K <sub>p</sub> → Negative Control	5	57.60	6.18
K <sub>n</sub> → Positive Control (High-fat diet)	5	62.60	9.86
P <sub>1</sub> → Treatment 1 (High fat diet + Omega-3 + Vit. D)	7	53.86	6.12
P <sub>2</sub> → Treatment 2 (Omega-3 + Vit. D)	7	53.00	6.76
Total	24	56.20	7.70

Post hoc data showed that the group of experimental animals that were given a HFD for 28 days (Kp) had a significant difference from the group of animals that only received a combination of Omega-3 and Vitamin D (P2)

with a significance value of  $p=0.026$ . This result shows that combined intake of Omega-3 and Vitamin D has the potential to have an effect on lowering TG levels in serum.

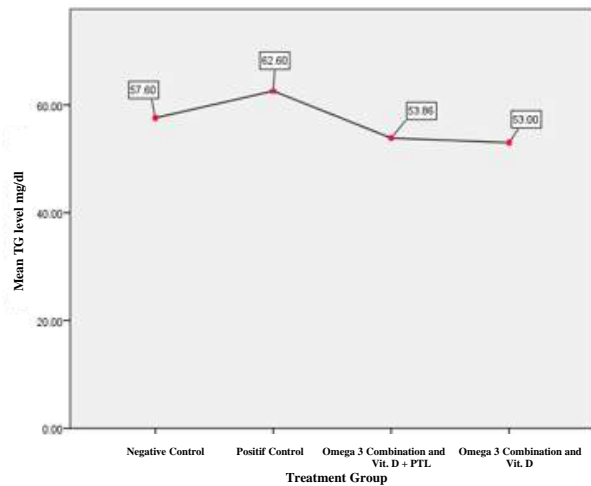
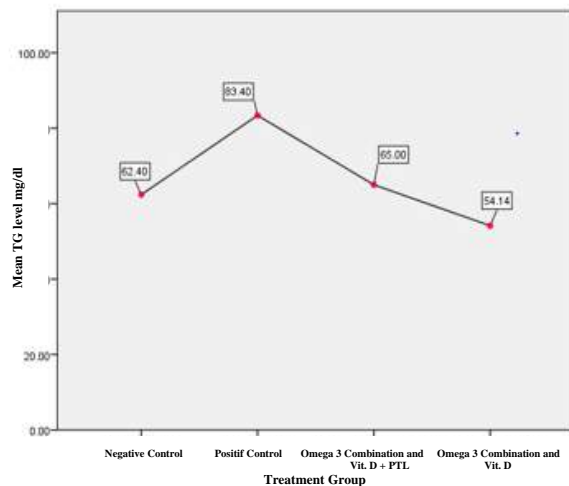


Table 2 shows data on HDL levels of experimental animals in each group. After the *One-Way Anova* test was carried out on the HDL levels of each experimental group, no significant difference was found in the mean HDL levels in each group ( $p=0.135$ ).

## DISCUSSION

### TG Levels and Omega-3 and Vitamin D Combination

Triglycerides (TG) are one of the four groups of lipids found in lipoproteins. In plasma TG accounts for about 16% of total plasma lipids<sup>11</sup>. Increased TG levels in the blood are often associated with excessive food intake, especially foods that contain lots of fat and carbohydrates, although several studies also state that TG levels in the blood can also increase in certain circumstances such as pregnancy<sup>22,23</sup>.

In this study, the treatment group that received an Omega-3 and Vitamin D combination and was still given a high-fat diet (P1) had an average TG level that did not differ much from the positive (Kp) and negative (Kn) control groups. Meanwhile, the group that only received the Omega 3 and Vitamin D combination (P2) showed a significant decrease in TG levels compared to the control group (Kp). This shows that combined intake of Omega-3 and Vitamin D cannot have the maximum effect on TG levels if it is not accompanied by limiting fat intake.

Data on TG levels in this study showed that the intake of a combination of Omega-3 fatty acids and Vitamin D could reduce TG

levels in experimental animals, both in the treatment group 1 (P1) and in the P2 group. However, the intake of Omega-3 and Vitamin D combination in the P1 group did not produce as good results as in the P2 group. The TG levels of these two groups were not significantly different ( $p=1.00$ ).

The TG level of P1 group was lower (65.00 mg/dL) but not different significantly ( $p=0.342$ ) compared to the positive control (Kp). However, P2 group had a significant ( $p=0.026$ ) lower of TG levels by 54.14 mg/dL. Based on these results, it can be noted that the intake of an Omega-3 and Vitamin D combination had a better effect on the group that received standard feed (P2) compared to the group that was given high-fat feed (P1). This is consistent with previous research which showed a relationship between decreased TG levels with intake of Omega-3 fatty acids and serum vitamin D levels<sup>14,18</sup>. However, this study did not compare the effect of reducing TG levels by Omega-3 and Vitamin D separately.

Omega-3 fatty acids are known to reduce TG levels in the blood by modifying various mechanisms related to lipid metabolism, especially those related to decreasing the activity of enzymes that synthesize TG.<sup>14</sup> Omega-3 fatty acids are known to modify various enzymes involved in TG formation by binding to various nuclear receptors. There are four core receptors that can be affected by Omega-3 fatty acids; liver X receptor (LXR); hepatocyte nuclear factor-4 $\alpha$  (HNF-4  $\alpha$ ); farnesol X receptor (FXR); and peroxisome proliferator-activated receptors (PPARs). The bond between Omega-3 and

these receptors can reduce TG levels in the blood<sup>24</sup>.

In contrast to Omega-3 fatty acids, the mechanism underlying the effect of Vitamin D intake on reducing TG levels is remain unclear. However, some literature states that Vitamin D can have indirect effects on lipid profiles, including reducing lipid absorption in the intestine and lipid synthesis<sup>25</sup>.

### **HDL Levels and Omega-3 and Vitamin D Combination**

High-density Lipoprotein (HDL) is a form of Lipoprotein in the body. HDL Lipoprotein is known as Lipoprotein which has anti-atherogenic effect. Lipoprotein HDL is a lipoprotein with a high protein content, which is around 45-55% of the total HDL content itself<sup>26</sup>. Various studies have found that HDL plays a role in various mechanisms in the cholesterol transport process<sup>26,27</sup>. In addition, HDL has also been studied for its role in inflammatory mechanisms and oxidative signaling. In the inflammatory mechanism, HDL was found to be able to suppress the inflammatory response, by inhibiting the induction of cytokines which play a role in increasing the inflammatory response. Meanwhile, in oxidative signaling, HDL was found to inhibit lipid peroxidation<sup>27</sup>.

In several studies, intake of Omega-3 was found to reduce the risk of suffering from cardiovascular disease and diabetes. Omega-3 fatty acids, both EPA and DHA, were found to increase HDL-Cholesterol levels. Increased HDL by Omega-3 intake is mediated by increased activity of lipoprotein lipase (LPL). Increased LPL activity by Omega-3 can reduce levels of Intermediate-density lipoprotein (IDL), and Very low-density lipoprotein (VLDL), which causes an increase in TG hydrolysis and then increases HDL levels<sup>28</sup>.

Although several studies have stated that there is an effect of intake of Omega-3 fatty acids on HDL, in this study there was no significant difference in HDL levels in the group that received Omega-3 and Vitamin D combination when compared to the control group (Kn and Kp). This can be caused by the source of Omega-3 given. Research by Zibaenezhad (2017) found that there were differences in the effect of Omega-3 intake from different sources on lipid profiles. In the research, it was found that intake of Omega-3 obtained through consumption of fresh fish will have a better effect on reducing LDL levels, and

other lipid profiles, including the ratio of LDL/HDL. The study was also found an increase in LDL levels in the group consuming Omega-3 supplementation, but on the contrary there was a decrease in LDL levels in the group consuming fresh fish<sup>29</sup>. However, this needs to be investigated further in order to find out the reasons for this difference.

Administration of Omega-3 and Vitamin D combination for only 2 weeks is also thought to have an effect on the results obtained. Several studies have stated that giving Omega-3 intake for more than 1 month can have a beneficial effect, both on the immune response and against cardiovascular disease<sup>29,30</sup>. Research regarding the duration of Omega-3 intake on lipid profiles needs further investigation.

Vitamin D is a type of vitamin that is widely consumed by the public. Vitamin D is generally associated with calcium homeostasis. Vitamin D in the form of *calcidiol* (25(OH)D), circulates in the blood and will pass through the kidney proximal tubules to become calcitriol(1,25(OH)2D), where calcitriol is the active form of Vitamin D<sup>16,17</sup>.

Apart from playing a role in the process of calcium homeostasis, Vitamin D also has various effects on processes in the body, including the inflammatory response and various processes related to an increased risk of metabolic syndrome<sup>17,31</sup>. Research has also found that Vitamin D is related to serum lipid profiles. Increased levels of Vitamin D in the form of calcidiol (25(OH)D), were found to reduce TG and LDL-C levels, both in men and women<sup>32</sup>.

Although it was found to have a significant effect on lipid profiles, especially those associated with metabolic syndrome, the administration of Vitamin D combined with Omega-3 in this study was found to have no significant effect on HDL levels. The mechanism underlying the effect of vitamin D on serum lipid levels is remain unclear<sup>33</sup>. The data in this study can be used as a reference and additional data for subsequent research to reveal the mechanism underlying the relationship between Vitamin D and lipid profile

In this study, intake of Vitamin D in the form of *calcidiol* (25(OH)D) of 400 IU for 2 weeks was not able to have a significant effect on serum HDL levels in experimental animals. In addition, this study also did not examine other lipid levels, such as LDL, and Total

Cholesterol (TC), which can be used as a comparison for HDL levels.

### **HDL-TG Levels and Combination Omega-3 + Vitamin D**

A high-fat diet can reduce the activity of the lipoprotein lipase enzyme in the blood circulation. A decrease in the lipoprotein lipase enzyme can reduce the breakdown of triglycerides into fatty acid and glycerol molecules. This decrease results in the accumulation of visceral fat thereby increasing TG levels<sup>34</sup>.

The high-fat diet also increases the enzyme 3-hydroxy-3-methylglutaryl coenzyme A reductase (HMG-CoA reductase). HMG-CoA Reductase is an enzyme in the liver that plays a role in synthesizing cholesterol levels, Very Low-Density Lipoprotein (VLDL) apolipoprotein-B100 (ApoB100), and increasing Low-Density Lipoprotein (LDL) receptors found on the surface of the liver and cells. Increased HMG-CoA Reductase due to a high-fat diet can result in increased levels of cholesterol, VLDL, LDL and Apolipoprotein B<sup>35</sup>.

A high-fat diet can increase TG levels<sup>35</sup> through a decrease in the enzyme lipoprotein lipase and the accumulation of visceral fat. As a result of this accumulation, it can increase Free Fatty Acid (FFA) thereby inducing an increase in the concentration of glucose produced by the liver into the blood circulation which results in insulin resistance<sup>36</sup>. Insulin resistance can also be caused by excessive food intake, causing glucose intolerance and hyperglycemia. In the pre-diabetic stage, there is a decrease in  $\beta$ -cell levels due to several risk factors, such as glucotoxicity, lipotoxicity, and increased inflammation.<sup>37</sup> Previous literature studies have shown an increase in triglyceride (TG) levels, fasting blood sugar (GDP) and a decrease in HDL cholesterol in high-fat animal models<sup>38</sup>.

Vitamin D is a group of *secosteroids* which have fat soluble properties. Vitamin D plays a role in regulating calcium absorption, bone growth and remodeling, regulates metabolic processes and immunity. Recent studies support that vitamin D plays a relevant role in islet dysfunction and insulin resistance<sup>39</sup>. The results of this study indicated that there was a decrease in TG levels after administration of omega 3 and vitamin D

combination. The results of this study were supported by previous studies which showed that experimental animals of *Rattus norvegicus* were induced on diets rich in vitamin D3 within 3 weeks, there was an increase in subcutaneous and visceral fat.<sup>40</sup>, whereas mice fed calcitriol via continuous pump showed reduced adipose weight. While the experimental animal *Rattus norvegicus* model of Vitamin D Receptor (VDR) showed a decrease in white adipose tissue mass, serum triglyceride (TG) concentration and total cholesterol<sup>41</sup>.

Vitamin D plays a role in stimulating insulin secretion in obesity due to a high-fat diet<sup>40</sup>. Both Vitamin D and Vitamin D Receptors (VDR) directly play a role in regulating functional genes, including genes that play an important role in the metabolism, secretion and action of insulin. Vitamin D also acts as an anti-inflammatory hormone that helps tissues to reduce local and systemic inflammation, thereby preventing islet, liver and muscle dysfunction.<sup>37</sup> Trans fatty acids contained in high-fat diets can increase LDL (Low Density Lipoprotein) cholesterol concentrations, triglycerides (TG), reduce HDL (High Density Lipoprotein) cholesterol concentrations, and increase the LDL/HDL cholesterol ratio. Trans fatty acids can also increase the LDL/HDL cholesterol ratio two times higher than saturated fatty acids<sup>42</sup>. Previous literature studies showed that there was a decrease in glucose levels in experimental animals that had been given a combination of vitamin D and L-cysteine supplementation<sup>43</sup>.

Omega-3 can increase the activity of the lipoprotein lipase enzyme<sup>35</sup>. Increased activity of lipoprotein enzymes can increase the breakdown of triglycerides (TG) into fatty acids and glycerol which results in a decrease in TG levels circulating in the blood<sup>44</sup>. The fatty acids and glycerol that are formed are then needed as fuel by cells to form energy (ATP) such as water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>) to produce energy<sup>34</sup>. Increased lipoprotein lipase activity also increases the inhibition of exogenous pathways of lipid metabolism by increasing the absorption of fat in the small intestine so that the concentration of cholesterol and triglycerides in the blood decreases<sup>45</sup>.

This event can increase the risk of atherosclerosis and CHD, compared to

measurements of total cholesterol or LDL cholesterol concentrations, respectively. In a 1% increase in total energy derived from trans fatty acid intake, there is a decrease in HDL cholesterol concentration of 0.013 mmol/liter and an increase in LDL cholesterol concentration (LDL-C) of 0.04 mmol/liter<sup>46</sup>. Previous literature studies have shown that in experimental animals that are made to lose Vitamin D Receptors (VDR) can increase insulin resistance in the liver<sup>47</sup>. In addition, vitamin D can reduce the expression of pro-inflammatory cytokines (IL-1 $\beta$ , IL-6)<sup>48</sup>, secreted by adipocytes thereby suppressing the inflammatory response. A number of studies have shown that vitamin D is involved in lipid metabolism by regulating adipogenesis, lipolysis, and lipogenesis<sup>37</sup>.

## CONCLUSION

In this study, it was found that a combination of Omega-3 and Vitamin D had a positive effect on TG levels. Still, this positive effect must be accompanied by limiting fat intake. In contrast to TG levels, serum HDL levels after administration of Omega-3 and Vitamin D combination did not provide a significant difference between groups. This study did not examine the other cholesterol, such as LDL, VLDL, and iLDL. Thus, HDL level has not been compared to these types of cholesterol to see if the different cholesterol levels were affected.

The effects of Omega-3 and Vitamin D separately were not investigated in this study, so their respective effects on lipid levels cannot be compared. Omega-3 intake has been extensively studied for its relation to lipid profile. Vitamin D was found to be related to lipid profile. Vitamin D intake can affect lipid absorption in the intestine. Nevertheless, much research on Vitamin D still needs to be done in order to answer the mechanisms underlying the effect of Vitamin D on lipid levels.

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## Combination of *Eucheuma Cottonii* and Corticosteroids has a Superior Immunomodulatory Effect on Asthma

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### ABSTRACT

Asthma prevalence has been increasing globally which is commonly treated using corticosteroid as gold standard treatment. However, corticosteroids have adverse effects and cases of corticosteroid-resistant asthma are emerging. *Eucheuma cottonii* (EC) has been shown to potentially attenuate inflammatory response in type I hypersensitivity. This study aimed to investigate the effect of *Eucheuma cottonii* extract and methylprednisolone combination on IL-4, IL-10, and histamine levels in Ovalbumin-induced asthma BALB/c mice. Thirty female BALB/c mice were randomly assigned to 6 groups : (1) Sham; (2) Ovalbumin-induced asthma mice; (3) Ovalbumin-induced asthma mice treated with methylprednisolone (MP) 0.24 mg/day; (4) Ovalbumin-induced asthma mice treated with EC extract 300 mg/kgBW/day; (5) Ovalbumin-induced asthma mice treated with combination of both. Treatments were given respectively for 7 days. Plasma IL-4, IL-10, and histamine levels were measured using ELISA method. The combination group showed both the lowest IL-4 levels ( $89.30 \pm 1.37$  pg/ml) and the highest IL-10 levels ( $487.03 \pm 20.57$  pg/ml) compared to other asthma-like mouse groups ( $p = 0.001$ ). No significant difference was observed in histamine levels among all treatments ( $p > 0.05$ ). The administration of a combination of methylprednisolone and *Eucheuma cottonii* extract significantly affected plasma IL-4 and IL-10 levels compared to monotherapies. However, there was no significant difference in plasma histamine levels compared to monotherapies.

**Keywords:** *Eucheuma cottonii*, corticosteroid, IL-4, IL-10, Histamin

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## INTRODUCTION

The prevalence of asthma has been increasing globally, even in developed countries such as Indonesia<sup>1,2</sup>. Corticosteroid, such as methylprednisolone (MP) has been used widely as the gold standard treatment of asthma, however, this medication has some adverse

effects, such as cushing syndrome, immunosuppression, and loss of bone density<sup>3</sup>. Moreover, there have been emerging cases of corticosteroid-resistant asthma in recent years<sup>4</sup>.

Seaweed, particularly *Eucheuma cottonii* (EC), is a highly valued natural resource renowned for its potential applications as food and traditional medicine. It contains

carrageenan, a sulfated polysaccharides which has been demonstrated to potentially regulate gut microbiota which produce short chain fatty acid (SCFA) which had been previously demonstrated to upregulate regulatory T (Treg) cells which has anti-inflammatory properties through production of interleukin 10 (IL-10) <sup>5,6</sup>. Additionally, EC contains flavonoids that exhibit anti-inflammatory properties by inhibiting the JAK/STAT pathway which has crucial role in the secretion of interleukin 4 (IL-4) and interleukin 13 (IL-13) by T helper 2 (Th2) cells<sup>7,8</sup>. Previous studies have demonstrated the beneficial effects of *Eucheuma cottonii* extract in reducing inflammatory response in type I hypersensitivity <sup>9</sup>. However, to our knowledge, there are currently no study comparing EC extract to the gold standard treatment, corticosteroid. Moreover, the effects of EC extract as an adjuvant to corticosteroid in asthma treatment remain largely unexplored. Therefore, this research aims to investigate the synergistic effects of these substances on asthma-related markers such as IL-4, IL-10, and histamin in BALB/c mice.

## METHOD

This posttest-only control group study was conducted on 30 female BALB/c mice from February to March of 2023 in Center of Food and Nutrition Study of Gadjah Mada University. This study has passed the ethical review by the Ethics Committee of Medical Faculty of Sultan Agung University (No. 10/I/2023/Komisi Bioetik).

The Center of Food and Nutrition Study of Gadjah Mada University cultivated and identified EC. The seaweed was dried and processed into coarse powder. This powder was then soaked in 50% ethanol (1:10, w/v) in a dark room at a temperature of 28°C for 24 hours and stirred using a magnetic stirrer for 1 hour. Subsequently, the extract was filtered through filter paper to remove any solid particles. The resulting filtrate was then evaporated at 40°C until it transformed into a paste-like consistency. This paste was frozen using liquid nitrogen and stored in a dark glass bottle at a temperature of -20°C.

The animal model used were 30 female BALB/c mice weighted  $\pm 20$ g. Female mice were used due to their higher susceptibility to

allergic reaction <sup>10</sup>. Combination of 20  $\mu$ g/mL ovalbumin (OVA) and 1 mg aluminium hydroxide (Biosm, Indonesia) were administered intraperitoneally at day 0 and 14. Furthermore, OVA inhalation was performed at a concentration of 3mg/m<sup>3</sup>/day from day 22 to day 24. Confirmation of asthma was performed using histopathology examination by 2 trained pathologists. The model were then randomized and divided into 6 groups: (1) Sham: healthy mice, (2) OVA: OVA-induced asthma mice, (3) MP: OVA-induced asthma mice treated with oral MP 0.24 mg/day (4) EC: OVA-induced asthma mice treated with oral *Eucheuma cottonii* extract 300 mg/kgBW/day, (5) MP+EC: OVA-induced asthma mice treated with combination of both. The treatments were administered orally by dissolving EC extract and/or MP into 2 cc of aqua at day 25 to 31. Termination was performed on the 32th day by inhalation of carbon dioxide and blood samples were taken from the orbital sinus and placed in EDTA tubes, then centrifuged at a speed of 3000 rpm for 20 minutes. The plasma was taken and stored at -70°C.

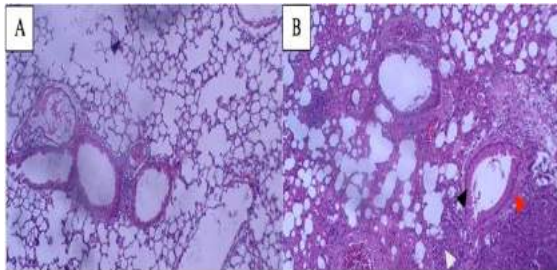
Histamine were measured spectrophotometrically using an ELISA kit (Bioenzy, Indonesia) according to the manufacturer's instructions.

The plasma levels of IL-4, IL-10, and Histamine were measured spectrophotometrically using an ELISA kit (Bioenzy, Indonesia) according to the manufacturer's instructions. The lungs and tracheobronchial tree were harvested for histopathological assessment and fixed using formaldehyde solution for 24 hours before preparation according to standard protocols. The samples were cut to a thickness of 5  $\mu$ m, and then stained with haematoxylin and eosin (H&E). The samples were observed under light microscope (magnification 100x) and blinded assessment was done by a trained pathologist.

The data for IL-4, IL-10, and histamine are presented descriptively and tested for normality and homogeneity using shapiro-wilk and levene's test respectively. Data were tested using one way ANOVA and tukey post-hoc test to determine differences between each groups with p-value < 0,05 considered significant. The data obtained were processed using computerized methods, and the analysis was performed using SPSS 25.0 for Windows.

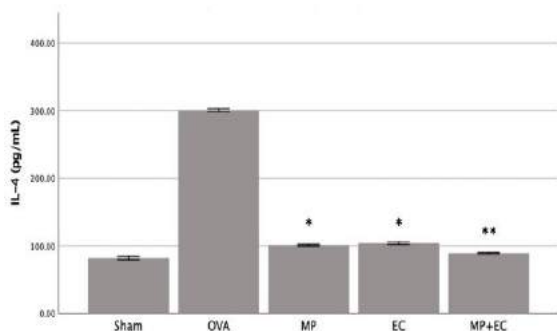
## RESULTS

Figure 1 demonstrates the histopathological findings of the OVA-induced asthma groups are consistent with histological changes in asthma. The findings include leukocyte infiltration (white arrowhead), respiratory epithelial hyperplasia (black arrowhead), and bronchi smooth muscle hypertrophy (red arrowhead).



**Figure 1 Lung and bronchi histopathology (H&E, 100x magnification). (A) normal lung and bronchi; (B) lung and bronchi in ovalbumin-induced asthma**

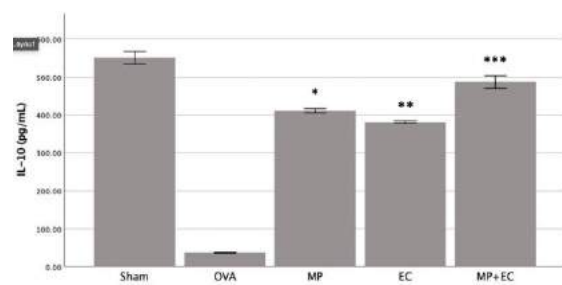
The plasma IL-4 level analyses were presented in Figure 2. The lowest IL-4 level were observed in MP+EC group compared to other OVA-induced asthma groups ( $p=0.001$ ). MP and EC groups had significant lower level of IL-4 compared to OVA group ( $p=0.001$ ) However there were no statistically significant difference in IL-4 level between the two groups ( $p=0.227$ ).



**Figure 2 Plasma IL-4 analyses. \*Mean values were significantly different compared to OVA group. \*\* Mean values were significantly different compared to OVA, MP and EC groups.**

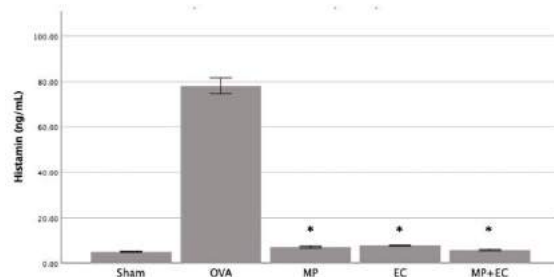
The plasma IL-10 level analyses were presented in Figure 3. The highest IL-10 level were observed in MP+EC group compared to other OVA-induced asthma groups ( $p=0,001$ ). Furthermore, EC group had a significantly

lower level of IL-10 compared to MP group.



**Figure 3 Plasma IL-10 analyses. \*\* Mean values were significantly different compared to OVA and MP groups. \*\*\* Mean values were significantly different compared to OVA, MP, and EC groups.**

The plasma histamine level analyses were presented in Figure 4. All treatment groups had significantly lower histamine level compared to the OVA group ( $p=0,001$ ). However, there were no statistically significant differences between the treatment groups ( $p>0,05$ ).



**Figure 4 Plasma Histamin analyses. \*Mean values were significantly different compared to OVA group.**

## DISCUSSION

This study is the first to investigate the effect of EC and methylprednisolone combination in asthma. The results demonstrates superior effects of combined therapy in attenuating inflammatory response in asthma compared to monotherapies. The administration of combined therapy resulted in a significantly lower plasma IL-4 level while simultaneously having higher plasma IL-10 level compared to monotherapies. This study also demonstrates the anti-inflammatory properties of EC which were comparable to methylprednisolone. However, there were no statistically significant difference in histamine

level of all treatment groups which may be attributed by other cells histamine-producing cells which are not influenced by IL-4 and IL-10 level such as enterocromaffin-like (ECL) cells and histaminergic neuron. Histamine secretion by ECL cells were influenced by somatostatin and gastrin, while histaminergic neuron were influenced by neurotransmitter such as dopamine and serotonin<sup>10,11</sup>. These findings are consistent with previous studies investigating the effect of EC in several condition mediated by type I hypersensitivity, such as asthma and food allergy<sup>9,12</sup>.

EC contains flavonoids such as quercetin and kaempferol which had been previously proven to downregulate the JAK/STAT pathway. Previous study has shown quercetin ability in downregulating GATA3 transcription factor<sup>7</sup>. Other study also showed that kaempferol had the ability to inhibit the activity of the JAK3 protein, thereby downregulate the expression of STAT6 and subsequent inhibition of GATA3 activity<sup>8</sup>. The downregulation of this pathway reduces IL-4 production by Th 2 cells.

Furthermore, the carrageenan in EC acts as a prebiotic that can alter the composition of the gut microbiota, leading to increased production of short-chain fatty acids (SCFAs)<sup>13</sup>. These SCFAs have the ability to decrease the expression of the HDAC9 gene, resulting in increased expression of the transcription factor FOXP3<sup>14</sup>. This transcription factor plays a role in upregulating Treg cells expression, leading to an increase in the anti-inflammatory cytokine IL-10. This cytokine suppresses the differentiation of CD4+ cells into Th2 cells, thereby reducing the production of IL-4. The IL-4 levels is further reduced with the administration of methylprednisolone, a corticosteroid preparation that reduces IL-4 levels in asthma by suppressing the activity of the transcription factor STAT6<sup>15</sup>.

## CONCLUSION

This study demonstrates the promising outcome of EC adjuvant to corticosteroid as the gold standard treatment. These findings also provide the data supporting comparable anti-inflammatory effect of EC which may reduce corticosteroid use in the treatment of asthma. However, it is important to note the potential adverse effect of EC administration which remains largely unexplored. Further study is

recommended to evaluate the long term adverse effects of EC administration. This animal study can provide valuable insights in treatment for asthma, however the findings in this study may not be replicated in human subject, thus clinical trial on human subject is necessary to determine the potential clinical implications of this combination.

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## CONFLICT OF INTEREST

This study is independently funded by the author. The author declares no conflict of interest.

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Original Article

***An Explorative Study of Indonesian Traditional Cheese 'Dangke' as High Protein Food from Enrekang, South Sulawesi***

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**ABSTRACT**

*This study aimed to examine the historical and cultural values of dangke as a traditional food, its potential as a source of animal protein, and the methods of its preparation and presentation. This qualitative descriptive study used in-depth interviews with key informants, focus group discussions with primary and supporting informants, and observation to collect data. The findings of this study indicate that dangke, which was originally made from buffalo milk and enriched with enzymes from papaya sap, reflects the culinary heritage of the Massenrempulu tribe in Enrekang Regency, South Sulawesi. However, the limited supply of buffalo milk has led to the modification of dangke using cow's milk in some parts of Enrekang. Historically, dangke has been served with rice or "pulu mandoti" to guests since the colonial era. The origin of the term "dangke" itself has roots in the Dutch language, possibly from the expression "dank je wel" (thank you) used by Dutch soldiers after tasting this delicious dish. In addition, previous studies have shown that dangke has a high protein content, making it a valuable food source to support the diversification of animal protein sources. In conclusion, dangke has a high cultural value for the people of Enrekang and is a traditional food with high nutritional value, especially in terms of protein content.*

**Keywords:** Dangke, Culinary Heritage, High Protein Food, Indonesian Traditional Cheese

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**INTRODUCTION**

Over the last few years, the Indonesian government has made stunting a priority nutritional problem in the 2024 RPJMN, with a

target of stunting prevalence reaching 14% in 2024. However, data from the 2022 Indonesian Nutrition Status Survey (SSGI) shows that the national stunting prevalence is 21.6% which the value is quite far from this target. Even though

the SSGI results have shown a decrease in prevalence from 2021 of 2.8%, other supports are still needed to achieve the national development target of the government program<sup>1</sup>.

Indonesia's government conducted programs to overcome this problem, one of them was providing supplementary food that contain high protein. However, during its implementation several obstacles were encountered, such as the menu being served being less varied and the nutritional content not meeting standards. While there are various kinds of traditional foods that can be used as basic ingredients for making supplementary food. The utilization of traditional food also has additional value because it shows ethnic, religious and cultural identity, which is reflected in various flavors, cooking techniques and serving methods.

Dangke, a traditional cheese from Enrekang Regency South Sulawesi, is a potential traditional food for supplementary food. Dangke is one of the superior products in the Massenrempulu tribe's culinary delights which has a cheese-like taste with a soft texture like tofu<sup>2,3</sup>. The Massenrempulu tribe is a tribe that lives in Enrekang Regency, South Sulawesi. This tribe is one of the tribes in South Sulawesi which is not as popular as the other three tribes such as Makassar, Bugis and Toraja.

The lack of cultural exploration of the Massenrempulu tribe, including its culinary culture, has resulted in the popularity of dangke being lower compared to other traditional foods such as tempeh and dadiah. There is a concern that the presence of dangke might gradually fade due to the influence of the free market and globalization<sup>4</sup>. Through this research, it is hoped that it can provide a new perspective on dangke as a cultural product of the Massenrempulu tribe and its potential as a high-protein food. This research aims to examine the historical and cultural value of dangke as a traditional food, the potential of dangke as a food source of animal protein, then observing how dangke is made and served.

## METHOD

This qualitative descriptive study uses data collection methods through in-depth interviews with key informants, focus group discussions with key and supporting

informants, and observation.

Research informants were selected using a *purposive sampling technique* with the criteria of having knowledge of cultural practices related to dangke. Informants include community leader (key informants), dangke producers and sellers (main informants), as well as dangke consumers (supporting informants). The research locations were carried out in dangke producing areas, Anggeraja District, Curio District, and Cendana District in Enrekang Regency, South Sulawesi Province.

Instrument data collection uses guidelines in-depth interview for community leaders to gather more information about: 1. The typical food of the Massenrempulu ethnic group; 2. History and philosophy related dangke as food traditional; 3. The production process of dangke; 4. Method of served, development food, and types consumer dangke; 5. Empiric information from community about nutrition substance, benefits, and effects negative from dangke.

In addition, focus group discussion also used guidelines to gather information about: 1) History and philosophy related dangke as traditional food; 2. The production process of dangke (election material raw materials and manufacturing dangke) in a way traditional; 3. Quality control in production, packaging, storage, and distribution of dangke; 4. Method to served and types of dangke's consumer; 5. Empiric information of nutrition substance, benefits, and effects negative from dangke; 6. Suggestion from participant for product development for child.

Data analysis resulting from qualitative research uses an interactive type of analysis by Miles & Huberman which includes data reduction, data presentation, and drawing data conclusions. This research procedure has passed ethical review by the Esa Unggul University Research Ethics Commission with number 0923-10.063/DPKE-KEP/FINAL-EA/UEU/X/2023

## RESULTS

This research used 2 community figures as key informants, 32 producers and sellers and 3 sellers as main informants, and 10 consumers as supporting informants from the research location.



**Table 1. Informants Characteristics**

Characteristics	n=47	%
Gender		
Man	13	27.6
Woman	34	72.4
Work		
Village head		
Farmer Group Secretary	1	2.1
Dangke Producer and Seller	1	2.1
Seller Dangke	32	68.1
Dangke Consumer	3	6.4
Work	10	21.3

Source: Primary Data, 2023

**Table 2. Protein and Fat Content of Cow's Milk, Buffalo Milk, Cow's Dangke, and Buffalo Dangke**

Nutrients	Cow's milk*	Cow's Dangke** min-max (mean)	Buffalo Milk*	Buffalo Dangke **min-max (mean)	High Protein Claim	
					Codex	BPOM
Protein (g/100 g)	3.2	15.7-33.3 (23.8)	6.3	14.5-26.1(21.3)	20% of NRV/100 g <sup>5</sup>	35% ALG/100g <sup>6</sup>
Fat (g/100 g)	3.5	8.8-21.6 (14.8)	12	10.1-23.9 (15.9)		
Water conten (%)	88.3	49.3-62.4 (55)	73.8	43.3-62.8 (52.7)		
Ash content (%)	0.7	1.9-2.4 (2.1)	0.8	1.9-2.7 (2.3)		

\*Source: List of Indonesian Food Composition ( <https://www.panganku.org/id-ID>)

\*\*Source: Wahniyathi Hatta et al., 2013

NRV ( Nutrition Reference Value ) protein = 57 g/day<sup>7</sup>

ALG (Nutrition Label Reference) protein = 60 g/day<sup>6</sup>

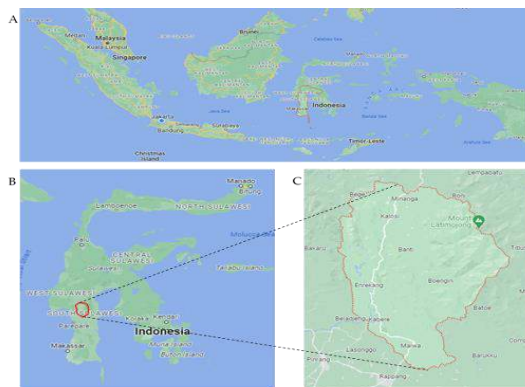
## DISCUSSION

### Historical study and cultural value of dangke as a traditional food

Traditional Indonesian food displays a variety of culinary riches that are reflected in the creativity of local people and the use of abundant natural resources. One of them is milk production in the highlands of Indonesia. Milk is the basic ingredient used in various traditional foods in several regions such as 'dadiah' from

South Sumatra and 'dan 'dangke' from South Sulawesi. Dangke is a type of traditional cheese that has a soft texture and rich taste<sup>2,3</sup>.

Traditional Indonesian food is shaped by several factors such as nature, history and culture. Geographically, Indonesia is the largest archipelagic country in the world with 17,508 islands. The tropical climate and high humidity support rich and unique natural resources, including beaches, volcanoes, tropical forests and biodiversity<sup>8</sup>.



**Figure 1. A) Map of Indonesia (the area outlined in red is South Sulawesi Province); B. Map of Sulawesi Island (the area outlined in red is Enrekang Regency); C. Enrekang Regency Regional Map (Source: <https://www.google.com/maps> ) .**

Apart from that, Indonesia has various ethnic groups, each of which has its own uniqueness. This high cultural diversity sometimes results in a lack of information regarding the culture of certain tribes, one of which is the Massenrempulu tribe.

The Massenrempulu tribe is one of the tribes found in the South Sulawesi region (Figure 1). So far, several history and culture learning books only write about three tribes, namely Bugis, Makassar and Toraja. However, in recent years, various tribes have been fighting for their identity to be recognized. One of them is the Massenrempulu tribe, this tribe lives in the district. Enrekang, South Sulawesi<sup>2</sup>. The location of this tribe is close to the traditional territory of the Toraja tribe, so they are sometimes considered part of the Toraja tribe. However, key informants said that their customs and culture were actually quite different, especially in traditional and religious ceremonies.

*"... Basically, Massenrempulu has its own identity. The language might be similar to Toraja, but the way of life, funeral ceremony, and the religion are different..."*

*(A, Community Leader)*

The word 'Massenrempulu' in the Enrekang language is translated as "stick like sticky rice". Therefore, the name Massenrempulu tribe is understood as a symbol of the inherent unity of the three small tribes that inhabit the district. The Enrekang are the Duri, Maiwa, and Enrekang<sup>9</sup>. However, there is also literature which states that the Massenrempulu tribe consists of the Duri, Enrekang and Maroangin tribes.

*"...If Massenrempulu is part of one district then it is not separated...so that is what unites Massenrempulu..."*

*(A, Community Leader)*

*"...Masserempulu...it means one unit of enrekang... Right here there are the Enrekang, Maiwa, and Duri tribes... That 's what makes the place different from the language. So duri is a different language, enrekang is a different language, maiwa is also a different language..."*

*(FM, Community Leader)*

Additionally, diverse traditions and cultural values play an important role in the way traditional food is prepared and served. Cooking methods, preservation techniques, and serving procedures are often passed down from generation to generation. This creates food that has the distinctive flavors and characteristics of a particular culture. This is also reflected in the Massenrempulu tribe, there are various kinds of traditional food including dangke, pulu mandotti, and nasu cempa<sup>4,9,10</sup>.

*"...O, if there are many, what are they starting with, hm dangke, second is nasu cembanya, and third is sokko from sticky rice, the term is mandotti...well, these three are the main term...."*

*(A, Community Leader)*

Dangke is a processed milk product that is coagulated using papaya sap (Figure 2). Dangke is also often referred to as the traditional cheese of the Massenrempulu tribe. Dangke has a distinctive and unique taste and is claimed to not be found in other regions. This can also be proven by the registration of dangke as communal intellectual property with registration number P73202100022.

Dangke is thought to have been first made in the Curio area of Enrekang Regency and has been around since the 18th century<sup>11</sup>. The results of interviews with community leaders in the Curio area stated that previously in the Curio area almost all households had buffalo livestock and produced abundant buffalo milk. This is also influenced by the geographical conditions of the Curio region which is located in the highlands which are suitable conditions for raising livestock. Apart from that, this area also has many grasslands to provide animal feed. To prevent buffalo milk from being wasted without being consumed, our ancestors innovated by processing buffalo milk until it curdles and can be used as a side dish. However, because the price of raw materials is expensive, this food is only served to guests of honor.

*"...In the past, the milk came from buffaloes, so we don't know why they could freeze it...if there was a lot of milk from the beginning, it was because many people kept buffaloes in the past...basically, people already knew that if a buffalo had children, it would*

*definitely "There's milk... Just how did the old people have the thought to make dangke? That's history. We don't know that buffalo dangke belongs to Curio sub-district. "*

*(A, Community Leader)*

Even though most of the key informants and main informants do not know directly about the initial discovery of the dangke making process, most of them know the basis for giving the name dangke. When Dutch officers entered the Curio area. People entertain because they are considered guests and are served this dish. Impressed by the friendliness and generosity of the Masserempulu people, the Dutch officers said 'dank je wel' which means thank you. Our ancestors mistook the term 'dank je wel' as the name of this dairy dish. The name stuck around and was adapted to the people's pronunciation, namely dangke <sup>11,12</sup>. This is also reinforced by



some information from in-depth interview informants and focus group discussions.

*"...in the beginning, according to the history that I know, dangke names from the colonialist. They said thank you in Dutch. Well, that's why it's called dangke. According to old people's stories..."*

*(Producer 1, Curio District)*

Based on the explanation above, it is known that the ancestors of the Massenrempulu tribe had high creativity in utilizing natural resources which is reflected in their ability to process milk using a unique process and using papaya sap. Apart from that, the friendly nature and respect for guests is depicted through the story of the naming of the dangke. This culture is still applied from generation to generation in society by the Massenrempulu tribe.



**Figure 2. Traditional dangke cheese from Enrekang Regency, South Sulawesi (Source: Research Team Documentation)**

### **The process of making dan serving dangke**

The simple dangke production process has been passed down from generation to generation and is unique in itself. The raw materials needed to produce dangke are only milk, papaya fruit sap and salt. When it first appeared in the Curio area, dangke used buffalo milk as its main ingredient. However, the decreasing number of buffalo farmers in Curio because some have shifted to becoming Kalosi coffee farmers has resulted in the availability of buffalo milk starting to decline. Apart from that, since the 20th century, the government launched a program to assist imported dairy cattle in several areas in Cendana District <sup>11</sup>.

*"... it's like this, since I first started serving in the livestock service in 84, I remember exactly the cows that entered Lekkong in 81/82.... So, the beef that were distributed/received by the*

*Enrekang government were placed in Lekkong, then as time went by there was a government program for FH cattle (Friesien Holstein)..."*

*(Producer 8, Cendana District)*

The production of dairy cow's milk which is greater than the production of buffalo milk is one of the factors that started to modify the main ingredients for making dangke, especially in the Cendana District area and followed by Anggeraja District. Dangke producers in the Curio District area still use buffalo milk as their own specialty.

### **Selection of ingredients**

When it first appeared in the Curio District area, the basic ingredient for making dangke was buffalo milk. There is quite a lot of buffalo milk available in this region because most dangke producers also have buffalo farms.

The smaller amount of buffalo milk produced compared to dairy cows means that the selling price of buffalo dangke is also higher. Apart from that, buffalo farmers usually wait around 3 months from birth before the milk is taken to be sold to producers or used to produce dangke themselves. In the process of collecting raw materials there are no special requirements or certain checks that are carried out.

*"...That's buffalo dam's milk, you can't say it's good or not, because it's always the good stuff if we talk about buffalo's milk, it depends on how we keep it, if you keep it for a long time and don't put it in the refrigerator, that's what's damaged. If you say it's from buffalo, that's all good. Nothing is not good. That's what is said to be damaged from the way it is stored..."*

*(Producer 1, Curio District)*

In contrast to the Curio area which uses buffalo milk, Cendana District and Anggeraja District use cow's milk as the main ingredient. Similar to the Curio area, in these two areas most of the dangke producers also have cattle farms. The cattle raised in these two regions are also quite diverse, from local to imported cattle. However, because of the various types of cows raised, the amount of milk produced is also different. To overcome this, most breeders also raise various types of cattle.

*"...Oh, we choose cow by size or their breed. If FH has a lot of milk, there is not enough milk for Simental. Let alone limousines, there aren't any..."*

*(Producer 2, Cendana District)*

### **Dangke-Making Process**

Based on the results of interviews and focus group discussions, it shows that the entire process of making dangke still uses the same recipe passed down from generation to generation for both buffalo dangke and beef dangke (Figure 3). The use of recipes has been passed down from generation to generation so there is no definite measurement for the use of papaya sap and salt <sup>13</sup>.

*"...so my experience there is that reducing the sap, if you don't have enough milk, means reducing the sap too, that's how..."*

*(Producer 5, Anggeraja District)*

*"... For me, I add 1 tablespoon of sap, salt, according to the amount of milk. Approximately 2 spoons..."*

*(Producer 2, Cendana District)*

In general, cheese products in various parts of the world were initially developed through production at the household level, as also happened in Dangke production. However, Dangke has not been able to reach the same level of popularity as various types of cheese from other countries, such as Cheddar, Kraft, Mozzarella and Cottage <sup>14</sup>. The process of making Dangke in Figure 3 shows many similarities with the process of making traditional cheese from various regions from all around the world, such as traditional Algerian cheese (Jben, Mechonja, and Fresh killa), as well as traditional Greek cheese (Tsalafouti). However, each unique characteristic reflects cultural heritage and local raw materials, the process generally involves the use of natural coagulants, stages of curd and whey separation, as well as the important role of local factors in shaping the final taste and texture of the cheese product <sup>15,16</sup>. The similarities in these processes highlight the shared basic principles behind global culinary diversity, as well as the importance of preserving and understanding the heritage value of traditional cheeses throughout the world.

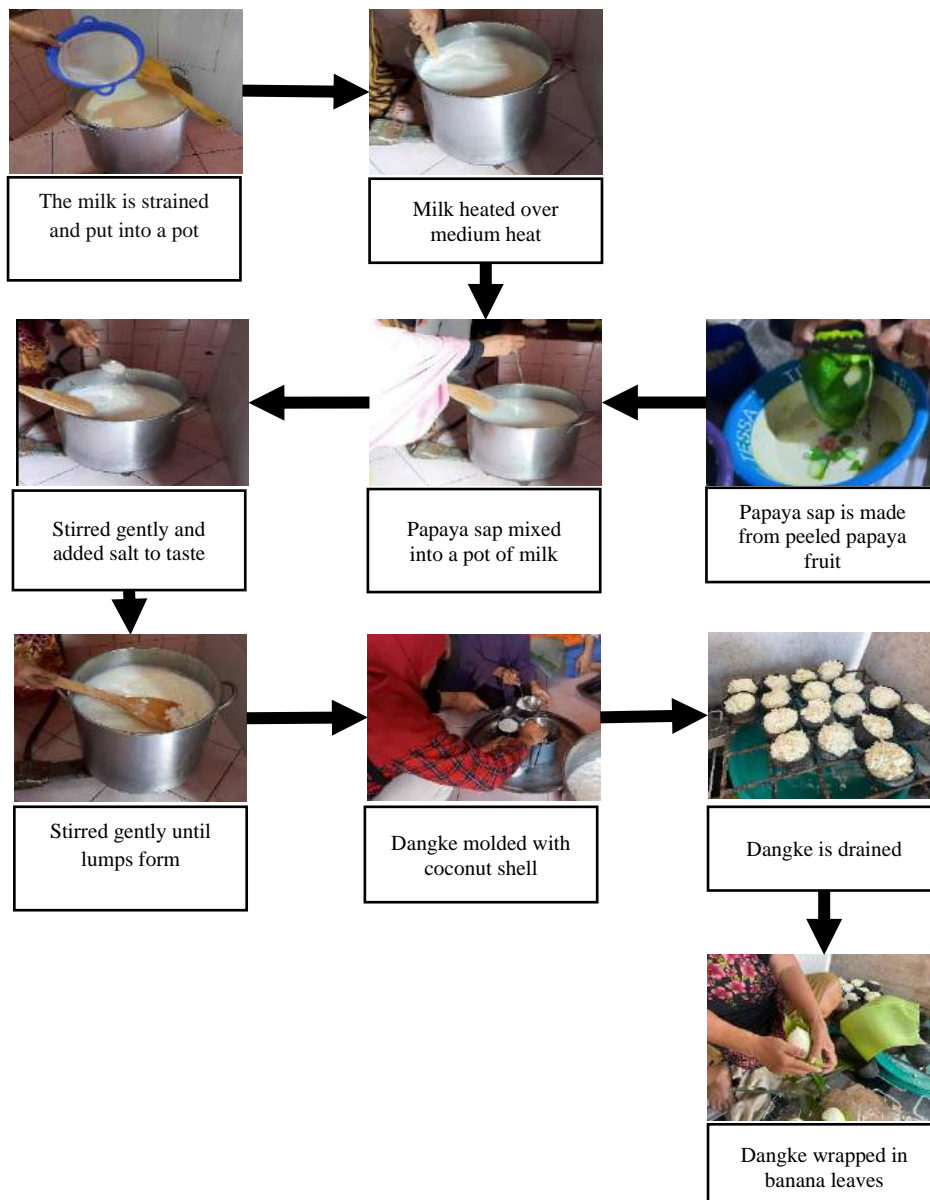
These limitations are related to a number of factors that influence the cheese production process. These limitations are related to a number of factors that influence the cheese production process. One of the main factors that is an obstacle is the variation in the quality of Dangke products which is still high. This is caused by the absence of standardization in the production process relating to parameters such as milk heating temperature and concentration of papaya sap as a coagulant. Most manufacturers also state that the amount of papaya sap used varies and depends on individual experience. Apart from that, excessive use of papaya sap can also produce a bitter taste. Therefore, efforts are needed to standardize the manufacturing process. One option that can be done is to use the commercial papain enzyme as a coagulant <sup>17</sup>.

*"...If it's bitter it's because there's excess papaya sap...If it's normal it's*

*because it's new papaya sap, because sometimes we don't know how much to use. So we just let him in..."*  
 (Producer 1, Anggeraja District)

The process of coagulating milk by enzymes begins with the gelatination stage, and when excessive protein hydrolysis occurs as a result of the influence of heating temperature and uncontrolled enzyme concentration, this

can have a negative impact on curd formation, which ultimately affects the quality of the resulting product. The lack of strict production standards and consistent control parameters in Dangke production is one of the main obstacles in efforts to increase the popularity of this product on par with cheeses from other countries that have succeeded in building a strong reputation in the global market <sup>14</sup>.



**Figure 3. How to make dangke (Source: Research Team Documentation)**

**Serving Dangke**

Different from the serving method of cheese products in general, dangke is served as

a side dish at the main meal, not as a snack. Dangke can be served in various ways that present a variety of unique flavors. First, the



remaining lumps of dangke are mixed in a panic with wai dangke (dangke water) and rice after the making process. The savory taste of wai dangke which resembles coconut milk adds to the taste of this menu. Both dangke can be eaten immediately after the molding process is complete. Then, dangke is also often fried. Thin slices of dangke are heated in hot oil to produce a crunchy and tasty outer layer, while the inside remains soft. This is a popular way to enjoy dangke.

Apart from that, dangke can also be burned. Dangke pieces are grilled on a grill to produce a distinctive aroma and deeper taste

(Figure 4). When welcoming guests, the Massenrempulu community usually serves processed dangke with rice/sokko pulu mandotti and chili sauce. The distinctive aroma of sokko pulu mandotti gives it a distinctive taste<sup>10</sup>.

*"...In our tradition, if it's served to guests, usually it's served with sokko mandotti...that's the origin combo."  
(A, Community Leader)*

*"...For me..I often grill it...Use butter, use Teflon...(and eat it as) a side dish, a substitute for fish..."  
(Consumer 2, Cendana District)*



**Figure 4. How to Serve Dangke A. Remaining lumps of dangke, wai dangke, and rice; B. Consumed immediately after printing; C. Dangke cut into small pieces then fried; D. Dangke and wai dangke served with sokko pulu mandotti (Source: Research Team Documentation)**

### **The Potential of Dangke as a High Protein Food**

The uniqueness of dangke lies in its equal position with other animal side dishes in everyday dishes. The basic ingredient of dangke which comes from milk makes the protein content of dangke quite high (Table 2) . The high protein content in dangke allows it to help build and repair muscle tissue, maintain bone

health, and support the immune system. Apart from that, empirically the Massenrempulu people also believe that consuming dangke can provide benefits for children's development and growth, especially for children's physical and cognitive growth.

*"...From experience, the people there in dusun Bule', if their child's in*

*examination period, they give them dangke to eat. They believe it will help their child got a high IQ ..."*  
(Producer 3, Curio District)

Apart from that, information regarding dangke content has also been disseminated by the government. This socialization activity is held by extension workers from related services such as the livestock or agriculture service.

*"...Ohhh it's high in protein, calcium. It's called milk. Vitamin A..B...(information) From the livestock and agriculture department, it is also normal for instructors to come. This is the new POM center at the regional office..."*  
(Producer 1, Anggeraja District)

Previous research shows that dangke, which comes from buffalo and cow's milk, has very diverse nutritional content. This is due to other factors such as the quality of raw materials, type and level of coagulating enzymes, processing methods, and product storage. There is no standardization of Dangke-making process in Enrekang Regency, people whom make Dangke used their own recipe according to their individual habits and experiences. At the end, this can influence the final quality of this cheese product.

Based on the data depicted in table 1, it shows that the protein content of buffalo dangke is 2 to 3 times higher than the protein content of buffalo milk. The table also illustrates that the protein content of beef dangke increases up to 5-10 times the protein content of cow's milk. However, the fat content of dangke also shows an increase, therefore it is still recommended not to consume dangke excessively<sup>18</sup>.

Based on the average protein content in the two types of dangke presented in table 1, it shows that both types of dangke fulfil the requirements for the high protein food claim issued by Codex Stan and BPOM. The Codex Stan standard requires solid food to contain a minimum of 20% of NRV/100 g (11.4 g) in order to be claimed as high food. Slightly different from the high protein claim requirements in Codex Stan, BPOM Indonesia requires a minimum protein content of 35% ALG/100 g (21 g) for solid food.

Serving dangke in everyday cooking creates a varied and delicious alternative to

meet daily animal protein needs. This is also confirmed by several dangke producers and consumers, because the savory taste of dangke allows it to be used in various types of dishes.

*"...It can be grilled, it can be stir-fried like tofu, we can make pepes...(dangke) crushed... Given eggs... Added celery leaves, green onions..."*  
(Producer 6, Anggeraja District)

*"...Yes, mix it with noodles, dice it into small cubes...Cut it up, add the noodles there, then smother the noodles, (or) eat meatballs..."*  
(Seller 1, Anggeraja District)

The use of dangke in various dishes can increase the diversification of food sources of animal protein. It is hoped that this can be a solution to the problem of lack of protein consumption which is often experienced by several age groups, especially in groups children aged<sup>19-21</sup>. Apart from the high protein content, the cultural identity value contained in dangke makes it an excellent local food choice for making supplementary food for toddlers and school-aged children. Implications for research in the field of nutrition. Research result show that dangke has a protein content of 22.5% , the high protein content in dangke makes it a useful food ingredient to support health. Protein is an important nutrient for growth and development, as well as maintaining body health.

The limitations of this study is language barriers because some of informant use local language. Therefore, we recruit translator to help research team.

## CONCLUSIONS

Dangke, which was previously made from buffalo milk with enzymes derived from papaya sap, reflects the culinary heritage of the Massenrempulu Tribe in Kab. Enrekang, South Sulawesi. However, the limited supply of buffalo milk caused a modification to using cow's milk in several areas of Enrekang. Historically, dangke has been served with rice or 'pulu mandoti' to guests since colonial times.

The origin of the term 'Dangke' itself has roots in Dutch, perhaps originating from the expression 'dank je wel' (thank you) used by Dutch soldiers after tasting this delicious dish. In addition, previous research shows that

Dangke has a high protein content, making it a valuable food ingredient to support the diversification of animal protein sources. Therefore, follow-up research is required to develop new products that can increase dangke reception.

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#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Original Article

*Analysis of Physical Fitness of Elementary School Students in Tempe and Sajoanging Districts, Wajo Regency During the Covid-19 Pandemic*

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**ABSTRACT**

*This study presents a comparative analysis of the physical fitness levels of elementary school students aged 10-12 in the Tempe and Sajoanging Districts of Wajo Regency. Utilizing a descriptive research approach, the research employed the Indonesian Physical Fitness Test (TKJI) instrument from the Ministry of National Education for data collection. The sample comprised 120 students selected through cluster sampling techniques. The data analysis involved t-test analysis, preceded by normality and homogeneity tests. The results indicated that the majority of students at SDN Kec. In Tempe exhibited physical fitness levels in the moderate and poor categories, with percentages of 6.6%, 75.0%, and 18.4%, respectively, for moderate, poor, and very poor categories. Conversely, at SDN Kec. In Sajoanging, the majority fell into the moderate (15.0%), poor (80.0%), and very poor (5.0%) categories. Overall, the general physical fitness level of students in both sub-districts was deemed poor. Comparing these findings with prior research by Ashadi Faqih and Sasmina Christina Yuli Hartati (2017), which focused on South Gugus Elementary School in Tuban Regency, it is evident that the physical fitness levels of students in Tempe and Sajoanging Districts are notably lower. Furthermore, the statistical analysis revealed a significant difference in the physical fitness levels between the two districts. Notably, students at SDN Sajoanging District demonstrated better physical fitness levels than their counterparts at SDN Tempe District. Specifically, a higher percentage of students in Sajoanging District fell into the poor category, while Tempe District had a greater proportion in the very poor category. In conclusion, the research underscores the importance of addressing the poor physical fitness levels among elementary school students in Tempe and Sajoanging Districts. The findings provide valuable insights for educational policymakers and practitioners to develop targeted interventions aimed at improving the overall health and well-being of students in the region.*

**Keywords:** Physical Fitness, Elementary School, Covid-19

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## INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, noble morals, and the skills needed by themselves and society. Education is an effort to develop all the potential. That students naturally possess<sup>1</sup>. Physical education means education that uses physical activity to produce an overall improvement in the physical, mental and emotional quality of students with the aim of maintaining health and strengthening body muscles<sup>2</sup>. Physical education is a learning process designed to improve physical fitness, develop motor skills, knowledge and active living behavior, and sportsmanship through physical activities<sup>3</sup>.

Coronaviruses are a family of viruses that usually attack the respiratory organs. This name comes from the Latin word "Corona", which means crown, because the outside of this virus is pointed like the crown that surrounds this virus. Of the many variants, only seven are known to infect humans, such as Covid-19, SARS and MERS. SARS is believed to have developed in China from bats to civets and infected humans<sup>4</sup>. One of the laboratory examinations that can be used as initial screening to support the diagnosis of COVID-19 and rule out other infections is a complete blood examination<sup>5</sup>.

"Online learning during the pandemic is part of efforts to increase awareness of the spread of the COVID-19 virus"<sup>6</sup>. The COVID-19 pandemic has forced the government to implement social distancing policies to slow the spread of COVID-19 in society. The Ministry of Education and Culture (Kemendikbud) responded with a learning-from-home (BDR) policy through online learning. This all limits children from doing physical activities or movement activities so that it can have an impact on the level of physical fitness of children. Physical fitness is physical fitness which is a description of the functional capabilities of the body's organs. This is based on the results achieved. For example: An athlete who has less ability but has a healthy body (static) by training his physique will be able to become a more skilled athlete in his field (dynamic) according to the concept of physical fitness that has been explained previously<sup>7</sup>. Physical fitness was then interpreted as a degree of dynamic health, so that therefore physical fitness became graded according to the degree of dynamic health one had at that time.

Thus, the degree of physical fitness is essentially the degree of dynamic health that is necessary (which corresponds) to the need to perform a physical task. Sport during this pandemic has become a primary need. Exercise can also relieve boredom at home, increase immunity, fill free time, and increase energy in carrying out routines daily.

reduced physical activity during the pandemic can increase the risk of several diseases and obesity and increased food supply accompanied by reduced physical activity will increase obesity<sup>8</sup>. From this latest explanation it becomes clearer that Physical Fitness is more focused on physiological fitness<sup>9</sup>. Physical fitness tends to be associated with cardiorespiratory endurance, namely the ability of the heart, lungs and blood vessels to function optimally in a state of rest and exercise to take up oxygen and distribute it to tissues that are active for body metabolism, influenced by various physiological factors<sup>10</sup>. Physical fitness is classified into 2, namely . a) Physical fitness related to health, including: cardiovascular endurance, muscle endurance, flexibility and body composition. b) Physical fitness related to movement skills, namely: speed, agility, reaction speed, resistance, balance, accuracy, coordination<sup>11</sup>. The level of physical fitness is very important and is in accordance with the needs of students who are always faced with busy study schedules. Increased physical fitness can provide significant impact on physical resilience. A person who has a high level of physical fitness will have the strength and endurance to carry out life activities without experiencing significant fatigue<sup>12</sup>. Physical fitness is the suitability of the physical condition for the tasks that must be carried out physically or physically based on physical requirements that are anatomical, physiological, anatomical suitability and physiological suitability. Physical fitness focuses more on physiological fitness, so that it can be defined as the level of suitability of the dynamic health level possessed by the performer to the severity of the physical tasks that must be carried out.

Good physical fitness will guarantee that someone in carrying out their duties is better prepared and always displays an optimal appearance, as well as having a high spirit of life. Physical fitness is also basic capital for a person<sup>13</sup>. However, another side that can be considered is the advantages of children in rural areas, especially in freedom of movement. Natural movements, such as running, jumping, climbing, are more likely for them to do during Covid-19, compared to children in the city. The possibilities for movement of children in villages are wider than those of children in cities. Cities with increasingly dense populations, where many children have lost their places to play, houses do not have yards, cause their movement space to become increasingly narrow, which has the possibility of affecting their movement skills.

Based on this explanation, namely the importance of developing physical fitness for national development and differentiating conditions in the elementary school education environment rural and urban areas, then the idea arose to investigate the issue of physical fitness of children or students in rural and urban areas. The results of

this investigation are useful as a diagnosis of the physical fitness condition of elementary school students. Also to improve the conditions for sports development in these schools.

From the results of observations and cursory observations, the researchers chose 2 sub-districts which would be the locations for future research, namely Tempe Sub-district and Sajoanging Sub-district. From these 2 sub-districts, 3 schools will be selected representing the sub-districts as research samples.

## METHODS

Comparative study (Comparative study) is a descriptive research methodology carried out by comparing similarities and differences as phenomena to find what factors, or what kind of situation, gave rise to a particular event. Comparative studies begin by collecting facts about the factors that cause a particular symptom to occur, then comparing it with other situations, or simultaneously comparing a symptom or event and the factors that influence it from two or several sample groups or research subjects<sup>14</sup>.

The population for this research is the students of SD Negeri Kec. Tempe and District Elementary School Students. Sajoanging. The total population in this research was 806 students consisting of: SDN 135 Akkajeng with 115 students, SDN 155 Assorajang with 89 students, SDN 2 Maddukelleng with 310 students, and SDN 4 Maddukelleng with 292. The samples for this research were students from SD Negeri Kec. Tempe and District Elementary School Students. Sajoanging, 60 people each consisting of 30 male students and 30 female students who were selected using cluster random sampling or randomly.

To obtain research data, an Indonesian Physical Fitness Test was carried out for teenagers aged 10 – 12 years. This test aims to determine the level of physical fitness of children aged 10 - 12 years. The data collected needs to be analyzed statistically, descriptively and analytically for the purposes of testing research hypotheses.

The images used in this research are as follows:

1. Descriptive data analysis is intended to obtain a general picture of the data which includes total value, range, average, standard deviation, minimum value and maximum value.
2. Inferential data analysis is used to test the research hypothesis using the t-test. However, before the inferential analysis, a homogeneity analysis requirement test is first carried out.

So the entire statistical data analysis used in this research was analysis using the SPSS version 26 program with a significance level of 95% or  $\alpha = 0.05$ .

## RESULTS

General description of the distribution of physical fitness level test results for class V students at SDN 135 Jalang and SDN 155 Assorajang both in Sajoanging District with class V students at SDN 2 Maddukelleng and SDN 4 Maddukelleng, Tempe District, Wajo Regency.

**Table 1. The results of the descriptive distribution of physical fitness level**

Statistics	Level of Physical Fitness	
	SDN Kec. Tempe	SDN Kec. Sajoanging
Sample	60	60
Range	9	6
Standard Deviation	1.822	1.56
Variance	3.321	2.435
Mean	10.97	11.85
Minimum	6	9
Maximum	15	15

Table 1 show that the description of research data regarding the level of physical fitness of students at SDN Kec. Tempe obtained a value of Range = 9; standard deviation = 1.822; Variance = 3.321; mean = 10.97; minimum = 6; maximum = 15. Distribution of Physical Fitness Level Data for Elementary School Students, Kec. Tempeh.

Table 1 show that the description of research data regarding the level of physical fitness of students at SDN Kec. Sajoanging obtained a value of Range = 6; standard deviation = 1.56; Variance = 2.435; mean = 11.85; minimum = 9; maximum = 15. Distribution of Physical Fitness Level Data for Elementary School Students, Kec. Sajoanging.

**Table 2. Description of research data regarding the level of physical fitness of students at SDN Kec. Tempe**

TKJI Value	Category	Frequency	Percent
22-25	Very Good	0	0%
18-21	Good	0	0%
14-17	Moderate	4	6,6%
13-Oct	Less	45	75,0%
9-May	Very Less	11	18,4%
Total		60	100,00 %

From the table above it can be explained that the overall level of physical fitness of students at SDN Kec. Tempe has 0 students (0.00%) in the very good category, 0 students (0%) in the good category, 4 students in the moderate category (6.6%), 45 students (75.0%) in the poor category, while 11 students (18.4%) were in the very poor category. The highest frequency is in the less category.

**Table 3. Description of research data regarding the level of physical fitness of students at SDN Kec. Sajoanging**

TKJI Value	Category	Frequency	Percent
22-25	Very Good	0	0,00%
18-21	Good	0	0,00%
14-17	Moderate	9	15,00%
13-Oct	Less	48	80,00%
9-May	Very Less	3	5,00%
Total		60	100,00 %

From the table above it can be explained that the overall level of physical fitness of students at SDN Kec. Sajoanging has 0 students (0.00%) in the very good category, 0 students (0.00%) in the good category, 9 students in the moderate category (15.00%), 48 students (80%) in the poor category, while 0 students (0.00%) are in the very poor category. To accept or reject the hypothesis by comparing the significant value with the value of 0.05. The criterion is to accept the hypothesis if the significant number is greater than 0.05 (Sig > 0.05).

**Table 4. The results of the normality test**

Variable	Sig	Conclusion
SDN Kec. Tempe	0,444	Normal
SDN Kec. Sajoanging	0,601	Normal

From the table above, the significant value of the physical fitness level data group at SDN Kec. Tempe is 0.444 with SDN Kec. Sajoanging is 0.601, because the significant value is greater than 0.05 (sig > 0.05), then the hypothesis stating that the sample comes from a normally distributed population is accepted. Thus it can be concluded that the normality of the distribution is fulfilled.

The homogeneity test is carried out to determine the equality of variances, or to test that the data obtained comes from a homogeneous population. Homogeneity testing uses Levene statistics. Decision making criteria are accepted if the significant values are greater than 0.05 (Sig > 0.05).

**Table 5. The results of the homogeneity test**

Group	Levene Statistic	Sig	Information
SDN Kec. Tempe	0,119	0,731	Homogen
SDN Kec. Sajoanging			

The results of the homogeneity test for research variables show that the Levene statistic value is 0.119, while the significance value is 0.731, which is greater than 0.05. Because the Sig value is > 0.05, the hypothesis which states that the data was obtained from a homogeneous population is accepted, so it can be concluded that the data in this study came from a homogeneous population.

Data analysis was carried out using a t-test on data on the physical fitness level of students at SDN Kec. Tempe with SDN Kec. Sajoanging . In this test, we will test the hypothesis: There is a difference in the level of physical fitness between students at SDN Kec. Tempe with SDN Kec. Sajoanging. To accept or reject a hypothesis by comparing the tcount value with the table value. The criterion is to accept the hypothesis if the tcount < ttable is at a significance level of 0.05.

**Table 6. The results of the t-test**

Variable	Average	t count	Alpha
SDN Kec. Tempe	10.97	2.852	0,005
SDN Kec. Sajoanging	11.85		

The results of the t-test obtained a calculated t value of 2,852 and a t table value of (0.05)(58) of 0.005. Because the calculated t value is greater than the t table (2.852 > 0.005), it can be concluded that there is a significant difference in the level of physical fitness of students at SDN Kec. Tempe with SDN Kec. Sajoanging.

The mean value obtained from SDN Kec. Tempe 10.97 while the mean value from SDN Kec. Sajoanging 11.85. It turns out that the mean value obtained from TKJI SDN Kec. Sajoanging is higher than SDN Kec. Tempe, so this indicates that the physical fitness level of SDN Kec. Sajoanging is better than SDN Kec. Tempeh.

## DISCUSSION

Data analysis shows that there is a significant difference in the level of physical fitness of students at SDN Kec. Tempe with SDN Kec. Sajoanging. Physical fitness level of students at SDN Kec. Sajoanging is better than SDN Kec. Tempeh. Based on the description of research data, it shows that the physical fitness level of students at SDN Kec. In Tempe, the majority of students have physical fitness levels in the moderate and poor categories, and very poor with a percentage of moderate = 6.6%, poor = 75.0% and very poor = 18.4%. Meanwhile at SDN District In Sajoanging, the majority of students have physical fitness levels in the moderate and poor categories, and very poor with a percentage of moderate=15.0%, poor=80.0% and very poor=5.0%. Thus, it can be concluded that in general the physical fitness level of students from both sub-districts is in the poor category. The results of this research are in line with the research results of: Faqih, Hartati, 2017<sup>15</sup>. The results of the research concluded that: "The results of the statistical analysis showed that the percentage value of the physical fitness level of students in grades IV and V of South Gugus Elementary School, Plumpang District,



Tuban Regency, resulted in a percentage of 45.07% in the poor category<sup>15</sup>."

Based on the description above, it turns out that the physical fitness level of students at SDN Kec. Sajoanging is better than SDN Kec. Tempeh. This can be seen from the categories obtained that at SDN Kec. In Sajoanging, most of the students fall into the poor and very poor categories, while at SDN Kec. Tempe for most of the students falls into the poor or very poor category. Looking at the physical fitness level of students at SDN Kec. Sajoanging with SDN Kec. Tempe as a whole, most of which fall into the poor and very poor categories, shows that during the Covid-19 pandemic that hit Indonesia, it really affected activities, namely there were restrictions on leaving the house and even restrictions on movement and sports activities.

## DISCUSSION

The physical fitness level of students at the Sajoanging District State Elementary School (schools located in rural areas) is higher than the physical fitness of students at Tempe District State Elementary Schools (schools located in urban areas). This is proven by the average physical fitness results, where the average physical fitness of Sajoanging District State Elementary School students is 11.85, while the average physical fitness result of Tempe District State Elementary School students is 10.97. The results of research by Wirawan and Juanita in 2016 supports the results of this research<sup>16</sup>. The results of their research concluded that: "There is a difference in the level of physical fitness between full day class IV students at The Naff Elementary School and regular class IV students at Balonggabus State Elementary School<sup>16</sup>. A better level of physical fitness is the full day students of The Naff Primary School. This is caused by several factors, including:

### 1. Environment

Different environmental conditions can affect the level of physical fitness of each individual. A polluted environment resulting from human activities and natural processes will have a negative impact on fitness and health, enjoyment of life, convenience, efficiency, beauty, as well as the balance of ecosystems and natural resources. In other words, it can be said that environmental management aims to overcome the negative impacts of human activities and improve the quality of the environment<sup>17,18</sup>. Students who go to school in rural areas have a good level of physical fitness compared to students in urban areas. This is influenced by the size of the school land which is used as a place for student activities. Schools in rural areas have quite large areas of land compared to schools in urban areas. The contributing factor is the large number of buildings that crowd the school environment. Apart from that, the number of vehicles in the city also

influences students' physical fitness levels. Pollution emitted by vehicles can affect the child's cardiovascular system. Apart from that, the sound emitted by passing vehicles can disturb students' concentration during class.

### 2. Nutrition

Physical fitness for children is influenced by inappropriate lifestyle and eating patterns. The food consumed by children also influences physical fitness factors. Nutritional adequacy figures have an influence on the growth and development of adolescents. Adequate nutritional nutrition for adolescents can regulate the body's metabolism, maintain and support the body's mechanical systems. Appropriate nutritional intake becomes energy to carry out various physical activities so that it can be used to form, improve and maintain physical fitness. Those in the canteen and those on the side of the road, especially if the school cannot control the types of food sold in the school canteen.

### 3. Facilities and infrastructure

School facilities and infrastructure that are less supportive affect the learning process in order to improve students' physical fitness. This is in line with research conducted by Zainuddin, et al., that incomplete facilities and infrastructure will affect the physical fitness of students at school which can be seen from the results of the physical fitness of students<sup>19</sup>. Elementary school students tend to enjoy playing, so providing physical fitness material using the play method will make students feel more comfortable moving. State elementary schools in rural areas have larger yards than state elementary schools in urban areas so carrying out any activity is more possible. Apart from that, the facilities at State Elementary Schools in rural areas are also more extensive, so that State Elementary Schools in rural areas have more enjoyment during the learning process because of the infrastructure.

## CONCLUSIONS

Based on the research results, it can be concluded that there is a significant difference in the level of physical fitness of students at SDN Kec. Sajoanging with SDN Kec. Tempe, where is the mean value from SDN Kec. Tempe 10.97 is in the low category, while SDN Kec. Sajoanging 11.85 is in the poor category. However, on average, Kec. Sajoanging is higher than the district average. Tempeh. Therefore, the level of physical fitness of students at SDN Kec. Sajoanging is better than the physical fitness level of students at SDN Kec. Tempeh.

Suggestions based on the conclusions and limitations of research regarding the comparison of physical fitness levels of students at SDN Kec. Sajoanging with SDN Kec. Tempe, the author

proposes the following suggestions: (1) For physical education and sports teachers at SDN Kec. Sajoanging with SDN Kec. Tempe to increase the physical fitness training of its students, because the overall level of physical fitness of students at SDN Kec. Tempe is in the poor category, while SDN Kec. Sajoanging is included in the medium category. Especially for physical education and sports teachers at SDN Kec. Tempe so that it can further improve the physical fitness of its students through more interesting learning or by providing additional training, (2) For parents/guardians of students, it is hoped that they will always provide support and encouragement so that their children's physical fitness is good, so that when carrying out daily work, they are good. that is, when playing or going to school without experiencing excessive fatigue, (3) Future researchers should conduct further research on the level of physical fitness of students by increasing its quantity and quality. In quantity, namely by increasing the number of subjects.

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#### CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## ***Hemoglobin Levels of Pregnant Women Consuming Multiple Micronutrients VS Fe+Folate in Banggai District***

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### **ABSTRACT**

*Providing Fe+Folate for a long time to pregnant women has not been able to show a significant reduction in the incidence of anemia during pregnancy. This study aims to determine the effect of consuming multiple micronutrient supplements on the Hb levels among pregnant women in Banggai District. This was a quasi-experimental study with a non-randomised community trial and pre and post-test control group design, which involved 48 pregnant women assigned in the intervention and control groups. This study was conducted in Banggai District in 2020. The intervention group involved pregnant women who were administered with Multiple Micronutrient (MMN) supplements based on the UNIMMAP formula. The control group involved pregnant women who were administered with Fe+Folate supplements. Supplements were administered during the second trimester of pregnancy. Hemoglobin levels were assessed at the 12th week and 24th week of pregnancy. Various anthropometric characteristics and measures were assessed at study baseline. Hemoglobin levels were assessed using the Hemocue Hb 201 tool. Nutritional intake was assessed using the Semi Quantitative-Food Frequency Questionnaire (SQ-FFQ). Data were analyzed using the chi-square test, independent t-test and dependent t-test. The results of the study showed that during the second trimester of pregnancy, the mean hemoglobin level in the intervention group who were given MMN decreased by 0.3 g/dl (p-Value=0.143) and in the control group who were given Fe+Folate decreased by 0.1 g/dl (p-Value=0.408). The difference in the decrease was not statistically significant. At the 24th week of pregnancy, the mean hemoglobin level of pregnant women who were given MMN was 0.1 g/dl higher than those who were given Fe+Folate. Such difference was not statistically significant (p-Value=0.415). Further study needs to be conducted to examine the effect of MMN and Fe+Folate on hemoglobin levels based on anemia status, characteristics of pregnant women and health status.*

**Keywords:** Multiple Micronutrients, Hemoglobin Levels, Pregnant Women

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## **INTRODUCTION**

Anemia is a major nutritional problem in Indonesia, including pregnant women. Anemia is a condition in which the amount of red blood cells or the concentration of hemoglobin in them is lower than normal depending on age, gender, physiological

conditions, smoking habits and altitude of residence<sup>1</sup>. According to Rohrig, 2016 hemoglobin is a metalloprotein containing iron which functions to transport oxygen in red blood cells throughout the body<sup>2</sup>. If the amount of hemoglobin is too low or abnormal, there will be a decrease in the blood's capacity to carry

oxygen to body tissues. This further causes symptoms such as fatigue, weakness, dizziness and shortness of breath. The most common causes of anemia include nutritional deficiencies, especially iron deficiency or impaired iron absorption. However, deficiencies of folate, vitamin B12 and Vitamin A are also important causes of anemia<sup>1</sup>.

Populations with greater iron requirements, such as growing children and pregnant women, are particularly at risk of anemia. Data derived from the World Health Organization (WHO) in 2019 showed that globally, the prevalence of anemia in pregnant women throughout the world was 36.5%<sup>3</sup>. Furthermore, based on basic health research in 2013, the prevalence of anemia in pregnant women was 37.1% and increased to 48.9% in 2018<sup>4</sup>. A survey conducted by Wijianto et al in 2010 showed that the percentage of pregnant women who experienced nutritional anemia was 21.4% (3 out of 7 pregnant women), 16.1% at risk of CED and 10.7% of underweight at 10 stunting loci in Banggai District<sup>5</sup>.

Pregnant women who experience iron deficiency anemia are associated with adverse reproductive outcomes such as premature birth, low birth weight babies, and reduced iron reserves for the baby, which can lead to impaired child development and intelligence. Failure to decrease the incidence of anemia can result in impaired health and quality of life among millions of women, and can further disrupt children's development and learning. Anemia is an indicator of poor nutrition and poor health<sup>3</sup>. A previous study conducted by Lalusu et al in 2018 showed that 55 of 187 teenagers studied (29%) had anemia. Teenagers with anemia were mostly had poor nutritional status by 89%, while 11% had good nutritional status<sup>6</sup>.

The diet of most women of childbearing age in Indonesia is still relatively poor, especially in terms of vegetable and fruit consumption. Almost the entire Indonesian population aged 15 years and over does not consume sufficient vegetables and fruit. 2018 Basic Health Research (RKD) showed that the proportion of vegetable and fruit consumption of less than 5 portions per day among residents  $\geq 15$  years increased from 93.5% in 2013 to 95.5% in 2018<sup>4</sup>. Adolescent health survey in Luwuk City, Banggai District revealed that fruit consumption, vegetable consumption, breakfast and the habit of bringing food to school were still low among teenagers (22-66%). On the

other hand, there were still teenagers who consumed fast food and carbonated drinks (20-33%)<sup>6</sup>. Teenagers are the forerunners of couples of childbearing age, especially teenage girls who will become pregnant mothers in the future.

Women living in developing or low-income countries are most vulnerable to malnutrition. The need for nutritious food during pregnancy has not become a priority need in the family. Therefore, when pregnant women do not have access to nutritious food, the risk of pregnancy complications and the health of the fetus and baby in the future will increase. In addition, dietary factors alone are not enough to meet the body's vitamin and mineral needs, especially micronutrient needs. Thus, the use of supplements is expected to reduce the risk of inadequate intake of various micronutrients.

Currently, the nutritional intervention is still provided in the form of iron folate supplements which are aimed at anticipating problems with anemia and fetal growth and development during pregnancy since anemia is still a crucial problem for pregnant women. The incidence of anemia from year to year does not show a significant decrease. Meanwhile, pregnant women also need other micronutrient components in the form of vitamins and minerals which are expected to prevent anemia and various health problems during pregnancy. A previous study conducted by Siregar et al. in 2020 proved that there was an effect of consuming Ambon bananas on the increase in Hb levels among pregnant women with anemia. It is known that Ambon bananas are rich in vitamins B6 and B12 which are needed in hemoglobin synthesis<sup>7</sup>. Therefore, iron/folate supplements to pregnant women should be added by other micronutrient supplementation. Combining these micronutrients into one supplement would be efficient. Multiple Micronutrient (MMN) supplements are one of the global strategies recommended by the United Nations International Childhood Emergency Fund (UNICEF) to prevent micronutrient deficiencies. A study conducted by Mashalina in 2012 revealed that apart from containing iron, MMN also contains 15 types of vitamins and minerals which are very important for pregnant women<sup>8</sup>.

This study aims to determine the effect of multi-micronutrient supplements on the hemoglobin levels among pregnant women in Banggai District. The study analyzed the differences in mean hemoglobin levels at the

12<sup>th</sup> week of pregnancy and the 24<sup>th</sup> week of pregnancy between pregnant women who consumed multi-micronutrient supplements and pregnant women who consumed Fe+folate; and analyzed differences in mean hemoglobin levels among pregnant women who consumed multi-micronutrient supplements and Fe+folate at the 24<sup>th</sup> week of pregnancy.

## METHOD

This was a quasi-experiment with a non-randomized community trial design and pre and post-test control group. The study was conducted in Banggai District in the work areas of 4 Community Health Centers, namely Kampung Baru, Simpong, Biak and Nambo in 2020. The number of samples involved in this study was 48 pregnant women, who were assigned in the intervention and control groups consisted of 24 pregnant women, respectively. The intervention group involved pregnant women who were administered with Multiple Micronutrient (MMN) supplements with composition based on the United Nations International Multiple Micronutrient Antenatal Preparation (UNIMMAP) formula by Unicef-WHO-UN which contained 15 vitamins and minerals. Meanwhile, the control group was administered with Fe+Folate supplements (in accordance with the current health program for pregnant women).

The intervention in this study was carried out in a single blind manner with the aim of preventing response bias. Respondents in both groups did not know the difference in the interventions provided. The Fe+Folate supplement, which was originally in tablet form, is packaged in capsule form that resembles MMN (the packaging process was carried out by pharmacists).

The current study was conducted with strict assistance to ensure consumption compliance. Intervention and compliance monitoring were carried out every 14 days. The accompanying staff provided notifications via electronic messages to remind respondents of their compliance in consuming supplements every day.

Hemoglobin levels were assessed at the

12<sup>th</sup> and 24<sup>th</sup> week of pregnancy. Various characteristics such as age, occupation, education, physical activity, body mass index (BMI), intake of iron and vitamin C from food were assessed at study baseline. Assessment of hemoglobin levels used the Hemocue Hb 201 device. Iron and vitamin C intake from food was assessed through interviews using the Semi Quantitative-Food Frequency Questionnaire (SQ-FFQ). Furthermore, assessment of nutritional status (BMI) used the Anthropometric Kit. The researchers standardized the instruments and anthropometric skills of the measuring staff before conducting the study. Before interview regarding food intake, the researchers and research assistants got training. Analysis of nutritional intake was performed by trained nutrition staff using the nutrisurvey application. Sampling and analysis of hemoglobin levels were carried out by trained personnel using standardized methods and tools.

Data analysis was performed based on type, data measurement scale and data distribution. In general, data analysis applied the chi-square test, independent t test and dependent t test and non-parametric test. This study has obtained ethical approval from the Ethics Commission of the Faculty of Public Health, University of Indonesia.

## RESULTS

Before providing intervention, a comparative analysis of the initial (baseline) characteristics in the two groups was first carried out. At the baseline, various characteristics of respondents were assessed, namely demographic characteristics (age, occupation, education), BMI and physical activity. Data were collected from 48 pregnant women from two subject groups (pregnant women who consumed MMN and pregnant women who consumed Fe+folate).

The mean age of pregnant women was 30.2 years. The youngest age of respondents was 20 years and the oldest age was 39 years. Most of respondents were housewives and had a high level of education (senior high school and college).

**Table 1. Comparison of Demographic Characteristics, BMI and Physical Activity By Intervention Group at the Study Baseline**

Characteristic of Respondents	MMN n(/%)	Fe+folate n(/%)	Total n(/%)	p-Value
<b>Age Category*</b>				
<20	0 (0.0)	0 (0.0)	0 (0.0)	0.739
20-35	19 (52.8)	17 (47.2)	36 (75.0)	
>35	5 (41.7)	7 (58.3)	12 (25.0)	
<b>Occupation**</b>				
Civil Servant/TNI/Police	2 (50.0)	2 (50.0)	4 (8.4)	0.082
Private	6 (85.7)	1 (14.3)	7 (14.6)	
Entrepreneur/Merchant/Service	0 (0.0)	3 (100.0)	3 (6.2)	
Housewife	16 (47.1)	18 (52.9)	34 (70.8)	
<b>Education **</b>				
No formal education	1 (100.0)	0 (0.0)	1 (2.1)	0.376
Elementary	3 (75.0)	1 (25.0)	4 (8.3)	
JHS	1 (50.0)	1 (50.0)	2 (4.2)	
SHS	7 (35.0)	13 (65.0)	20 (41.7)	
Diploma/Bachelor/Master	12 (57.1)	9 (41.9)	21 (43.8)	
<b>BMI **</b>				
<18.5 (Underweight)	1 (50.0)	1 (50.0)	2 (4.2)	1.000
≥18.5-<25 (Normal)	14 (50.0)	14 (50.0)	28 (58.3)	
≥25-27 (Overweight)	9 (50.0)	9 (50.0)	18 (37.5)	
<b>Physical Activity*</b>				
High(MET>3000)	11 (50.0)	11 (50.0)	22 (45.8)	0.273
Moderate(MET600-3000)	7 (70.0)	3 (30.0)	10 (20.8)	
Low(MET<600)	6 (37.5)	10 (62.5)	16 (33.3)	

\*) Data were analyzed using the chi-square test.

\*\*) Data were analyzed using non-parametric statistical test

The mean body mass index (BMI) indicated normal nutritional status with a fairly wide range. The lowest BMI was 17kg/m<sup>2</sup> (underweight) and the highest BMI was 27kg/m<sup>2</sup> (overweight/obese).

The respondents' physical activity at the baseline of the study was classified as heavy in

both groups. However, it is also necessary to consider the fairly wide interval in physical activity scores in these two groups. There were no significant differences in iron and vitamin C intake variables between the two study groups. The hemoglobin levels before the intervention in both groups were normal with a mean of 11.6 g/dl.

**Table 2. Comparison of Age, BMI, Physical Activity, Food Intake and Hemoglobin Levels by Intervention Group at the Study Baseline**

Variable	MMN n(/%)	Fe+folate n(/%)	Total	p-Value
Age at time of study *	29.7 (20-38)	30.7 (23-39)	30.2 (20-39)	0.508
BMI *	23.5 (18-27)	23.9 (17-27)	23.7 (17-27)	0.529
Physical Activity Score *	3815.5 (120-12320)	2410.0 (120-6760)	311.7 (120-12320)	0.509
Iron Intake**	53.3 (13.78-95.0)	56,94 (13,78-300.63)	55.13 (13.78-300.63)	0.445
Vitamin C Intake **	163.2 (22.7-403.3)	184,22 (35.6-466.1)	173.76 (22.7-466.18)	0.734
Hemoglobin *	11.7 (9.9-14.0)	11,4 (8.2-14.3)	11.6 (8.2-14.3)	0.509

\*) Data were analyzed using the chi-square test.

\*\*) Data were analyzed using non-parametric statistical test

However, there were still some respondents with low hemoglobin levels. Based on comparative analysis, there were no differences in characteristics between the two study groups at the study baseline (p-value >0.05).

**Table 3. Percentage of Compliance with Supplement Consumption by Study Group**

Intervention Group	Mean (SD)	p*
Pregnant Women who were administered with MMN	85.9 (13.9)	0.607
Pregnant Women who were administered with Fe+Folat	86.5 (11.1)	

*\*) Data were analyzed using t-test.*

Furthermore, the level of compliance with supplement consumption in the two groups was also evaluated. The results of the analysis showed that a percentage of compliance in both groups of >85%. Based on independent t test analysis, there was no significant difference in the percentage of compliance between the two groups.

The mean hemoglobin levels in both groups decreased during the second trimester of pregnancy. In the group of pregnant women consuming MMN, the mean hemoglobin level in the 12<sup>th</sup> week of pregnancy was 11.7 g/dL (minimum Hb level was 9.9 g/dL and maximum Hb level was 14.0 g/dL). Such finding indicated a normal condition (non-anemic) of pregnant women. However, there were respondents with Hb levels of <11 g/dl (had anemia). No analysis was performed on the number of respondents who experienced anemia at the initial stage of the study (12<sup>th</sup> week of pregnancy).

**Table 3. Differences in Mean Hemoglobin Levels During Pregnancy (12<sup>th</sup> week and 24<sup>th</sup> week) in both groups**

Intervention Group	Time of Examination	Mean (min-max)	P *
Pregnant Women who were administered with MMN	12 <sup>th</sup> week	11.7 (9.9-14.0)	0.143
	24 <sup>th</sup> week	11.4 (8.9-13.3)	
Pregnant Women who were administered with MMN	12 <sup>th</sup> week	11,4 (8.2-14.3)	0.408
	24 <sup>th</sup> week	11.3 (9.3-13.3)	

*\*) Data were analyzed using t-test.*

The mean Hb level at the 24<sup>th</sup> week

decreased to 11.4 g/dL (minimum Hb level was 8.9 g/dL and maximum Hb level was 13.3 g/dL). It can be seen that there were respondents who had quite low hemoglobin level by 8.9 g/dl. However, such decrease in Hb level was not statistically significant (p-Value> 0.05). In the group of pregnant women who consumed Fe+Folate, the mean Hb level at the 12<sup>th</sup> week of pregnancy was 11.4 g/dL (minimum Hb level was 8.2 g/dL and maximum Hb level was 14.3 g/dL). Such finding indicated that most of pregnant women had a normal Hb level of >11 g/dl. However, there were respondents in this group who experienced moderate anemia (Hb level of 8.2 g/dl) in the first trimester of pregnancy. No analysis was performed on the number of respondents who experienced anemia.

**Table 4. Differences in Mean Hemoglobin Levels at the 24<sup>th</sup> Week of Pregnancy between the Intervention Groups**

Intervention Group	Mean (min-max)	p*
Pregnant Women who were administered with MMN	11.4 (8.9-13.3)	0.415
Pregnant Women who were administered with Fe+Folat	11.3 (9.3-13.3)	

*\*) Data were analyzed using t-test.*

At the 24<sup>th</sup> week of pregnancy, the mean Hb level decreased to 11.3 g/dL (minimum Hb level was 9.3 g/dL and maximum Hb level was 13.3 g/dL). Although there was a decline in the group, individually there were several respondents who experienced an increase in hemoglobin levels. Based on comparative analysis, the difference in mean hemoglobin levels was not statistically significant (p-Value >0.05).

At the end of the second trimester, the mean hemoglobin level of pregnant women who consumed MMN was higher than those who consumed Fe+Folate. However, such difference was not statistically significant (p-Value >0.05). In the group of pregnant women who consumed MMN, there were respondents with Hb levels that were much lower than in the group of pregnant women who consumed Fe+Folate. On the other hand, in this group there were also

respondents with Hb levels that were higher than the highest Hb levels in the group of pregnant women who consumed Fe+Folate. Such finding showed a fairly high interval estimate of hemoglobin levels in the group of pregnant women who consumed MMN.

## DISCUSSION

This was a non-randomized controlled quasi-experimental study. Compared to quasi-experimental without a control group or observational study, this type of study is superior and more convincing in studying the effect of the independent variable on the dependent variable.

Based on the results of this study, the mean hemoglobin levels of pregnant women in both study groups decreased during the second trimester. However, the difference was not statistically significant ( $p>0.05$ ). In theory, micronutrient supplementation is effective in increasing the hemoglobin levels of pregnant women as found in a study conducted by Royani, (2013)<sup>9</sup>. Likewise, a study conducted by Sosiloningtyas in 2012 showed that administration of Fe+folate tablets per day to pregnant women for 13 weeks could reduce anemia rates and increase pregnant women's iron level.

A decrease in hemoglobin levels found in this study could be due to several factors during pregnancy<sup>10</sup>. Iron deficiency often occurs during pregnancy since iron requirement increases twice the requirement before pregnancy. This happens because the blood volume increases by up to 50% during pregnancy and causes hemodilution which is commonly known as physiological anemia in pregnancy which often occurs at 24-32 weeks of pregnancy. The increase in total blood volume begins early in the first trimester and then increases rapidly until mid-pregnancy<sup>11</sup>. At the beginning of pregnancy in the first trimester, pregnant women usually experience excessive hyperemesis. Excessive hyperemesis can affect hemoglobin levels<sup>12</sup>. Mothers with higher grade hyperemesis gravidarum tend to have more severe anemia<sup>13</sup>. Hyperemesis that occurs continuously can cause dehydration due to lack of fluid consumed and loss of fluid due to vomiting. As a result, extracellular fluid and plasma are reduced so that the volume of fluid in the blood vessels as well as blood flow to the tissues decrease. Such condition further lead to a decrease in the amount of food substances

(nutrients) including iron and oxygen to be delivered to the tissues. So, even though multimicronutrient supplements are given, it is not optimal for producing red blood cells and may cause a decrease in hemoglobin levels (anemia).

It is expected that providing multi-micronutrients based on UNIMMAP formula can anticipate the problems mentioned above. MMN not only contains iron but also contains 15 types of vitamins and minerals which are very important for pregnant women and also help the absorption of nutrients. Although multi-micronutrient supplements only contain 30 mg of iron (lower than the iron content in the Fe+Folate formula), they have various advantages and have gone through various clinical trials regarding their positive and negative impacts on health. Various studies revealed that the absorption level of the ferrous form of iron ( $Fe^{++}$ ) used in this formula was higher than the ferric form ( $Fe^{+++}$ ); Iron absorption in multi-micronutrient supplement formulations was higher (compared to Fe+Folate) due to the presence of Vitamin C, vitamin A, and riboflavin; The addition of 60 mg of iron should be accompanied by at least 30 mg of zinc to avoid possible negative effects on iron absorption; the addition of iron could increase the total amount of metal, which could increase negative side effects; Lower iron content sufficient if consumed regularly, as it could reduce certain side effects (eg, constipation); Excessive iron level would increase susceptibility to some infections; Almost all pregnant women experienced mild or moderate anemia, which can be treated with 30 mg of iron<sup>14</sup>.

In this study, the mean hemoglobin level in the group of pregnant women who consumed MMN was higher than the group of pregnant women who consumed Fe+folate. The difference in the mean hemoglobin levels between the Multiple Micronutrient and Iron Folate groups was 0.1 g/dL, which was not statistically significant. Likewise, a study conducted by Monoarfa in 2018 showed that the mean hemoglobin levels in the Multiple Micronutrient group was higher than those in the Iron Folate group, but this difference was not statistically significant ( $p=0.994$ )<sup>15</sup>. The difference in the mean hemoglobin levels between the Multiple Micronutrient and Iron Folate groups was 0.2 g/dL<sup>15</sup>. This little difference could be due to initially normal Hb

levels of women who consumed multi-micronutrient supplements before the intervention. Thus, when the intervention was performed, the mean hemoglobin level remained the same and could decrease due to hemodilution.

The provision of nutritional supplements will be more effective if given to groups experiencing health problems related to the deficiency of those nutrients. An intervention study on micro-nutrients and DNA damage yielded varied results, influenced by factors such as nutritional status and health at the time of administration<sup>16</sup>. A systematic review conducted by Keats, et al in 2019 indicated a decreased risk of giving birth to underweight babies, with a reduction of up to 19% in mothers with anemia, 12% in underweight mothers, and a decrease of 16% in mothers with insufficient weight during pregnancy<sup>17</sup>. This study did not conduct a stratified analysis based on anemia status, health conditions, and other characteristics of pregnant women theoretically linked to changes in hemoglobin levels during pregnancy.

Insufficient iron intake in the body can also be caused by factors inhibiting iron absorption, such as the habit of drinking tea while eating<sup>18-20</sup>. According to Proverawati (2013), drinking tea at least an hour before or after eating will reduce the absorption capacity of blood cells for iron by 64%<sup>21</sup>. The reduction in absorption capacity caused by tea is higher than the effect caused by drinking a glass of coffee after eating, wherein coffee only reduces absorption capacity by 39%. The reduction in iron absorption is caused by the tannin content in tea which binds minerals<sup>21</sup>. In this study, it was found that the majority of respondents had the habit of consuming tea. However, the researchers did not ask about the time of tea consumption.

Apart from Banggai District, large multi-micronutrient supplementation trials or projects have been conducted in various countries and in Indonesia since 1990 (approximately 23 decades). Therefore, the efficacy and effectiveness of multi-micronutrients in treating anemia and various health problems of pregnant women and babies has been tested in various studies. Furthermore, 12 efficacy trials and 6 effectiveness trials were conducted by UNICEF in 12 countries covering 3 continents (Asia, Africa and America) with the aim of improving micronutrient status,

gestational age at birth and reducing the rates of stillbirths and neonatal deaths<sup>22</sup>. A systematic review and meta-analysis confirmed the effect of multi-micronutrient administration in reducing the risk of low birth weight, premature birth, and preterm pregnancy. A Cochrane review conducted by Keats et al. in 2019 identified 20 trials (141,849 women) which concluded that, compared with iron supplementation with or without folic acid, daily multi-micronutrient supplementation during pregnancy could reduce the risk of low birth weight and preterm pregnancy in low and middle income countries. Likewise, deaths at birth and neonatal deaths were slightly lower in the MMN group<sup>16</sup>. Moreover, a meta-analysis conducted by Smith et al. in 2017 consisted of 17 randomized trials in low and middle-income countries also found greater survival effects and birth outcomes from micronutrient supplementation with high adherence ( $\geq 95\%$ ) to supplementation<sup>23</sup>. This meta-analysis showed a subgroup of pregnant women who might experience greater benefits from antenatal multiple micronutrient supplementation compared with folic acid supplementation alone. Among anemic women, multiple micronutrient supplementation resulted in greater reduction in the risk of low birth weight (-19%), non-term pregnancy (-8%), and death of infants aged 6 months (-29%) compared to non-anemic women anemia. Among underweight women (BMI <18.5 kg/m<sup>2</sup>), multiple micronutrient supplementation reduced the risk of preterm birth by 16%. Furthermore, initiation of multiple micronutrient supplementation before 20 weeks gestation reduced the risk of preterm birth (11%) and high compliance ( $\geq 95\%$ ) reduced the risk of infant death (-15%)<sup>23</sup>.

There were several limitations that might cause bias in this study. This study did not apply a randomization procedure in allocating subjects to each group. This could lead to subject selection bias, thus influencing the generalization of study results. In addition, the number of samples in this study was not calculated based on differences in proportions or differences in mean hemoglobin levels between the group of women who consumed MMN and Fe+Folate, thereby reducing research power and external validity. In addition, data analysis section did not analyze differences in hemoglobin levels between the

two groups by anemia status at the baseline of the study and various characteristics that are theoretically related to hemoglobin levels of pregnant women which might have a modifying effect of MMN consumption on hemoglobin levels of pregnant women.

## CONCLUSIONS

The mean hemoglobin levels of pregnant women in both study groups decreased during the second trimester. During the second trimester of pregnancy, the mean hemoglobin level in the intervention group who were given MMN decreased by 0.3 g/dl (p-value=0.143) and in the control group who were given Fe+Folate decreased by 0.1 g/dl (p-value=0.408). The difference in the decrease was not statistically significant. At the 24th week of pregnancy, the mean hemoglobin level of pregnant women who were given MMN was 0.1 g/dl higher than those who were given Fe+Folate. Such difference was not statistically significant (p-value=0.415).

There is a need to conduct further study to strengthen the evidence on the effect of MMN administration since early pregnancy and during the preconception period on hemoglobin levels. The further experimental study should apply a randomization procedure in subject allocation with an appropriate sample size to ensure external validity. Further study is recommended to determine the effect of MMN and Fe+Folate on hemoglobin levels by considering anemia status, characteristics of pregnant women and other health status before intervention is carried out.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Original Article

## ***The Influence of Electrode Plate Area in Reducing Turbidity and Color Levels in Peat Water***

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### **ABSTRACT**

*Peat water generally exhibits characteristics ranging from dark brown to black, with high organic content and a pH range between 3.7 and 5.3. These features pose challenges in meeting clean water quality standards, essential for maintaining human health. Consequently, the treatment of peat water becomes a pressing need to enhance its quality for suitable use. Electrocoagulation has emerged as a widely applied method in peat water treatment. This research aims to evaluate the influence of electrode plate area and contact time in reducing turbidity and color in peat water. The research methodology employed a quasi-experimental design known as the One-Group Pretest-Posttest. Thirty test samples were collected with variations in electrode plate areas of 4 x 30 cm, 5 x 30 cm, and 6 x 30 cm. Contact time was varied within the range of 30, 60, 90, 120, and 150 minutes, applying a voltage of 48 volts. The results indicated fluctuations in the increase of turbidity in peat water after the electrocoagulation treatment. A plate area of 6 x 30 cm led to a turbidity increase of 27.33 NTU or approximately 83% after a contact time of 150 minutes. Meanwhile, the color level in peat water decreased by 65 TCU with a 5 x 30 cm electrode plate area after 150 minutes of contact time, achieving an effectiveness of 90% in color reduction. In conclusion, the electrode plate area significantly influences the reduction of turbidity and color in peat water. Although there is no discernible effect of contact time on turbidity levels, prolonged contact time has a significant impact on reducing the color level in peat water.*

**Keywords:** Peat Water, Electrocoagulation, Plate Area, Turbidity, Color

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## **INTRODUCTION**

Water is a crucial natural resource for the survival of living beings on Earth and plays a vital role in various aspects of human life<sup>1</sup>. The use of water in daily activities such as eating, cooking, bathing, washing, and others indicates that water is not only a consumption necessity but also supports individual hygiene and sanitation<sup>2</sup>. However, rapid population growth and the passage of time have made the provision of clean water increasingly challenging.

According to Lestari et al. (2021), the minimum water requirement for hygiene and sanitation purposes in a household is around 50 liters per individual per day<sup>3</sup>. In Indonesia, particularly in West Kalimantan, the provision of clean water still faces disparities. Areas not covered by clean water services generally rely on water sources such as dug wells or river water, which may not always meet cleanliness standards. This is particularly true in peat swamp areas where peat water is commonly used for various purposes, including sanitation, even though its quality often fails to meet requirements<sup>2</sup>.

According to Putra et al. (2022), Indonesia has extensive peatland potential, especially in Kalimantan, Sumatra, and Papua<sup>4</sup>. The peatland area in West Kalimantan, specifically in Kuburaya and Pontianak, reaches 354,474 hectares or 33% of the total peatland area in West Kalimantan<sup>5</sup>. The distribution of this extensive peatland area results in abundant peat water in West Kalimantan, especially in Pontianak.

Characteristics of peat water in West Kalimantan, including Pontianak, encompass low turbidity, dark brown to black color, high organic content, and a pH range of 3.7 to 5.3<sup>6</sup>. In Pontianak and Kuburaya, physical parameters of peat water include acidity levels (pH) between 4 and 5.7, conductivity ranging from approximately 1.31  $\mu\text{S}/\text{cm}$  to 82.2  $\mu\text{S}/\text{cm}$ , and turbidity ranging from 1.31  $\mu\text{S}/\text{cm}$  to 82.2  $\mu\text{S}/\text{cm}$ , with all peat water being brown in color. Chemical parameters involve organic substance content ranging from approximately 11 mg/L to 16 mg/L, iron content from around 2 mg/L to 5 mg/L, and total hardness from about 590 mg/L to 1302 mg/L<sup>7</sup>.

However, challenges in meeting clean water needs in West Kalimantan persist. Data from the Central Statistics Agency (2020) shows that the volume of clean water distributed by the Clean Water Company of West Kalimantan Province continues to increase but still falls short of requirements<sup>8</sup>. Additionally, the use of rainwater as an alternative source of clean water is hindered by climate change, leading to droughts during the dry season<sup>9</sup>.

In this context, communities often rely on peat water to meet sanitation needs. However, peat water does not meet the standard quality as clean water, as regulated by the Ministry of Health of the Republic of Indonesia No. 32 of 2017<sup>10</sup>. Previous research by Apriana (2022) indicates that peat water in Parit Nanas Siantan Hulu, North Pontianak, exceeds the standard limits for turbidity and color<sup>11</sup>.

Water that does not meet quality standards can have negative impacts on public health, causing waterborne diseases such as diarrhea, cholera, dysentery, and typhoid<sup>12</sup>. In the context of peat water, dental erosion due to low pH effects is also one of the health impacts that may arise<sup>13</sup>.

Lack of disinfection effectiveness is also a serious problem because peat water characteristics such as turbidity, color, and odor can protect microorganisms from disinfection

efforts<sup>14</sup>. Data on diarrhea cases in Pontianak City shows that North Pontianak has the highest contribution to the number of diarrhea cases in 2018, 2019, and 2020<sup>15</sup>.

Therefore, efforts are needed to treat peat water to meet quality standards as clean water. Electrocoagulation methods are promising approaches. This process combines electrochemical and flocculation-coagulation aspects to produce easily separable clumps<sup>16</sup>. Several previous studies Putra et al., (2022); Apriana, (2022); Lavianiga et al., (2019), have shown that electrocoagulation, especially using aluminum electrodes, can effectively reduce turbidity, color, and iron content in peat water<sup>4,11,17</sup>.

Although previous research has provided a good understanding of the potential of electrocoagulation, further research is needed to understand the influence of electrode plate area in the peat water treatment process. This research will use aluminum electrodes with variations in plate area (4 x 30 cm, 5 x 30 cm, and 6 x 30 cm) to evaluate the efficiency of peat water treatment in reducing turbidity and color without adding coagulant or supporting electrolyte. In addition, variations in contact time (30 minutes, 60 minutes, 90 minutes, 120 minutes, and 150 minutes) will also be tested to determine the optimal conditions in the electrocoagulation process. Thus, this research is expected to make a significant contribution to the development of more effective and efficient peat water treatment technology to meet clean water quality standards. This research aims to investigate the influence of electrode plate area and contact time in reducing turbidity and color in peat water.

## METHOD

This study is a type of quantitative research using a quasi-experimental method with a One-Group Pretest-Posttest research design. This design involves administering treatment after conducting a pretest, followed by a posttest to compare the results with the conditions before treatment<sup>18</sup>. The research was conducted from November to June 2023 at the Integrated Laboratory of the Ministry of Health Polytechnic Pontianak. The research sample is peat water taken from Parit Nanas street, Siantan Hulu, North Pontianak.

The research population is peat water

on Jalan Parit Nanas Siantan Hulu, North Pontianak, and the number of samples used is 30 samples for turbidity and 30 samples for color. Sample collection was carried out using predetermined procedures.

In the analysis stage, tests for turbidity and color of peat water were conducted with variations in the electrode plate sizes, namely 4 x 30 cm, 5 x 30 cm, and 6 x 30 cm. The obtained data were then statistically tested using the Paired Sample T-Test to compare the results before and after treatment with the electrocoagulation method. Conclusions were drawn based on the p-value, where  $p \leq 0.05$  indicates that the alternative hypothesis ( $H_a$ ) is accepted, while if  $p > 0.05$ ,  $H_a$  is rejected.

Furthermore, to evaluate the influence of plate area, direct current, and contact time, a Two-Way ANOVA test was conducted. Prior to this, tests for Normality and Homogeneity assumptions were performed to ensure that the data met the analysis requirements. Conclusions were made by comparing the p-values from the Two-Way ANOVA, where  $p < 0.05$  indicates a

difference in the influence of plate area on turbidity and color when treated with direct current, while if  $p > 0.05$ , there is no difference.

The results of the turbidity and color analysis were then compared with the standards set by the Ministry of Health of the Republic of Indonesia No. 32 of 2017 to assess the water quality resulting from the experiment.

## RESULTS

The peat water used in this research is river water located in Jalan Parit Nanas, Siantan Hulu Village, North Pontianak District. Based on the results of preliminary tests conducted by previous researchers Apriana, (2022) obtained turbidity levels, namely turbidity levels of 972 NTU and color levels of 1746 TCU. The turbidity level allowed according to Permenkes Number 32 of 2017 is 25 NTU and for color levels which is 50 TCU. So it can be seen that the turbidity and color levels of peat water on Parit Nanas street, exceed the quality standard.

**Table 1. Initial Data of Turbidity Levels Before and After Processing Electrocoagulation Method Electrode Area 4 x 30 cm, 5 x 30 cm and 6 x 30 cm**

Repetition	Turbidity Level (NTU)									
	X					Y				
	30	60	90	120	150	30	60	90	120	150
<b>Electrode Area 4 x 30 cm</b>										
1	5,65	5,47	5,38	4,97	4,76	15,21	12,84	13,35	12,42	14,42
2	4,21	4,43	4,88	4,65	4,68	14,41	12,58	11,58	13,86	12,50
Average	4,93	4,95	5,13	4,81	4,72	14,81	12,71	12,46	13,14	13,46
<b>Electrode Area 5 x 30 cm</b>										
1	5,40	6,09	5,96	4,58	5,10	20,25	18,05	17,44	18,10	17,24
2	4,57	4,60	4,72	4,78	4,25	21,14	19,48	16,20	17,53	17,92
Average	4,98	5,34	5,34	4,68	4,67	20,69	18,76	16,82	17,81	17,58
<b>Electrode Area 6 x 30 cm</b>										
1	4,55	5,38	4,80	4,30	4,80	24,17	23,15	21,25	26,87	28,90
2	4,33	4,26	4,85	4,85	4,50	27,05	22,12	21,79	20,27	25,77
Average	4,44	4,82	4,83	4,57	4,65	25,61	22,63	21,52	23,57	27,33

Source: Primary Data 2023

Table description:

X = Before Processing

Y = After Processing

Based on the measurement results in table 1 with the 4x30 cm Electrode Area electrocoagulation method shows a fluctuating increase, the least increase occurs at a contact time of 90 minutes which is 12.46 NTU. For measurements on the 5x30 cm Electrode Area electrocoagulation method, Table 1 above

shows a fluctuating increase, the least increase occurred at a contact time of 90 minutes, which amounted to 16.82 NTU. In Table 1 with the 6x30 cm Electrode Area electrocoagulation method also shows a fluctuating increase, the least increase occurs at a contact time of 90 minutes, which is 21.52 NTU.

**Table 2. Initial Data of Color Levels Before and After Treatment Electrocoagulation Method Electrode Area 4 x 30 cm, 5 x 30 cm and 6 x 30 cm**

Repetition	Color Levels (NTU)									
	X					Y				
	30	60	90	120	150	30	60	90	120	150
<b>Electrode Area 6 x 30 cm</b>										
1	610	660	650	690	670	550	650	490	320	220
2	670	680	650	670	640	690	540	400	280	150
Average	640	670	650	680	655	620	595	445	300	185
<b>Electrode Area 5 x 30 cm</b>										
1	670	640	650	680	690	480	300	180	100	80
2	700	670	670	660	620	560	180	200	150	50
Average	685	655	660	670	655	520	240	190	125	65
<b>Electrode Area 6 x 30 cm</b>										
1	610	620	650	720	670	570	490	350	250	150
2	660	670	650	640	630	500	600	320	390	110
Average	635	645	650	680	650	535	545	335	320	125

Source: Primary Data 2023

Table description:

X = Before Processing

Y = After Processing

Based on the measurement results on Electrocoagulation Method Processing Electrode Area 4 x 30 cm table 2 above shows a continuous decrease, the most decrease occurs at a contact time of 150 minutes which is 185 TCU. The measurement results on Electrocoagulation Method Processing Electrode Area 5 x 30 cm table 2 above

shows a continuous decrease, the most decrease occurs at a contact time of 150 minutes which is 65 TCU. In Processing Electrocoagulation Method Electrode Area 6 x 30 cm table 2 above shows a continuous decrease, the most decrease occurs at a contact time of 150 minutes which is 125 TCU.

**Table 3. Preliminary data on acidity (pH) before and after treatment Electrocoagulation Method Electrode Area 4 x 30 cm, 5 X 30 cm and 6 x 30 cm**

Repetition	Degree of acidity (pH) (NTU)									
	X					Y				
	30	60	90	120	150	30	60	90	120	150
<b>Electrode Area 4 x 30 cm</b>										
1	5	5	5	5	5	6	6	6	6	6
2	5	5	5	5	5	6	6	6	6	6
Average	5	5	5	5	5	6	6	6	6	6
<b>Electrode Area 5 x 30 cm</b>										
1	5	5	5	5	5	6	6	6	6	6
2	5	5	5	5	5	6	6	6	6	6
Average	5	5	5	5	5	6	6	6	6	6
<b>Electrode Area 6 x 30 cm</b>										
1	5	5	5	5	5	6	6	6	6	6
2	5	5	5	5	5	6	6	6	6	6
Average	5	5	5	5	5	6	6	6	6	6

Source: Primary Data 2023

Table description:

X = Before Processing

Y = After Processing

Based on the measurement results in Table 3 above, the pH of peat water after processing increased by 6 for each contact time at a plate area of 4 x 30 cm. The measurement results on the pH of peat water after processing

increased by 6 for each contact time at a plate area of 5 x 30 cm. The 6 x 30 cm plate area also showed that the pH of the peat water increased by 6 for each contact time after treatment.

**Table 4. Initial Temperature Data Before and After Processing Electrocoagulation Method Electrode Area 4 x 30 cm, 5x30 cm, and 6x30 cm**

Repetition	Temperature (NTU)									
	X					Y				
	30	60	90	120	150	30	60	90	120	150
<b>Electrode Area 4 x 30 cm</b>										
1	27	27	27	27	27	28	28	28	28	28
2	27	27	27	27	27	28	28	28	28	28
Average	27	27	27	27	27	28	28	28	28	28
<b>Electrode Area 5 x 30 cm</b>										
1	27	27	27	27	27	28	28	28	28	28
2	27	27	27	27	27	28	28	28	28	28
Average	27	27	27	27	27	28	28	28	28	28
<b>Electrode Area 6 x 30 cm</b>										
1	27	27	27	27	27	28	28	28	28	28
2	27	27	27	27	27	28	28	28	28	28
Average	27	27	27	27	27	28	28	28	28	28

Source: Primary Data 2023

Table description:

X = Before Processing

Y = After Processing

Based on the measurement results in Table 4 above, the temperature of peat water after processing increased by 28 degrees for each contact time at a plate area of 4 x 30 cm. The 5 x 30 cm plate area also experienced an increase of 28 degrees for each contact time. The table above also shows that the temperature of peat water after treatment increased by 28 degrees for each contact time at a plate area of 6 x 30 cm.

Based on the table above, it shows that each of them has a p value > 0.05, so it is concluded that the data is normally distributed.

**Table 5. Results of Normality Test for variation of plate area and contact time on turbidity levels in peat water.**

Treatment group	Shapiro-Wilk		
	Statistic	df	Sig.
Before treatment 4x30 cm	0,904	10	0,240
Before treatment 5x30 cm	0,880	10	0,130
Before treatment 6x30 cm	0,904	10	0,244
After treatment 4x30 cm	0,892	10	0,179
After treatment 5x30 cm	0,924	10	0,389
After treatment 6x30 cm	0,947	10	0,636

**Table 6. Results of Analysis of Turbidity Difference with Electrode Plate Area 4 x 30 cm, 5x30 cm and 6x30 cm**

Variable	N	Mean	SD	Deviation (d)		Sig. (2-tailed)
				Mean	SD	
<b>Electrode Plate Area 4x30 cm</b>						
Color Content						
Before Treatment	10	5,07	0,32	-8,41	0,84	0,000
After Treatment	10	13,48	0,99			
<b>Electrode Plate Area 5x30 cm</b>						
Color Content						
Before Treatment	10	5,00	0,320	-13,33	1,673	0,000
After Treatment	10	18,33	0,996			
<b>Electrode Plate Area 6x30 cm</b>						
Color Content						
Before Treatment	10	4,66	0,320	-19,47	3,023	0,000
After Treatment	10	24,13	0,996			

Based on the table 6, the average turbidity level before treatment is and the average turbidity level after treatment is 5 NTU.

While the average difference in turbidity levels before and after treatment is 8.41 NTU. Statistically there is a significant difference in the average turbidity levels before and after treatment with an electrode plate area of 4 x 30 cm, the results of the analysis obtained p value = 0.000.

Based on the table 6, the average turbidity before treatment is 5 and the average turbidity level after treatment is 18.33 NTU. While the average difference in turbidity levels before and after treatment is 13.33 NTU. Statistically there is a significant difference in the average turbidity levels before and after treatment with an electrode plate area of 5 x 30 cm, the results of the analysis obtained p value = 0.000.

The average turbidity level before treatment is 4.66 and the average turbidity level after treatment is 24.13 NTU. While the average difference in turbidity levels before and after treatment is 19.47 NTU. Statistically there is a significant difference in the average turbidity levels before and after treatment with an electrode plate area of 6 x 30 cm, the analysis results obtained p value = 0.000.

**Table 7. Two Way Anova Test Results Turbidity Levels**

Indicators	Sig.
Plate Area	0,000
Contact Time	0,303

Based on table 7 regarding the parametric test using two way anova, it is found that on the plate area the p value = 0.000 means that there is an influence between the plate area and the turbidity level in peat water. In contact time, the value of p=0.303 means that there is no influence between contact time and turbidity levels in peat water.

**Table 8. Normality Test of Color Level**

Treatment group	Shapiro-Wilk		
	Statistic	df	Sig.
Before treatment 4x30 cm	0,934	10	0,493
Before treatment 5x30 cm	0,970	10	0,895
Before treatment 6x30 x cm	0,937	10	0,518

After treatment 4x30 cm	0,958	10	0,764
After treatment 5x30 cm	0,860	10	0,076
After treatment 6x30 cm	0,928	10	0,689

Based on the table 8, it shows that each obtained a p value > 0.05, so it is concluded that the data is normally distributed. Hypothesis analysis testing with parametric tests, namely the Paired Sample test.

**Table 9. Results of Color Difference Paired Sample T-Test Analysis with Electrode Plate Area 4 x 30 cm, 5X30 cm and 6x30 cm**

Variable	N	Mean	SD	Deviation (d)		Sig. (2-tailed)
				Mean	SD	
<b>Electrode Plate Area 4x30 cm</b>						
Color Content						
Before Treatment	10	659	22,828	230	186,90	0,004
After Treatment	10	429	183,81			
<b>Electrode Plate Area 5x30 cm</b>						
Color Content						
Before Treatment	10	665	23,68	437	162,27	0,000
After Treatment	10	228	170,08			
<b>Electrode Plate Area 6x30 cm</b>						
Color Content						
Before Treatment	10	652	31,1	279	180,64	0,001
After Treatment	10	373	169,2			

Based on the table 9, the average color level before treatment is 659 TCU and the average color level after treatment is 429 TCU. While the average difference in color levels before and after treatment is 230 TCU. Statistically there is a significant difference in the average color content before and after treatment with an electrode plate area of 4 x 30 cm, the analysis results obtained p value = 0.004.

The average color level before treatment is 665 TCU and the average color level after treatment is 228 TCU. While the average difference in color levels before and after treatment is 437 TCU. Statistically there is a significant difference in the average color content before and after treatment with an electrode plate area of 5 x 30 cm, the results of the analysis obtained p value = 0.000.

The average color level before

treatment is 652 TCU and the average color level after treatment is 373 TCU. While the average difference in color levels before and after treatment is 279 TCU. Statistically there is a significant difference in the average color content before and after treatment with an electrode plate area of 6 x 30 cm, the results of the analysis obtained p value = 0.001.

**Table 10. Two Way Anova Test results to see the color effect of plate area and contact time on peat water color content using the electrocoagulation method.**

Indicators	Sig.
Plate Area	0,000
Contact Time	0,000

Based on the results of the parametric test using two-way anova, it was found that on the plate area, the p value is 0.000, meaning that there is an influence between the plate area and the decrease in color levels in peat water, then on the contact time, the p value is 0.000, meaning that there is an influence between the contact time and the decrease in color levels in peat water.

## DISCUSSION

### Measurement of peat water turbidity levels before and after treatment of the electrode plate area.

Based on the measurement of the peat water turbidity level, in the treatment of the electrode plate area of 4 x 30 cm, the average value before processing at 30 minutes was 4.93 NTU, 60 minutes was 4.95 NTU, 90 minutes was 5.13 NTU, 120 minutes was 4.81 NTU and 150 minutes was 4.72 NTU. Then after processing, it was found that there was a fluctuating increase in the turbidity level of peat water where after being given a contact time of 30 minutes the turbidity level became 14.81 NTU, 60 minutes was 12.71 NTU, 90 minutes was 12.46 NTU, 120 minutes was 13.14 NTU and 150 minutes was 13.46 NTU.

In the measurement results for the treatment with an electrode plate area of 5 x 30 cm. The average result before processing at 30 minutes is 4.98 NTU, 60 minutes is 5.34 NTU, 90 minutes is 5.34 NTU, 120 minutes is 4.68 NTU and 150 minutes is 4.67 NTU. After processing, there was a fluctuating increase in turbidity levels where the contact time of 30 minutes was 20.69 NTU, 60 minutes was 18.76

NTU, 90 minutes was 16.82 NTU, 120 was 17.81 NTU and 150 minutes was 17.58 NTU.

With the treatment of the electrode plate area of 6 x 30 cm in measurements before processing, the average result at 30 minutes was 4.44 NTU, 60 minutes was 4.82 NTU, 90 minutes was 4.83 NTU, 120 minutes was 4.57 NTU and 150 minutes was 4.65 NTU. Then there was a fluctuating increase in the turbidity level of peat water. After processing, the average increase was obtained at a contact time of 30 minutes to 25.61 NTU, 60 minutes to 22.63 NTU, 90 minutes to 21.52 NTU, 120 minutes to 23.57 NTU and at a contact time of 150 minutes to 27.33 NTU.

The increase in turbidity with the treatment of the electrode plate area of 4 x 30 cm was greatest at a contact time of 30 minutes, which was 67% or 14.81 NTU and at a contact time of 90 minutes showed a decrease of 59% or 12.46 NTU and again showed an increase in turbidity value at a contact time of 120 minutes, which was 13.14 NTU. Furthermore, in the treatment of a plate area of 5 x 30 cm, there was an increase in turbidity of 75.5% or 14.81 NTU at a contact time of 30 minutes and at a contact time of 90 minutes a decrease of 68.5% or 16.82 NTU and then an increase again at a contact time of 120 minutes, namely 74% or 17.81 NTU. For the treatment with the electrode plate area, the largest increase was shown at a contact time of 30 minutes, which amounted to 82.5% or 25.61 NTU and at a contact time of 90 minutes showed a decrease to 77.5% or 22.63 NTU and again increased at a contact time of 120 minutes by 80% or 23.57 NTU.

The pH of the peat water before treatment was 5 degrees of acidity, while after treatment the pH of the peat water increased to 6 or 17% for each plate area and contact time. And the temperature of the peat water before treatment was 27oC while after treatment it became 28oC or 4% on each plate area and contact time. The increase in pH and temperature was caused by the electrocoagulation process.

According to Novianti & Tuhu, (2018) said that in the electrocoagulation process there are factors that can affect it, such as temperature, contact time, current strength, voltage and acidity (pH)<sup>19</sup>. In this study, the increase in turbidity levels can be influenced by the factor of current strength and voltage where the volt used is 48 volts. Based on the



information in the input tool produced is 110-220 v and 240 watts. Where in this strong current in the electrocoagulation process the current used is direct current, the magnitude of the current can cause the formation of hydroxide gas (H<sub>2</sub>) which occurs at the cathode which is too large and fast then can break the floc that has been formed. At a strong voltage, the current that produces chemical changes flows through the medium (metal or electrolyte) due to a potential difference, because the electrical resistance in the medium is greater than the metal. The increase in the larger plate area tends to have a higher turbidity number, this is likely due to the ability to produce hydroxide (H<sub>2</sub>) which is greater where the increase in turbidity levels is 82.5% or 25.61 NTU at a contact time of 30 minutes while at a smaller plate area at a contact time of 30 minutes the increase in turbidity is only 67% or 14.81 NTU. According to Rezagama & Notodarmojo (2012), the decomposition of metal compounds related to humic acid or humic acid contained in peat water, which was originally dissolved, into non-dissolved, is likely to cause an increase in turbidity<sup>20</sup>. Hanafi et al (2016) stated that the characteristics of peat water in West Kalimantan have high organic content, namely 138 - 1560 mg/l KMNO<sub>4</sub><sup>6</sup>. So that with the high organic content which then causes the breakdown of metal compounds due to direct electric current.

In this electrocoagulation process, oxidation and reduction processes occur where the anode will produce gas in the form of air bubbles and foam. Hasrianti & Nuraisa (2015) state that one of the substances that can cause turbidity in water is the presence of iron (Fe) in the water, then if this is related to the increase in peat water turbidity levels in this study, it is because the large voltage results in a strong current so that it produces more bubble formation reactions and reacts with iron (Fe) related to humus acid or organic substances in peat water to break down metal compounds so that this also causes the wider electrode plate to experience more turbidity than the other two electrode sizes<sup>21</sup>. Furthermore, the formation of particles resulting from the electrocoagulation process that will be fluttered to the surface has not settled completely so that it is carried away during the reading of the turbidity test sample.

Based on the results obtained regarding the contact time of the electrode plates, it can be seen that each variation of the plate area

increased at a contact time of 30 minutes, then decreased at a contact time of 90 minutes and increased again at a contact time of 120 minutes. The possibility of a large increase at the beginning of the contact time is due to the ability of the plates to produce reactions that can break the flocs due to the large amount of hydroxide (H<sub>2</sub>) produced, which is what causes the high turbidity levels in peat water. For a contact time of 120 - 150 minutes, it can be seen that the increase in this contact time can be due to the length of contact time causing saturation of the electrode plate so that it causes the ability to reduce turbidity levels in peat water. Syamsur et al (2018) that the longer contact time can cause the electrode to become saturated and the magnetic field that occurs is already small so that the electrocoagulation process is at a minimum, it is suspected that most of the turbidity is due to flocs that settle in the vessel or container<sup>22</sup>.

For this contact time, it can be seen that the 90-minute contact time is better because it shows a decrease in turbidity levels where the 4 x 30 cm plate area turbidity drops to 59%, the 5 x 30 cm plate area is 68.5% and the 6 x 30 cm plate area is 77.5%.

Based on this, it can be concluded that the wider the electrode plate can cause an increase in the turbidity level of peat water after treatment with the electrocoagulation method. The better contact time in reducing turbidity levels occurs at a contact time of 90 minutes.

### **Measurement of the color content of peat water before and after treatment of the electrode plate area.**

Furthermore, the results of the examination of the color content of peat water with the treatment of the electrode plate area measuring 4 x 30 cm, obtained the average value of the color content before treatment at 30 minutes, namely 640 TCU, 60 minutes 670 TCU, 90 minutes 650 TCU, 120 minutes 680 TCU and 150 minutes 655 TCU. While the average value of color levels that have been processed using the electrocoagulation method in the treatment of the electrode plate area of 4 x 30 cm, namely at a contact time of 30 minutes of 620 TCU, 60 minutes 595 TCU, 90 minutes 445 TCU, 120 minutes 300 TCU and at 150 minutes 185 TCU, it can be seen that there is a difference between the color levels before and after processing and there is a decrease in the color levels carried out processing from time to

time. In this 4 x 30 cm electrode plate area, it can be seen that the most optimum time in reducing the color level is 150 minutes with a color level of 185 TCU, meaning that there is a decrease of 72% from the average color level before processing.

In the examination of color levels on the electrode plate area of 5 x 30 cm, the average value at 30 minutes is 685 TCU, 60 minutes 655 TCU, 90 minutes 660 TCU, 120 minutes 670 TCU and 150 minutes 655 TCU. The average value of color content after processing was 520 TCU at 30 minutes of contact time, 240 TCU at 60 minutes, 190 TCU at 90 minutes, 125 TCU at 120 minutes and 65 TCU at 150 minutes. It can be seen that in the treatment of peat water with the electrocoagulation method in the treatment of the electrode plate area of 5 x 30 cm, there is a decrease from time to time and there is a decrease between the color level before treatment and the color level after treatment. From this decrease, it can be seen that the optimum time in reducing the color level is 150 minutes with a color level of 65 TCU, meaning that there is a decrease of 90% from the average color level before processing.

Furthermore, at an electrode plate area of 6 x 30 cm, the average value obtained before processing at a time of 30 minutes was 635 TCU, 60 minutes was 645 TCU, 90 minutes was 650 TCU, 120 minutes was 680 TCU and time 150 minutes was 650 TCU. While the results after processing with the electrocoagulation method in the treatment of the electrode plate area of 6 x 30 cm were produced at a contact time of 30 minutes of 535 TCU, 60 minutes of 545 TCU, 90 minutes of 335 TCU, 120 minutes of 320 TCU and 150 minutes of 125 TCU. It can be seen that there is a decrease in the color level between before processing and after processing. However, in the color content that has been processed there is a fluctuating decrease and increase, where there is an increase in the 60-minute contact time of 545 TCU on a 6 x 30 cm plate and decreases in the next minute. In the treatment with this electrode plate area, the optimum time in reducing color levels is 150 minutes, namely the resulting level of 125 TCU. There was a percentage decrease of 79%.

The pH of the peat water before treatment was 5 degrees of acidity, while after treatment the pH of the peat water increased to 6 or by 17% for each plate area and contact time. And the temperature of the peat water before treatment was 27°C while after treatment

it became 28°C or 4% on each plate area and contact time. The increase in pH and temperature was caused by the electrocoagulation process.

According to Suwanto et al (2017) the occurrence of a decrease in color levels in water occurs when  $\text{Al}(\text{OH})_3$  flocs are formed when the anode is electrified. Then the floc that has been formed will bind to organic molecules contained in water, this will cause a decrease in color levels<sup>13</sup>. As for previous research, it is said that the more aluminum hydroxide that is formed, the more compounds will react with organic compounds in water that contain a lot of humic acid so that this is what causes the color to decrease.

Thus, it can be concluded that there is a reduction in the average value of the color content of peat water before and after the treatment of variations in the electrode plate area of 4 x 30 cm, 5 x 30 cm and 6 x 30 cm. However, based on the results of the average value obtained, the largest decrease in color content occurred at a plate area of 5 x 30 cm and a contact time of 150 minutes with an average decrease of 65 TCU and a percentage effectiveness of 90%. This research is in line with research conducted by Suwanto et al (2017) which states that the longer the contact time in electrocoagulation processing, the greater the color reduction efficiency obtained<sup>13</sup>.

#### **Analysis of the effect of electrode plate area on peat water turbidity levels.**

Based on the Paired Sample T-Test statistical test, the calculated p value for the electrode plate area of 4 x 30 cm is 0.000, for the electrode plate of 5 x 30 cm the p value is 0.000 and for the electrode plate of 6 x 30 cm the p value is 0.000, meaning that there is a significant difference between the turbidity levels before treatment and after treatment with a variation of the electrode plate area of 4 x 30 cm, 5 x 30 cm and 6 x 30 cm. This difference is the fluctuating increase in turbidity levels in peat water after treatment in each plate area treatment.

Furthermore, the Two Way ANOVA test conducted obtained a value of  $p = 0.000$ , meaning that  $H_a$  is accepted, so it can be concluded that there is an effect of electrode plate area on peat water content. Where the effect of the plate area is the increase in peat water turbidity levels.

From the three variations of electrode plates, it appears that there is a different magnitude of increase where for the larger electrode plate area, namely 6 x 30 cm, there is a greater increase in turbidity levels, namely 83% or 27.33, on the other hand, the size of the electrode plate which tends to be smaller, namely 4 x 30 cm, the increase in turbidity levels is also less, namely 67%.

According to Rezagama & Notodarmojo (2012), the decomposition of metal compounds associated with humic acid or humus contained in peat water, which was originally dissolved, into non-dissolved water, is likely to cause an increase in turbidity<sup>20</sup>.

Thus, it can be concluded that there is an influence of the plate area but in this case in increasing the turbidity value of peat water. Then based on the percentage results obtained, the largest increase in the level of increase occurred at a plate area of 6 x 30 cm.

Analysis of the effect of electrode plate area on peat water color content. Based on the Paired Sample T-Test statistical test, the calculated p value for the electrode plate area of 4 x 30 cm is 0.004, for the electrode plate area of 5 x 30 cm the p value is 0.000 and for the electrode plate area of 6 x 30 cm the p value is 0.001, meaning that there is a significant difference between the color levels before treatment and after treatment with variations in electrode plate area of 4 x 30 cm, 5 x 30 cm and 6 x 30 cm. This difference is a decrease in the color level of peat water after processing in each plate area treatment.

Furthermore, the Two Way ANOVA test carried out obtained a value of  $p = 0.000$ , meaning that  $H_a$  was accepted that there was an effect of electrode plate area on the color content of peat water. This shows that there is an effect of the plate area on reducing the color content of peat water.

According to the results of the processing carried out using the electrocoagulation method from the third variation of the electrode plate area, it can be seen that there is a different decrease. The most optimum decrease in color content in the variation of 5 x 30 cm electrode plates is 90% with a value at the color level of 65 TCU. Then when compared to the electrode plate size of 6 x 30 cm and the electrode plate size of 4 x 30 cm where the 6 x 30 cm plate area reduces the color level by 79% or 125 TCU while the electrode plate size of 4 x 30 cm decreases

efficiency is 72% or 185 TCU. This shows that the wider the plate, the better the efficiency of reducing color levels.

This is in line with the research of Suwanto et al (2017) which states that the occurrence of a decrease in color levels in water occurs when  $Al(OH)_3$  flocs are formed when the anode is electrified. Then the floc that has been formed will bind to organic molecules contained in water, this will cause a decrease in color levels. As for previous research, it is said that the more aluminum hydroxide that is formed, the more compounds will react with organic compounds in water that contain a lot of humic acid so that this is what causes the color to decrease.

#### **Analysis of contact time on peat water turbidity levels.**

Based on the Two Way ANOVA test conducted, the value of  $p=0.303$  means that  $H_a$  is rejected, so there is no effect of contact time on peat water turbidity levels. Contact time has no effect on reducing turbidity levels, possibly because the turbidity rate fluctuates in the 30-minute contact time at an electrode plate area of 4 x 30 an increase of 67% (14.81 NTU), a plate area of 5 x 30 the increase in turbidity that occurs is 75, 5% (20.25 NTU), plate area 6 x 30 the increase in turbidity that occurred was 82.2% (25.61 NTU) while at a contact time of 90 minutes the turbidity rate decreased by 59% (12.46 NTU) plate area 4 x 30 cm, 68.5% (16.82 NTU) plate area 5 x 30 cm, and 77.5% (21.52 NTU) plate area 6 x 30 cm. And the turbidity levels increased again at a contact time of 120 minutes the area of the electrode plate 4 x 30 increased 63% (13.14 NTU), the area of the plate 5 x 30 the increase in turbidity that occurred was 74% (17.81 NTU), the area of the plate 6 x 30 the increase in turbidity that occurred 80% (23.57 NTU). Syamsur et al (2018) the longer contact time can cause the electrode to become saturated and the magnetic field that occurs is already small so that the electrocoagulation process is at a minimum, it is suspected that most of the turbidity is due to flocs that settle in the vessel or container.

#### **Analysis of contact time on peat water color content.**

Based on the Two Way ANOVA test conducted, the value of  $p=0.000$  means that  $H_a$  is accepted that there is an effect of contact time on peat water treatment with the

electrocoagulation method. Where the effect of this time shows a decrease in the color level. It can be seen from time to time that there is a reduction in the color content of peat water after treatment with the electrocoagulation method. At an electrode plate area of 4 x 30 cm there was a decrease of 4% (620 TCU) with a contact time of 30 minutes, 11% (595 TCU) with a contact time of 60 minutes, 32% (445 TCU) with a contact time of 90 minutes, 56% (300 TCU) with a contact time of 120 minutes and 72% (185 TCU) with a contact time of 150 minutes. For a plate area of 5 x 30 minutes the color reduction that occurs is 24% (520 TCU) 30 minutes contact time, 63% (240 TCU) 60 minutes contact time, 71% (190 TCU) 90 minutes contact time, 81% (125 TCU) 120 minutes contact time and 90% (65 TCU) 150 minutes contact time. Then the plate area of 6 x 30 minutes the decrease in color levels that occurred was 16% (535 TCU) 30 minutes contact time, 16% (545 TCU) 60 minutes contact time, 49% (335 TCU) 90 minutes contact time, 52% (320 TCU) 120 minutes contact time and 79% (125 TCU) 150 minutes contact time.

The longest contact time showed the most decrease for each area variation and the most optimum was at an electrode plate area of 5 x 30 cm by 90% or 65 TCU. This research is in line with research conducted by Suwanto et al (2017) which states that the longer the contact in electrocoagulation processing, the greater the color reduction efficiency obtained<sup>13</sup>.

The limitation of this study is that the researcher did not replace the electrode plates with new ones during the repetitions and did not immerse the electrode plates in a 5% H<sub>2</sub>SO<sub>4</sub> solution, which serves to clean impurities or substances adhering to the electrode plates.

## CONCLUSION

The conclusion is that there is an influence of the electrode plate size on the turbidity and color levels of peat water. There is no influence of the prolonged contact time on the turbidity levels, whereas there is an influence of the prolonged contact time on the color levels of peat water using the electrocoagulation method.

As a suggestion for further research, researchers may conduct experiments by combining the electrode plate size with

different types of plates, such as iron or copper, to evaluate their effectiveness. Additionally, using smaller electrode plate sizes or lower voltages could be an alternative for treating the turbidity of peat water. When repeating the treatment, it is advisable to replace the electrode plates with new ones to prevent saturation, thus expecting to make a positive contribution to the development of the electrocoagulation method for peat water treatment.

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## ***The Relationship between Frequency of Consumption of Cariogenic Foods and DMF-T Index in 12-Year-Old Children***

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### **ABSTRACT**

*The most common oral disease in Indonesia is dental cavities, especially common in school-age children due to their tendency to favor sweet and sticky foods that can cause dental caries. This study aims to identify the relationship between the frequency of cariogenic food consumption and the DMF-T index in 12-year-old children at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency in 2023. This type of research is an analytic study with a cross-sectional design. The study population included 47 respondents aged 12 years from SDN 05 Batu Taba. The research methods involved interviews regarding the frequency of cariogenic food consumption and DMF-T index examination. Data analysis involved univariate and bivariate analysis, with the chi-square test used for bivariate analysis. The results showed that the frequency distribution of cariogenic food consumption was categorized as low 63.8%, medium 19.1%, high 17.0%, and very high 0%. The frequency distribution of dental caries in the good category reached 42.6%, while the bad category reached 57.4%. The statistical test results showed a  $p$  value of  $0.016 < 0.005$ . The conclusion of this study is that there is a significant relationship between the frequency of cariogenic food consumption and the DMF-T index in 12-year-old children at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency. It is recommended to intensify the longitudinal study to better understand the behavioral changes of cariogenic food consumption frequency and its impact on DMF-T index over time.*

**Keywords:** Cariogenic Food, Dental caries, DMF-T Index, Primary School Students

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## **INTRODUCTION**

Oral health plays an integral role in maintaining overall well-being, serving as a reflection of the body's general condition and indicative of nutritional deficiencies and other illnesses. Disturbances in oral health not only impact physical well-being but also have psychosocial ramifications, including diminished self-confidence and effects on daily activities, both in educational and workplace

settings<sup>1</sup>.

Dental and oral diseases, such as dental caries and periodontal diseases, are significant concerns in Indonesia, particularly among children and adults<sup>2</sup>. Dental caries, being a multifactorial and infectious disease, involves genetic and environmental factors in its etiology<sup>3</sup>. In this context, it is crucial to emphasize the importance of dental and oral health care in children, given the significant prevalence of dental caries in this age group.

The World Health Organization

(WHO) 2013 research results indicate that the prevalence of dental caries in 12-year-old children is 22.5%<sup>4</sup>. WHO considers 12-year-olds a global indicator for comparing dental caries, as they are in the final years of elementary school, easily accessible through the school system, and have complete permanent teeth growth (except for third molars)<sup>4</sup>. In 2018, the 12-year-old age group in the Sumatera Barat region faced the highest proportion of dental problems, with 43.4% having cavities<sup>5</sup>.

Data from Riskesdas 2018 reveals that dental and oral problems affected 57.6% of the Indonesian population, a notable increase from 25.9% in 2013<sup>5</sup>. The DMF-T index also rose from 4.6 to 7.1, suggesting an average of 7 dental issues per individual<sup>5</sup>. Sumatera Barat experienced an increase in the proportion of dental problems, especially cavities, from 22.1% in 2013 to 43.9% in 2018<sup>5</sup>.

School-aged children are vulnerable to dental caries due to their inclination towards consuming cariogenic foods like chocolates and candies. The frequency of consuming cariogenic foods, particularly those containing sucrose, can lead to a low pH in the mouth, triggering demineralization and reducing remineralization. The oral hygiene of children is often worse due to a higher intake of cariogenic foods and beverages compared to adults<sup>6</sup>.

A recent study at SDN 3 Fajar Mataram in 2020 revealed a prevalence of 55 (64%) dental caries among respondents who frequently consumed cariogenic foods ( $\geq 3$  times a week)<sup>7</sup>. Similar research conducted at SDN Bung Makassar in 2018 and Puskesmas III Denpasar Selatan in 2017 also found a significant relationship between the consumption of cariogenic foods and dental caries<sup>8,9</sup>.

SDN 05 Batu Taba in Sumatera Barat is the focus of this study. Despite receiving regular dental health education, mass tooth brushing activities have not been fully implemented, influenced in part by the distance from Puskesmas Biaro to SDN 05 Batu Taba, which is approximately  $\pm 5.1$  km. The aim of this research is to investigate the relationship between the frequency of cariogenic food consumption and the DMF-T index in 12-year-old children at SDN 05 Batu Taba, Ampek

Angkek District, Agam Regency.

## METHOD

This study employs an analytical research design aimed at gaining an understanding of how and why health phenomena occur. It involves the dynamic analysis of correlations between various risk factors and related effects. The research design used is cross-sectional because the focus is on analyzing the correlation between risk factors and effects at a specific point in time.

The research was conducted on February 8, 2023, at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency. The research population includes all 12-year-old children at SDN 05 Batu Taba, totaling 47 individuals. The sample was taken using a total population technique, making the entire population the research sample. Inclusion criteria involve research subjects willing to be respondents and present at school during the research.

Data analysis was carried out using univariate and bivariate analyses. Univariate analysis is utilized to describe the general characteristics of the research subjects, while bivariate analysis, particularly the chi-square test, is employed to evaluate the relationship between two main variables: the influencing (independent) variable and the influenced (dependent) variable.

## RESULTS

**Table 1. Data on the number of students aged 12 years SDN 05 Batu Taba Ampek Angkek District Agam Regency in 2023**

Class	Number of students aged 12 years		Total	Percentage (%)
	Male	Female		
	VI A	9		
VI B	11	15	26	55,3
Total			47	100

Table 1 shows that the number of respondents was 47 people consisting of female respondents as many as 55.3% (26 people), male respondents as many as 44.7% (21 people) and this study was conducted on 12-year-old children in class VI A and VI.

**Table 2. Frequency Distribution of Cariogenic Food Consumption in 12-Year-Old Children at SDN 05 Batu Taba, Ampek Angkek Canduang District, Agam Regency in 2023.**

Criteria	F	%
Low	30	63,8
Medium	9	19,1
High	8	17,0
Very High	0	0
Total	47	100%

Table 2 shows that the frequency distribution of respondents with the highest frequency of consumption of cariogenic foods is low criteria, namely 63.8% (30 people) and the least is high criteria, namely 17.0% (8 people).

**Table 3. Frequency Distribution of Dental Caries Based on DMF-T Criteria in 12 Years Old Children at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency in 2023.**

DMF-T criteria	f	%
Good	20	42,6
Bad	27	57,4
Total	47	100%

Table 3 shows that the frequency distribution of respondents with dental caries based on the DMF-T criteria was mostly poor criteria, namely 57.4% (27 people) and the least DMF-T criteria was good criteria, namely 42.6% (20 people).

**Table 4. Statistical Test Results of the Relationship between Frequency of Consumption of Cariogenic Foods and DMF-T Index in 12-Year-Old Children at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency in 2023.**

	Value	Df	Asymp. sig (2-sided)
Pearson's chi-square	8.274 <sup>a</sup>	2	0.016
Likelihood ratio	11.197	2	0.004
Linear-by-Linear Association	3.109	1	0.078
N of Valid Cases	47		

Table 4 shows that the results of chi square statistical analysis using the SPSS program obtained the result  $\rho$  value  $0.016 < 0.05$ ,

meaning that there is a significant relationship between frequency of cariogenic food consumption with DMF-T index in children aged 12 years old at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency.

## DISCUSSION

Based on the research on the frequency of consumption of cariogenic foods among 12-year-old children at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency, the data shows that the frequency of consumption of cariogenic foods has low criteria for 63.8% (30 people), moderate criteria for 19.1% (9 people), and high criteria for 17.0% (8 people). Thus, it can be concluded that the majority of students have a low criteria for the frequency of consumption of cariogenic foods.

According to Tarigan (2013), food significantly influences oral health<sup>10</sup>. Fiber-rich foods with natural teeth-cleaning properties, such as apples, guavas, and jicamas, can be considered alternatives to maintain dental hygiene. Conversely, soft and tooth-damaging foods, such as candies, chocolates, and biscuits, can increase the risk of dental damage.

However, these research findings differ from Novita's study in 2022 at SDN 224 Palembang, which showed that the frequency of cariogenic food consumption was mostly in the moderate criteria at 63%<sup>11</sup>.

The distribution of dental caries frequency based on the DMF-T index among 12-year-old children at SDN 05 Batu Taba indicates that 42.6% (20 people) have good criteria, and 57.4% (27 people) have poor criteria. Data analysis shows that the distribution of dental caries frequency with poor DMF-T criteria is dominant. This may be caused by a lack of attention to oral hygiene, insufficient regular dental check-ups, and the habit of consuming sweet foods at school.

Dental caries is caused by host factors, microorganisms, substrates (diet), and time factors<sup>12</sup>. Carbohydrates left in the mouth, microorganisms, and saliva can directly cause dental caries. Another factor that can influence is inadequate tooth brushing frequency.

The importance of tooth brushing habits is evident from the recommendation to brush teeth twice a day, after breakfast and



before bedtime. Brushing teeth before bedtime is crucial to stop bacterial reproduction in the mouth because reduced saliva production during sleep cannot neutralize the acidic pH in the oral cavity<sup>13</sup>.

Substrate or diet factors, as stated by Effendy (2016), can affect plaque formation and bacterial metabolism<sup>14</sup>. Research shows that carbohydrate consumption, especially sucrose, can increase the risk of dental damage<sup>15-19</sup>. Therefore, it is important to reduce the frequency of consuming cariogenic foods and pay attention to daily eating patterns.

Sweet and adhesive foods, such as chocolate and biscuits, have properties that can adhere to teeth. If not cleaned properly, it can undergo a chemical process with bacteria and saliva that can damage tooth enamel. Sugar in food and drinks can lower plaque pH, leading to demineralization of tooth enamel with the help of bacteria, especially *Streptococcus mutans*<sup>20-23</sup>.

Oral health maintenance, such as regular dental check-ups every 6 months, can help prevent and treat cavities<sup>23-26</sup>. Talibo's research (2016) also supports the relationship between the frequency of consuming cariogenic foods and the incidence of dental caries in sixth-grade students at SDN 1 & 2 Sonuo.

This study also found a significant relationship between the frequency of consuming cariogenic foods and the DMF-T index in 12-year-old children at SDN 05 Batu Taba. High frequency of consuming cariogenic foods, especially with low criteria, is associated with a poor DMF-T index. Thus, the findings of this research make a significant contribution to understanding the factors influencing the oral health of 12-year-old children.

## CONCLUSION

Based on the results of the study on the Relationship between Frequency of Consumption of Cariogenic Foods and DMF-T Index in 12-Year-Old Children at SDN 05 Batu Taba, Ampek Angkek District, Agam Regency, it can be concluded that the majority of 12-year-old children experience frequency of cariogenic food with low criteria as much as 63.8%, and the most DMF-T index with very low criteria at 42.6%. Furthermore, this study showed a

significant relationship between the frequency of cariogenic food consumption and DMF-T index in 12-year-old children in the area, along with a p-value of 0.016 ( $p < 0.05$ ) obtained from the chi-square test.

For future research, it is recommended to intensify the longitudinal study to better understand the behavioral changes of cariogenic food consumption frequency and its impact on DMF-T index over time.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Original Article

## ***Antioxidant Activity and Amino Acid Profile of "Dadih" from Various Regions in West Sumatra, Indonesia***

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### **ABSTRACT**

*Dadih or curd is a traditional product typical of West Sumatra which is made through natural fermentation using the lactobacillus plantarum bacteria in bamboo. Each region in West Sumatra makes curd in various ways that affect its quality. This study aims to determine the amino acid profile and antioxidant activity of curd from various regions in West Sumatra. The study was conducted by testing curd from 4 main curd center regions, namely Bukittinggi, Payakumbuh, Batusangkar and Alahan Panjang. Certain tests were applied to assess the protein content using the Kjeldahl method, amino acids content using the HPLC method and antioxidant activity using the DPPH method. The test results showed that curd from Payakumbuh had a higher protein and amino acid content compared to other regions. Furthermore, such curd had the highest level of antioxidant activity towards free radicals compared to other regions, with an IC50 value of  $95.11 \pm 0.40$  mg/kg, which was included in the strong category. There was a significant relationship between amino acid content and antioxidant activity of curd. It can be concluded that curd from Payakumbuh had the best amino acid content and antioxidant activity compared to other regions in West Sumatra.*

**Keywords:** Curd, Antioxidant, Amino Acids

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## **INTRODUCTION**

Dadih or curd is a traditional fermented milk product originating from West Sumatra, Indonesia. This product is made by processing fresh buffalo milk using local lactic acid bacteria of *Lactobacillus plantarum* to ferment naturally for approximately one day in bamboo. Curd is considered to have good health benefits due to its amino acid composition and antioxidant activity<sup>1</sup>.

The fermentation process in curd is considered to produce free amino acids which can be beneficial for the body. These amino acids can be essential or non-essential. The amino acid content determines its ability to

supply protein needs in various body metabolisms<sup>2</sup>. Amino acids are known to have a strong relationship to antioxidant activity<sup>3</sup>.

The antioxidant activity of curd refers to its ability to fight harmful free radicals and reduce oxidative stress in the body<sup>4</sup>. Antioxidants are essential for maintaining cellular health and reducing the risk of chronic diseases such as cardiovascular disorders, neurodegenerative conditions, and some types of cancer<sup>5</sup>. Evaluation of antioxidant activity in curd is considered important to determine its potential as a functional food.

West Sumatra has several regions as the centers of curd production, including Bukittinggi, Alahan Panjang, Payakumbuh and

Batusangkar. The curd production process in each region is very diverse regarding preparation, processing to distribution. In addition, the type of buffalo and the feed used are also different. Such differences mean that the quality of the curd produced will be different. Therefore, this study aims to evaluate the antioxidant activity and amino acid profile of curds originating from various regions in West Sumatra, Indonesia.

## METHOD

The study was conducted by observing several curd samples from several regions in West Sumatra, including the Payakumbuh, Batusangkar, Bukittinggi and Alahan Panjang areas. The study observed the antioxidant capacity and amino acid content of curd originating from various regions.

**Materials and Tools.** The materials used in this study included curd from Payakumbuh, Batusangkar, Bukittinggi and Alahan Panjang which was taken on the second day of fermentation,  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  DPPH (1,1-diphenyl-1-picrylhydrazyl) and other chemicals. The tools used included an ice box, UV-VIS spectrophotometer, burette and stand, Erlenmeyer, rubber suction cup, watch glass, dropper pipette, measuring flask and volume pipette.

**Protein Content Test.** Protein content was tested using the Kjeldahl method and AOAC method<sup>6</sup>. Through the following stages:

**Destruction stage.** The sample was taken, then ground thoroughly, then weighed 1 gram and put it in a Kjeldahl flask. To make sample destruction easier, 2 grams of mixed catalyst and 25 ml of concentrated  $\text{H}_2\text{SO}_4$  were added while stirring gently until the solution was homogeneous. Then the solution was heated until it boiled and the color changed to clear green.

**Distillation stage.** The cooled destructed solution was diluted with 100 ml of distilled water in a 100 ml volumetric flask and pipetted 5 ml into the distillation flask. To make it easier to separate ammonia from the sample solution, 30% NaOH was added to make the solution alkaline. Some boiling stones were also added. The solution was distilled and the distillate was collected in an Erlenmeyer flask

containing 10 ml of 2% boric acid solution and a few drops of mixed indicator (methylene red + bromothymol blue). Distillation was performed for approximately 5-10 minutes.

**Titration stage.** The resulting distillate was titrated with a standard solution of 0.01 N hydrochloric acid. The titration point was reached when the color changed from blue to orange. Blanks were made according to the sample treatment. Calculation of % Protein was performed using the following formula:

$$\begin{aligned} \%N &= (\text{ml NaOH blanko} - \text{ml NaOH sample}) \\ &\times \\ &\quad \frac{\text{Normality of NaOH} \times 14.008}{\text{gr sample} \times 1000} \times 100\% \\ \% \text{ Protein} &= \% N \times 6.25 \end{aligned}$$

**Antioxidant Activity Test.** The curd samples were weighed as much as 10 grams, dissolved in 10 mL of ethanol p.a (1000 ppm). Furthermore, a dilution was made from this solution with a concentration of 100-500 ppm, 2.5 mL was pipetted into a 5 mL volumetric flask and 1 mL of DPPH was added. Samples were incubated for 30 minutes at room temperature. Absorbance was determined using the UV-Vis spectrophotometric method at a wavelength of 517 nm. Samples were made in three replications. Further, an equation was made between the concentration of the solution and the absorbance<sup>7</sup>. The equation was made into the following formula:

$$\text{Antioxidant Capacity} = (\text{V sample} \times [\text{sample}] \times \text{Dilution factor}) / \text{Sample weight (g)}$$

**Amino Acid Profile Test.** The amino acid profile was analyzed using the High-Performance Liquid Chromatography (HPLC) method to determine the content of essential amino acids such as L-arginine, L-histidine, L-isoleucine, L-leucine, L-phenylalanine, L-valine, L-threonine, as well as non-essential amino acid profiles such as L-alanine, L-aspartic acid, glycine, L-glutamic acid, L-lysine, L-proline, L-serine, L-threonine, the mobile phase used consists of water and sulfuric acid. Meanwhile, the stationary phase used is column C18. Detection was carried out at a wavelength of 254 nm<sup>2</sup>.

## RESULTS

**Table 1. Protein content of curd from various regions in West Sumatera**

Parameter	Unit	Payakumbuh	Batu sangkar	Alahan panjang	Bukittinggi
Protein Level	%	8.91±0.22	7.70±0.17	7.94±0.18	7.66±0.01

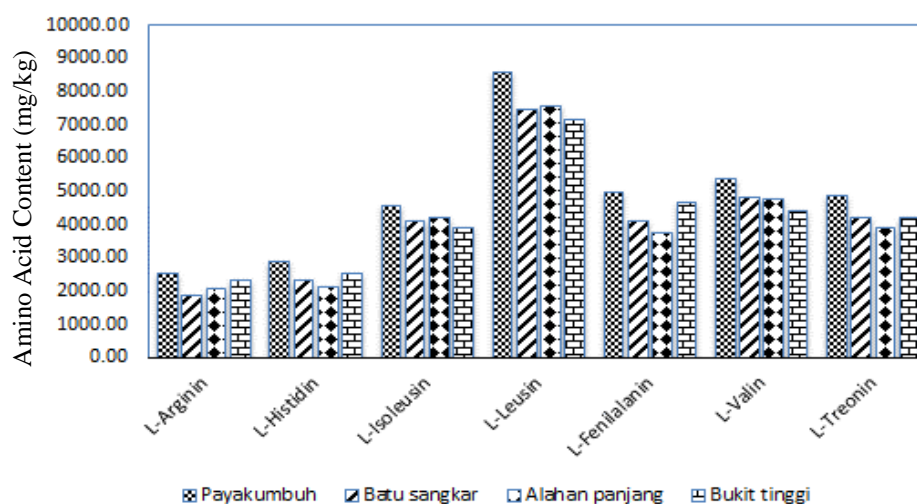
**Table 2. Amino acid profile of curd from various regions in West Sumatera**

Parameter	Unit	Payakumbuh	Batu sangkar	Alahan panjang	Bukit tinggi
Essential amino acids					
L-Arginine	mg / kg	2546.94±1.70	1865.83±0.30	2063.39±0.42	2347.63±1.1
L-Histidine	mg / kg	2891.65±3.90	2329.49±2.26	2102.38±6.02	2532.96±5.6
L-Isoleucine	mg / kg	4555.92±8.75	4121.03±3.46	4199.02±0.76	3905.79±5.7
L-Leucine	mg / kg	8588.33±3.08	7483.63±5.18	7556.36±1.095	7148.97±7.1
L-Phenilalanin	mg / kg	4993.27±3.57	4100.96±3.51	3729.85±5.41	4692.96±7.3
L-Valine	mg / kg	5403.23±2.56	4797.27±4.72	4746.56±3.82	4405.91±2.9
L-Threonine	mg / kg	4881.31±2.76	4224.61±3.04	3924.22±0.84	4206.66±5.8
Non-essential amino acids					
L-Alanine	mg / kg	2763.06±0.22	2380.14±1.06	2651.94±4.00	2356.93±0.2
L-Aspartic Acid	mg / kg	5602.30±3.38	4698.05±3.79	5604.85±1.62	4932.51±3.2
Glisine	mg / kg	2002.84±0.16	1698.22±1.02	1631.21±0.36	1675.01±1.1
L-Glutamic Acid	mg / kg	17378.74±11.64	14611.48±8.74	16631.87±19.45	14674.93±18.1
L-Lysine	mg / kg	5980.03±3.25	5451.36±2.60	6500.24±4.66	5101.19±1.9
L-Proline	mg / kg	8884.55±4.56	7756.81±2.06	7886.49±7.29	7227.07±10.3
L-Serine	mg / kg	5816.78±0.63	5034.03±3.40	4718.41±3.71	4882.03±3.4
L-Thyrosine	mg / kg	4385.40±1.60	3518.98±1.07	3422.52±0.80	4168.46±1.7

Curd is a traditional functional drink that is naturally fermented using buffalo milk as its raw material. Buffalo milk is known to contain quite good animal protein compared to other food ingredients. Table 1 shows the protein content values in curd from several regions in West Sumatra. The highest protein content in curd comes from the Payakumbuh region. This protein content is greatly influenced by the quality of milk produced by each type of

buffalo<sup>8</sup>.

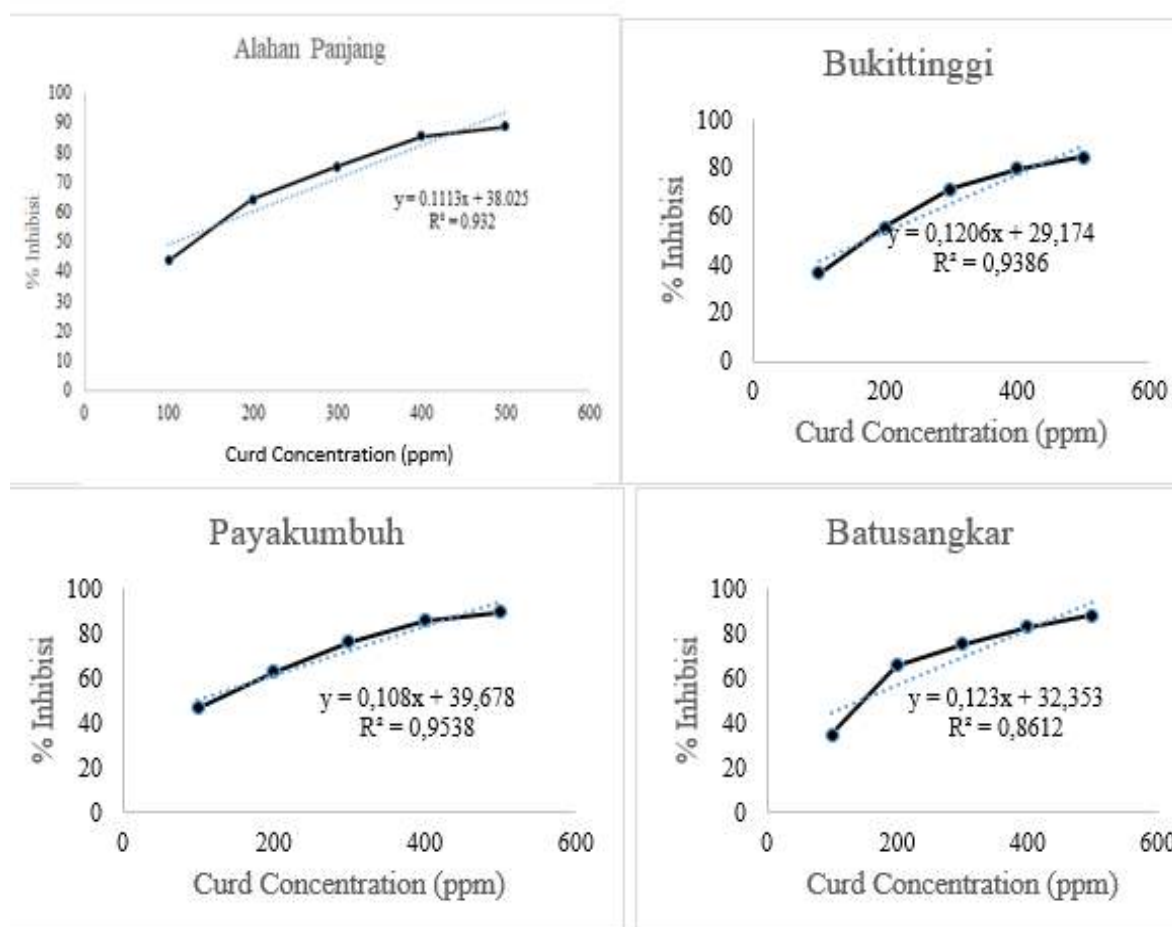
As a protein source functional drink, curd contains very diverse amino acids. Table 2 shows the amino acid profile of curd. Curd has several essential amino acids including argine, histidine, isoleucine, leucine, phenylalanine, valine and threonine. Such amino acid content shows that curd is a functional drink that has quite complete ingredients.



**Figure 1. Graph on Amino Acid Profile of Curd from various regions in West Sumatera**

**Table 3. Absorbance value of curd towards free radicals of DPPH**

Area	Concentration (ppm)	Absorbance DPPH	Absorbance Sample + DPPH	% Inhibition
Payakumbuh	100	0.714	0.380	48
	200	0.714	0.266	63
	300	0.714	0.172	76
	400	0.714	0.103	86
	500	0.714	0.076	89
Batusangkar	100	0.714	0.465	35
	200	0.714	0.245	66
	300	0.714	0.178	75
	400	0.714	0.123	83
	500	0.714	0.087	88
Alahan Panjang	100	0.714	0.402	44
	200	0.714	0.256	64
	300	0.714	0.177	75
	400	0.714	0.105	85
	500	0.714	0.08	89
Bukittinggi	100	0.714	0.455	36
	200	0.714	0.32	55
	300	0.714	0.205	71
	400	0.714	0.145	80
	500	0.714	0.112	84



**Figure 2. Similarity curve between curd concentration and % inhibition**

**Table 4. Calculation of antioxidant activity (IC 50)**

Area	Equation	Antioxidant Activity (IC50) (mg / kg)	Category
Payakumbuh	$Y=0.1080x + 39.678$	95.11± 0.40	Strong
Batusangkar	$Y=0.1230x + 32.353$	143.76 ±0.19	Moderate
Alahan Panjang	$Y=0.1113x + 38.025$	107.59 ±1.09	Moderate
Bukittinggi	$Y=0.1206x + 29.174$	172.49 ±0.26	Weak

The presence of amino acids in curd is known to provide antioxidant activity. Table 3 shows the absorbance value of curd against DPPH which can be used as an indicator of antioxidant activity in the product. Curd from Payakumbuh had the highest level of antioxidant activity with an IC50 value of 95.11 ± 0.40 mg/kg, which was included in the strong category.

## DISCUSSION

### Protein Level

Buffalo milk generally has a protein content of 4.68 -5.14%<sup>9</sup>. The fermentation process can increase the protein content of milk after it becomes curd. It is known that there is an increase in protein from 4.68 -5.14% buffalo milk to 7.66-8.91% or around 15-30% after it becomes curd. This increase is due to the fermentation process of the *Lactobacillus plantarum* microorganism which utilizes carbohydrates as an energy source and produces carbon dioxide as a by-product. The fermentation process results in a decrease in carbohydrate content, with further impact on an increase in the protein concentration in the curd<sup>3</sup>.

Fermentation of curd is considered not only to increase protein quantitatively, but also to improve the protein quality of the curd. The protein in curd is generally in the form of small peptides, making it easier for the body to digest it after consumption. Under such condition, curd has higher bioavailability than buffalo milk<sup>11</sup>.

### Amino Acid Profile

Amino acids are chemical compounds that make up protein and contain an amine group (NH<sub>2</sub>) and a carboxyl group (COOH)<sup>12</sup>. There are at least around 20 amino acids that make up protein<sup>12</sup>. Every protein that enters the body must first be digested into amino acids before it can be used in various functions such as immunity, muscle building and various other body metabolisms<sup>13</sup>.

Amino acids are divided into two groups, namely essential and non-essential amino acids. Essential amino acids are amino acids that cannot be made in the body and must be obtained from food sources of protein, which are also called exogenous amino acids. On the other hand, non-essential amino acids are amino acids that can be made in the body, or so called endogenous amino acids<sup>14</sup>.

Table 2 shows the amino acid content of curd from various regions. Curd contains both essential amino acids and non-essential amino acids. The essential amino acids contained in curd include L-arginine, L-histidine, L-iso leucine, L-leucine, L-Phenylalanine, L-valine and L threonine. On the other hand, curd in West Sumatra also contains non-essential amino acids including L-alanine, L-aspartic acid, glycine, L-glutamic acid, L-lysine, L-proline, L-serine and L-tyrosine. The complete amino acid content in curd makes this fermented drink considered very beneficial for individuals who consume it<sup>15</sup>.

Figure 1 revealed that curd from Payakumbuh had the highest amount of essential amino acids compared to curd from other regions. The amino acid content in curd increases due to the fermentation process carried out by microorganisms, generally the *Lactobacillus plantarum* bacteria<sup>16</sup>. The fermentation process in curd causes the breakdown of casein protein in milk resulting in smaller peptide molecules and free amino acids<sup>17</sup>. Amino acid content in curd reaches its highest amount after being fermented for 8 hours at an incubation temperature of 42°C or the equivalent of 16-20 hours at room temperature<sup>3</sup>. Curd that is fermented for too long will cause the amino acids in the curd to be reused by the *Lactobacillus plantarum* bacteria for their nitrogen. This condition will reduce the amino acid content in curd<sup>3</sup>.

The essential amino acid content in



curd is very useful for maintaining individual health, for example L-arginine and L valine which have benefits for reducing fatigue due to exercise<sup>18</sup>. Furthermore, L-arginine also has a good effect in lowering blood pressure because it can influence the synthesis of Nitric Oxide. (NO) which can relax blood vessels<sup>19</sup>. Another amino acid, namely isoleucine has a good influence on improving digestive tract health, digestive ability, and improving intestinal microbiota<sup>20</sup>. There is also the amino acid called phenylalanine which plays a role in nervous system regulation. Consuming this amino acid can increase concentration, motivation and mood for those who consume it<sup>21</sup>. With the various benefits presented by the amino acids in curd, this fermented drink has the potential to be a functional drink that is good for health.

### **Antioxidant Activity**

The antioxidant activity of curd was tested using the DPPH (2,2-diphenyl-1-picrylhydrazyl) method. The curd sample was mixed with DPPH free radicals which had been dissolved in several concentrations. Furthermore, the ability of the curd to fight free radicals was examined using a UV-Vis spectrophotometer.

Table 3 shows the absorbance values of free radicals in various concentrations. Figure 2 shows the equation obtained between free radical concentration and absorbance. After making an equation between the concentration of free radicals and the absorbance value, an equation was obtained:  $y = a(x) + b$  per each sample. This equation was further used as a basis for calculating antioxidant activity (IC50). Table 4 shows the results of antioxidant activity calculation of curd from various regions in West Sumatra.

The antioxidant activity of curd from the Payakumbuh region was included in the strong category. Meanwhile, curd from Batusangkar and Alahan Panjang was in the moderate category, and curd from Bukittinggi was in the weak category. There was a very strong relationship between antioxidant activity and the number of amino acids in curd<sup>3</sup>. Each amino acid has antioxidant activity, of which there are seven amino acids with the best antioxidant activity including tryptophan, methionine, histidine, lysine, cysteine, arginine, and tyrosine<sup>22</sup>.

The antioxidant activity of amino acids varies based on constituent structures. For example, the amino acids of histidine and arginine contain a nitrogen atom with one free electron. This condition will make it easier for such amino acids to fight free radicals and then neutralize them. Other amino acids such as tyrosine have a benzene ring which is very active in eliminating free radical ions<sup>22</sup>. The good antioxidant activity in curd makes this drink an alternative functional food in treating various degenerative diseases, such as dyslipidemia, atherosclerosis, obesity and others<sup>23-25</sup>.

Differences in antioxidant activity in each region were also caused by differences in the amino acids content, as well as antioxidants presented in milk before processing. The feed consumed by buffalo greatly influences the quality of the milk produced. Cows or buffalo that are fed a diet high in antioxidant sources such as vitamin E, carotene and retinol produce milk that contains higher antioxidant activity<sup>26</sup>. The antioxidants in raw milk include  $\beta$ -lactoglobulin, vitamins A, E, C, and  $\beta$ -carotene<sup>26</sup>. Efforts to increase the stability of antioxidants in curd can be done in various ways, including adding antioxidants<sup>27</sup>, or by making the curd into powder using the freeze drying method<sup>28</sup>.

### **CONCLUSION**

Curd from various regions in West Sumatra had various antioxidant activities and amino acid profiles. Curd from Payakumbuh had the highest level of antioxidant activity towards free radicals compared to other regions, with an IC50 value of  $95.11 \pm 0.40$  mg/kg (strong category). Furthermore, such curd also had the highest essential amino acid content compared to other regions, including the amino acids of histidine, arginine, isoleucine, leucine, valine, phenylalanine and tyrosine.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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## ***The Effect of Moringa Leaf Extract (Moringa Oleifera) On Triglyceride Levels in Streptozotocin Induced Type 2 Diabetes White Wistar Rats***

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### **ABSTRACT**

*High blood sugar levels can hasten the liver's production of triglycerides. Normally, the body uses glucose as one of its energy sources. This study aimed to determine changes in the weight of mice and decrease triglyceride levels in mice by administering Moringa leaf extract. This type of research is a pure experiment with a "pre and post-randomized controlled group" design. This was carried out using a repeated ANOVA test, a sample of 25 mice. The research used male white rats of the Wistar strain, which were induced with STZ (Streptozotocin) at a dose of 65 mg/kg BW and NA 230 mg/kg BW, where the experimental animals were divided into 5 groups, namely negative control group, positive control and 3 treatment groups given the extract. from Moringa leaves at a dose of 200, 300, 400 mg/kg BW of rats. The optimal dose of Moringa leaves for losing weight and reducing triglyceride levels in mice is a dose of 400 mg/kg of mouse body weight. Glibenclamide (0.09 mg/kg rat body weight) and Moringa leaf extract (300 mg/kg rat body weight) are each the optimal dose to reduce glucose levels in rats. With a p value for each variable of 0.001, administration of Moringa leaf extract affected body weight, glucose and triglyceride levels in white Wistar rats with type 2 diabetes induced by streptozotocin. These findings suggest that Moringa leaf extract may have potential therapeutic effects in treating diabetes-related complications.*

**Keywords:** Rat Triglycerides, Blood Glucose, Moringa Leaf Extract, Streptozotocin

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### **INTRODUCTION**

The rapid progress of technology greatly affects people's quality of life. One of the bad impacts is the emergence of several degenerative diseases, such as diabetes mellitus<sup>1,2,3</sup>. This type of disease can be caused by a less active lifestyle and unhealthy eating habits. Apart from that, technological advances have also reduced people's physical activity

levels, as evidenced by the increasing use of private transportation and the increasing use of computers in the workplace<sup>4,5,6,7</sup>. Additionally, the convenience and accessibility of modern technology has led to a sedentary lifestyle, where people spend more time engaging in screen-based activities than participating in physical exercise. Lack of physical activity not only contributes to the development of diseases such as diabetes mellitus but also increases the

risk of obesity and cardiovascular problems <sup>8,9</sup>.

Excessive blood glucose levels can accelerate liver triglyceride production. One component of body fat is triglycerides. Triglycerides have normal functions in the body, such as as a source of energy, if levels are within normal limits <sup>10</sup>. However, high blood glucose levels can lead to higher triglyceride levels, which can result in a number of health problems. Obesity, heart disease, and diabetes are some of the diseases that high triglyceride levels can cause when triglyceride levels increase, this can contribute to the development of atherosclerosis, a condition characterized by the buildup of plaque in the arteries. This can increase the risk of heart attack and stroke <sup>11,12</sup>. Additionally, high triglyceride levels are often associated with insulin resistance, which is a key factor in the development of type 2 diabetes.

In the body, triglycerides and other fats are transported by unique molecules called lipoproteins. Because some lipoproteins with high triglyceride content also carry cholesterol, having high triglyceride levels can harm a person's health<sup>13</sup>. Those with high triglyceride levels are at risk of atherosclerosis, or narrowing of the artery walls. Fatty deposits that build up on artery walls cause atherosclerosis, which reduces blood flow and increases the risk of heart disease <sup>14,15</sup>. To stop the onset of atherosclerosis and its related problems, it is important to control triglyceride levels with a balanced diet, frequent exercise, and, if necessary, medication. Apart from diet and exercise, maintaining a healthy body weight is also important in controlling triglyceride levels. Excess weight can contribute to higher triglyceride levels and increase the risk of atherosclerosis. Monitoring triglyceride levels regularly and working with a healthcare professional can help individuals manage triglyceride levels effectively and reduce the risk of heart disease <sup>11,16</sup>.

High triglyceride levels are associated with an increased risk of heart disease and other blood vessel disorders, such as low-density lipoprotein (LDL) cholesterol. People who have elevated triglyceride levels—the current upper limit is above 1.7 mmol/L—also often have elevated total, LDL, and HDL cholesterol levels. It resembles a trio. Although elevated

triglyceride levels pose a potential danger, this is exacerbated if there is low HDL cholesterol, a situation commonly found in individuals with prediabetes or diabetes. The combination of high triglyceride levels with low HDL cholesterol can worsen the risk of heart disease and other blood vessel problems. People with diabetes or prediabetes are more likely to experience this combination, so it is important for them to control their lipid profile with lifestyle changes and medication if necessary <sup>17</sup>.

Among the many uses of flavonoids are to protect cell structure, increase the effectiveness of vitamin C, reduce inflammation, stop bone loss, and act as an antibacterial <sup>18</sup>. The vitamin C present in powdered milk contributes to a healthy metabolism by increasing the amount of cholesterol produced in the form of fatty milk, increasing HDL cholesterol levels, and reducing the amount of powdered milk that is returned to the milk and converted into cholesterol <sup>19</sup>.

This study aims to determine changes in the weight of mice and decrease triglyceride levels in mice by administering Moringa leaf extract. This research was carried out using experimental methods, where mice were divided into 5 groups, namely negative control group, positive control and three treatment groups which were given extract from Moringa leaves at doses of 200, 300, 400 mg/kg mice. The novelty of this research is that this study used Moringa leaf extract as an experimental material and observed changes in the mice's body weight and their triglyceride levels.

## METHOD

Types and Research Design. The type of research used is a true experiment (pure experiment) using mice as test animals. The scope of scientific disciplines in this research includes the field of nutrition, it is pure experimental research in the field of nutrition using a pre and post randomized controlled group design approach. The study used male white Wistar rats induced by STZ (Streptozotocin) at a dose of 65 mg/kg BW and NA 230 mg/kg BW (Szkudelski, 2001), where the experimental animals were divided into 5 groups, namely: negative control group, positive control group and 3 Treatment groups were given extract from Moringa leaves at a

dose of 200, 300, 400 mg/kg BW of mice. The negative control group received a placebo, while the positive control group was administered a standard drug for comparison. The doses of Moringa leaf extract were chosen based on previous studies and their potential therapeutic effects on diabetes. Before being induced by STZ, the experimental animals were first checked for blood glucose levels and triglyceride levels to ensure that the experimental animals did not have diabetes or hypertriglyceridemia. Next, measurements of triglyceride levels in the blood of male white Wistar rats were carried out on the 5th day after induction. Mice were declared hypertriglyceridemic if the triglyceride level in the blood was  $> 150$  mg/dl (National Institute Health, 2001), then the negative control was only given distilled water, the positive control was given glibenclamide 0.09 mg/kg BW and the treatment group was given Moringa leaf extract to experimental mice at a dose of 200, 300 and 400 mg/kg BW of mice for 21 days. On days 9, 15 and 21, triglyceride levels in the blood were measured post test I II and III.

**Dosage Calculation.** Based on the research results of Setyawaty (2020 with the title Effectiveness of moringa oleifera on triglyceride levels in diabetic wistar rats (*Rattus norvegicus*) induced with streptozotocin (STZ), the minimum dose of administering Moringa leaf extract is 300mg/kg BW of rats)<sup>20</sup>. In this study, the dose given to mice with diabetes mellitus was 200mg, 300mg, 400mg of Moringa leaf extract. The dosage conversion rate for glibenclamide for humans with a body weight (BW) of 70 kg to mice with a BW of 200 g is 0.018. The therapeutic dose of glibenclamide in humans is 5 mg, then the dose for mice is 200 g, namely:  $0.018 \times 5 \text{ mg} = 0.09 \text{ mg/ } 200 \text{ g BW}$ . Therefore, the dose of glibenclamide given to mice in this study was 0.09 mg/200 g BW.

**Data Collection Procedure.** The materials needed for this research are as follows. First, the test material is Moringa leaves (*Moringa oleifera*) taken from the Jayapura City area. The ingredient for Moringa leaf extract is water. Second, white male Wistar rats aged 8 – 12 weeks, weighing 140 – 200 g and who meet the inclusion and exclusion criteria. Third, standard Comfeed feed given ad libitum to male white Wistar rats. Fourth, Streptozotocin (STZ) to induce experimental animals to develop diabetes mellitus at a dose of 65 mg/Kg BW.

Fifth, the ingredients for measuring blood glucose levels are Glucose GOD FS Kit, phosphate buffer (Ph 7.5), Glucose Oxidase Phenol 4-Aminophenazone. Sixth, the ingredient for measuring triglyceride levels is Glycerol 3 phosphatase (GPO)

The tools used are first, tools for extracting Moringa leaves are mortar/blender, sieve, digital scale, measuring cup, 250 ml Erlenmeyer, 250 ml beaker glass, filter paper, glass funnel. Second, tools for keeping male white rats of the Wistar strain consist of digital scales, animal cages, standard feed containers and ad libitum drinking containers. Third, the tool for administering extracts from Moringa leaves is a gastric tube and the tool for induction of STZ and NA is a 3 ml sterile needle. Fourth, tools for measuring blood glucose levels consist of test tubes, micro pipettes, vortexes, glucose pipettes and spectrophotometers. Fifth, tools for measuring triglyceride levels consist of test tubes, micro pipettes, disposable syringes, centrifuges and spectrophotometers.

**Making Moringa Leaf Powder.** The ingredients used in making Moringa leaf extract are Moringa leaves, which are a type of tropical plant that is easy to grow in tropical areas like Indonesia. The water extraction method is as follows, Moringa leaves have been dried in the sun for 2-3 days until dry, some are left whole to dry and crushed. The powder is then extracted with water in a ratio of 1:10 (w/v), macerated at 50°C for 3x24 hours, the extract obtained is filtered.

**Preparation of Experimental Animals.** In order to ensure the health aspects of experimental animals, maintenance of experimental mice is carried out at the Inter-University Research Center for Food and Nutrition Study Laboratory (PAU) Gadjah Mada University (UGM) Yogyakarta, taking into account the following matters. Firstly, mice are kept in individual cages that are ventilated and well lit, room temperature ranges from 28 – 32°C. Second, food and drinks are provided ad libitum in the form of standard feed referring to the American Institute of Nutrition (AIN 93). Third, for health, the cage is cleaned every day. Fourth, the research began by preparing 25 white male *Rattus norvegicus* Wistar strain rats aged 8 – 12 weeks, which were adapted for 7 days with standard feeding. Fifth, the weight of the mice was weighed as basic data, then divided randomly into 5 groups, namely negative control, positive control and 3

treatment groups of 5 mice each. Sixth, the extract from Moringa leaves is given sonde, while normal feed and drink are given ad libitum.

Induction of Streptozotocin (STZ), Nicotinamide (NA) and Measurement of Blood Glucose and Triglyceride Levels in Experimental Rats. The induction of streptozotocin (STZ), nicotinamide (NA) and measurement of blood glucose and triglyceride levels in mice. The experiment was carried out in the first way. The mice that had been adapted for 1 week then had their blood taken to measure their initial glucose and triglyceride levels. Second, rats were then induced intraperitoneally with STZ at a dose of 65 mg/kg BW (100 mg STZ dissolved in 10 ml citrate buffer pH 4.5) and NA at a dose of 230 mg/kg BW (dissolved in 0.9% NaCl at a dose of 3 ml/ 200 g BB). NA induction was given 15 minutes before STZ induction in the 5 third treatment groups. Blood sampling for measuring blood glucose and triglyceride levels was carried out on the 5th day post-induction (pre test) to ensure that the mice really had diabetes mellitus. Before taking blood, the mice were fasted for 6 hours. Fourth, food and drink are still provided during treatment ad libitum. Fifth, blood sampling for measuring blood glucose and triglyceride levels was carried out on days 9, 15 and 21, as post-tests I, II and III. Sixth, blood glucose levels are measured quantitatively using the Enzymatic Colorimetric Test GOD – PAP method via the retro orbital plexus. Seventh, measurement of blood triglyceride levels is carried out quantitatively using the spectrophotometric method via the retro orbital plexus.

Extract from Moringa Leaves. Making Moringa leaf extract in the first way, powdered Moringa leaves are weighed according to the treatment, namely 200, 300 and 400 mg. secondly, the extract from Moringa leaves obtained was then filtered and then the extract from Moringa leaves was given to experimental mice in treatments III, IV and V. Sonde was given to mice for 21 days of treatment every morning.

Population and Sample. The population in this study was male white rats (*Rattus norvegicus*) of the Wistar strain. The samples in this study were male white Wistar rats aged 8 - 12 weeks, obtained from the Inter-University Research Center for Food and Nutrition Research Laboratory (PAU) Gadjah Mada

University (UGM) Yogyakarta. The number of experimental animals used in this study was determined using the Faderer formula (Faderer, 1991), so that a sample of 4 mice was obtained.

The minimum number of experimental animals used is 4 animals. To avoid a shortage of experimental animals, 1 animal will be added to each treatment group so that 25 experimental animals are needed. The sampling technique for 20 mice was carried out by random sampling, divided into 5 groups. This random sampling technique ensures that each mouse has an equal chance of being selected for a treatment group. By adding one animal to each group, the researchers can ensure that there are enough animals to accurately represent the population and obtain reliable results.

The inclusion criteria in this study were first, male Wistar white rats aged 8 – 12 weeks with a body weight range of 140 – 200 g. Second, triglyceride levels in the blood > 150 mg/dL. Third, blood glucose levels  $\geq$  200 mg/dl after the fourth STZ induction. Rats are healthy, have no anatomical abnormalities and appear active. Meanwhile, the sample exclusion criteria were first, mice that looked sick (inactive movements), second, mice with extreme weight loss (>10%) before treatment. Third, mice died before and during treatment.

Before the analysis is carried out, the data that has been collected is checked for data completeness, coding, tabulated and entered into the computer. Data analysis includes descriptive and inferential statistical analysis. Descriptive analysis of data on changes in rat body weight, blood glucose levels and triglyceride levels expressed as mean and standard deviation. Data is presented in tabular form. The primary data in this study was data on changes in the mice's body weight, and changes in triglyceride levels between treatment groups were obtained from the results of laboratory examinations over 21 days. Laboratory data were analyzed statistically using the Repeated Anova test to determine the results of changes in the weight of mice and triglyceride levels in the blood of white mice. This analysis was tested using SPSS 16 software. Data from the analysis of rat body weight, changes in rat weight, and triglyceride levels in the experiment were presented in tabular form and narrated. Research reliability was assessed by calculating the Cronbach's alpha coefficient for the variables measured in the study. The results showed high internal

consistency, indicating that the data collected was reliable. Additionally, the researchers also conducted a post-hoc analysis to determine any significant differences between the treatment groups in terms of body weight and triglyceride levels.

The ethical test for this research, with number 003//KEPK/-J/XI/2019 from the Poltekkes kemenkes Jayapura, has been passed. Poltekkes Kemenkes Jayapura's ethical test makes sure the study complies with moral standards and protects participants' rights and welfare. This permission shows how dedicated the researchers are to carrying out their investigation in a morally and responsibly manner. By obtaining ethical approval, the researchers have demonstrated their commitment to upholding ethical principles and

ensuring the well-being of the participants involved in the study. This approval also provides assurance that the research will be conducted with integrity and respect for all individuals involved.

## RESULTS

The effect of giving Moringa leaf extract on rat weight and triglyceride levels in the blood on changes in rat weight. For changes in rat weight, the repeated ANOVA test was used to find out the difference between samples that took more than two measurements. Based on the results of measuring changes in rat weight using the repeated ANOVA test.

**Table 1. Effect of giving Moringa leaf powder on changes in body weight in experimental mice.**

BB Rat (gr)	Control Negative	Control Positive	Treatment I	Treatment II	Treatment III	p value
Initial Condition	175,60 (4,45)	171,20 ( 8,10)	180,20(11,96)	172,00 (12,39)	180,80(11,30)	
Pretreatment	180,80 (4,32)	174,60 (8,05)	184,20 (13,25)	175,40 (12,83)	184,40 (11,61)	
Initial DM	177,40 (5,03)	171,60 (8,50)	180,00(12,51)	172,40 (12,58)	180,40 (11,32)	
Day 9	174,20 (4,76)	177,00 (8,97)	184,20 (12,31)	177,20 (12,73)	185,60 (10,35)	0,001
Day 15	170,20 (4,55)	183,20 (8,64)	186,20 (13,14)	183,00 (11,81)	193,40 (11,54)	
Day 21	166,40 (4,77)	189,80(8,64)	190,60(15,24)	188,40(12,13)	199,00(10,97)	
Changes for 21 days	-14,4(0,45)	15,2 (0,41)	6,46(1,99)	13(-0,7)	14,6(-0,64)	

Based on Table 1. Using the Repeated ANOVA test, the results showed that there were differences in each treatment group with a value (Sig <0.05). In the table, the negative control was only given distilled water, the positive control was given glibenclamide 0.09 mg/200 g BW of mice, while treatments I, II and III were given extract from Moringa powder at doses of 200, 300 and 400 mg/kg BW of mice. So it can be said that there is an influence of giving Moringa leaf powder on changes in body weight of experimental mice. The most prominent

changes in body weight were observed in mice given treatment III with an increase of 14.6 grams when compared to pre-treatment in the same group. The results of the study showed that there was a significant effect of administering Moringa leaf powder on changes in body weight in experimental mice. This can be seen from the most significant increase in body weight occurring in mice given treatment III with an increase reaching 14.6 grams compared to before treatment.



**Table 2. Average blood glucose levels**

Glucose (gr)	Control Negative	Control Positive	Treatment I	Treatment II	Treatment III	p value
Initial Condition	71,41 (6,21)	177,42 (4,51)	73,44(1,23)	67,56 (3,06)	71,96(2,80)	0,001
Pretreatment	231,75 (2,08)	232,48 (3,48)	232,33 (2,48)	233,58 (3,86)	237,30 (5,92)	
Initial DM	233,40 (1,89)	189,58 (3,07)	205,48 (2,77)	190,41 (3,18)	186,80 (1,22)	
Day 9	236,74(4,37)	132,65 (3,53)	177,42 (2,77)	142,95 (2,99)	136,97 (3,14)	
Day 15	240,54 (7,53)	117,61(1,52)	148,11(2,88)	132,68(1,77)	199,70(1,79)	
Day 21	8,79(5,45)	-114,87(1,96)	-84,22(0,4)	-100,9(-2,09)	-37,6(-4,13)	

Based on the results of measuring changes in glucose levels using the repeated ANOVA test, a p value of 0.001 was obtained so that it could be concluded that there were differences in the average blood glucose levels in each sample and there was an effect of giving Moringa leaf powder on changes in the blood glucose levels of mice. The highest reduction in

glucose was achieved in the positive control group, reaching -114.87 when compared with pre-treatment in the same group. The results showed that administering Moringa leaf powder had a significant effect in reducing blood glucose levels in mice. This can be the basis for developing therapy using Moringa leaves as an alternative treatment for diabetes.

**Table 3. Effect of Moringa leaf extract on changes in triglyceride levels in experimental rats**

Triglyceride (gr)	Control Negative	Control Positive	Treatment I	Treatment II	Treatment III	p-value
Initial Condition	127,26 (10,18)	129,30 (4,78)	118,99(5,32)	120,41 (5,19)	131,95 (6,90)	0,001
Pretreatment	162,37 (11,05)	176,09 (9,58)	167,88 (8,08)	165,66 (10,26)	165,37 (10,86)	
Initial DM	114,20 (3,10)	83,95 (2,19)	105,30 (1,93)	98,79 (2,51)	91,02 (1,95)	
Day 9	115,98 (3,04)	80,80 (2,16)	102,00 (1,26)	93,49 (3,24)	85,78 (3,07)	
Day 15	119,01 (1,90)	73,49(2,49)	98,37(2,20)	87,91(1,62)	79,01(3,14)	
Day 21	-43,36 (-9,15)	-102,6	-69,51(-5,88)	-77,75(-8,64)	-86,36(-7,72)	

Based on Table 3, using the Repeated ANOVA test, the results showed that there was an effect of Moringa leaf extract on changes in Triglyceride levels in Experimental Rats with a p value of 0.001. The highest reduction in triglyceride levels was achieved in treatment group III, reaching -86.36 when compared to pre-treatment in the same group. These results show that Moringa leaf extract can significantly reduce triglyceride levels in experimental mice. These findings show the potential for using Moringa leaf extract as an alternative therapy to overcome the problem of high triglycerides. Apart from that, this research also shows that a

significant reduction in triglyceride levels occurred after administering Moringa leaf extract for a certain period of time. This shows that regular use of Moringa leaf extract can provide benefits in reducing triglyceride levels in experimental mice.

The experimental mice used in this research were Wistar white *Rattus norvegicus* mice aged 8 - 12 weeks with a body weight range of 140 - 200 g, which were obtained from the Laboratory of the Center for Food and Nutrition Studies, PAU UGM Yogyakarta. The number of mice used in this study was 25, where each treatment consisted of 5 mice. The

average body weight of experimental mice at the beginning of adaptation, at the beginning of pre-treatment and at the beginning of STZ induction was  $175.96 \pm 9.64$  grams,  $179.88 \pm 10.01$  grams and  $176.36 \pm 9.98$  grams. Experimental mice were selected based on age and body weight according to research criteria. The mice were obtained from the Center for Food and Nutrition Studies Laboratory, PAU UGM Yogyakarta to ensure the quality and uniformity of the mice used in this research.

The results of the statistical analysis showed that there were differences in the average body weight in the 5 times the experimental mice's body weight data were collected between the treatment groups. This means that the body weight status of experimental mice was homogeneous before treatment with Moringa leaf extract. The increase in body weight of experimental mice after being induced by STZ was shown in the positive control treatment group, treatment I, II and treatment III, while for the negative control there was a decrease in body weight in experimental mice after being induced by STZ (negative control = -14.4; positive control = 15.2 ; P1 = 6.46 ; P2 = 13 ; P3 = 14.6 ).

The induction of STZ of 65 mg/kg BW and NA of 230 mg/kg BW in the 5 groups of experimental mice caused the emergence of several characteristics of diabetes mellitus such as the mice looking sick, experiencing polyuria, weight loss (negative control). In addition, mice also showed a significant increase in blood glucose levels and ketonuria. This shows that the induction of STZ and NA in the experimental group of mice succeeded in producing diabetes mellitus conditions similar to humans. After streptozotocin induction, muscle atrophy occurs accompanied by a decrease in skeletal muscle mass and loss of structural protein due to the absence of carbohydrates used in energy metabolism, resulting in weight loss. Apart from that, post-induction streptozotocin can also cause a decrease in blood glucose levels and impaired pancreatic function. This is caused by damage to the pancreatic beta cells which produce insulin, thereby disrupting glucose regulation in the body<sup>21</sup>.

Induction of STZ in diabetic mice is associated with a characteristic loss of body

weight caused by muscle wasting and due to loss of tissue protein<sup>22</sup>. In addition, STZ induction can also cause an uncontrolled increase in blood glucose levels, due to damage to pancreatic cells that produce insulin. This causes diabetic mice to be more susceptible to long-term complications such as kidney problems and nerve damage<sup>23,24,25</sup>.

The weight loss of diabetic mice may be due to dehydration and increased fat and protein catabolism, leading to muscle wasting, possibly also contributing to the weight loss in diabetic mice<sup>26,27</sup>. In addition, increased insulin secretion can also result in increased protein synthesis due to its anabolic effect. Apart from that, increasing insulin secretion can also increase the use of glucose by body cells, reduce blood sugar levels, and inhibit fat formation. It may also contribute to weight loss in diabetic mice<sup>28,29,30</sup>.

The decrease in the amount of insulin produced by  $\beta$  cells in the cells of the islets of Langerhans experienced by mice injected with STZ means that the blood glucose produced by digestion cannot be utilized by body cells<sup>31</sup>. The body cannot utilize glucose as an energy source, so the body uses energy reserves from protein and body fat. This causes weight loss. Apart from that, weight loss can also be caused by increasing the body's metabolism in an effort to produce enough energy. This process can cause fatigue and weakness in mice that experience a decrease in insulin levels<sup>32</sup>.

The results of examining triglyceride levels in rats induced by Moringa leaf powder showed that there was an effect of administration in each treatment which had been tested using a statistical test which had a significant value of  $<0.05$  in each administration of Moringa powder at different doses which had an average that reached the limit value. normal triglyceride levels. The results show that the average triglyceride levels of experimental mice at the beginning of adaptation, at the beginning of pre-treatment and at the beginning of STZ induction were 125.58 grams, 167.47 grams, 98.65 grams. The results of the examination also showed that mice given a higher dose of Moringa leaf powder had lower triglyceride levels compared to mice given a lower dose. This shows that there is a dose effect on reducing triglyceride

levels. The decrease in triglyceride levels in experimental mice showed that treatment III was very close to the normal limit, namely 110.62 mg/dl, while treatment II was 113.25 and treatment I was 118.50 mg/dl.

Diabetes mellitus sufferers will notice changes in their body metabolism, the most significant of which is related to fat, specifically increasing fat metabolism by increasing the amount of fat broken down by ketones and reducing the amount of fat in serum and triglycerides. Due to its significant lipid metabolism, diabetes mellitus is often referred to as a disorder of fat metabolism. Increased lipid metabolism in diabetes mellitus sufferers can also increase the risk of cardiovascular disease, such as stroke and heart disease. Additionally, serious cases of metabolic acidosis can be caused by increased levels of ketone bodies in the body<sup>33</sup>. These increased ketone levels can cause a condition called diabetic ketoacidosis, which is a potentially life-threatening complication of diabetes. Diabetic ketoacidosis occurs when the body lacks insulin, causing a buildup of ketones and a decrease in pH levels. It is important for people with diabetes to monitor their ketone levels closely and seek medical attention if they experience symptoms such as excessive thirst, frequent urination, nausea, or stomach pain.

For people with diabetes mellitus, there is a change in the conversion of glucose into fatty acids in the depot due to intracellular glucose deficiency<sup>34</sup>. Insulin inhibits hormone sensitive lipase in adipose tissue, and without this enzyme plasma free fatty acid levels more than double. Increased glucagon also increases fatty acid mobilization<sup>35,36</sup>. So, in diabetes mellitus sufferers, free fat levels in parallel with blood glucose levels are a good indicator of the severity of diabetes mellitus. Apart from that, increasing levels of free fatty acids in the blood can also cause more severe insulin resistance in people with diabetes mellitus. This can worsen blood sugar control and cause long-term complications such as heart disease and other organ damage.

Diabetes mellitus is sometimes more accurately described as a metabolic disorder resulting from impaired glucose metabolism rather than carbohydrate metabolism. Reduced metabolism in diabetes mellitus sufferers can

increase the risk of kidney disease. In addition, free fatty acid levels in the blood through mealtime rituals and exercise can help increase tissue sensitivity to insulin and control diabetes. Individuals with diabetes mellitus often experience increased levels of triglycerides in their bloodstream<sup>37</sup>. This further supports the potential relationship between triglycerides and diabetes. Additionally, adopting a healthy lifestyle that includes regular physical activity and a balanced diet can help improve insulin sensitivity and manage diabetes effectively<sup>38</sup>.

Under normal circumstances the body uses glucose as an energy source. In conditions of insulin resistance, hormone-sensitive lipase will become active so that triglyceride lipolysis in adipose tissue increases. This situation will produce excessive free fatty acids. Free fatty acids will enter the bloodstream, some will be used as an energy source and others will be taken to the liver as raw material for the formation of triglycerides. In the liver, free fatty acids are converted back into triglycerides and become part of VLDL. VLDL is a lipoprotein that transports triglycerides from the liver to other body tissues. Excessive VLDL production can cause fat to build up in the arteries and increase the risk of cardiovascular disease. Excessive fat buildup in the arteries can lead to atherosclerosis, a condition characterized by narrowing and hardening of the arteries. This can restrict blood flow and increase the risk of cardiovascular events such as heart attack or stroke. Therefore, maintaining a balance in VLDL production is very important to prevent cardiovascular disease<sup>13</sup>.

The use of Moringa leaf extract has the effect of reducing triglyceride levels by 400 mg. The best dose used was 400mg in this study. The difference in triglyceride levels before and after administration of Moringa leaf extract is caused by the presence of active substances in Moringa such as alkaloids, flavonoids, tannins and saponins. This active substance has a positive effect in reducing triglyceride levels in the body. Apart from that, research also shows that consistent use of Moringa leaf extract at a dose of 400 mg can provide significant results in reducing triglyceride levels. Furthermore, the study found that a reduction in triglyceride levels was observed in participants who consistently consumed a 400 mg dose of

Moringa leaf extract over a certain period of time. This suggests that maintaining regular doses of Moringa leaf extract can lead to a sustained increase in triglyceride levels.

Moringa leaves act as antihyperlipidemia because they contain alkaloids, saponins, phytosterols, tannins, phenolics and flavonoids. Flavonoids in Moringa leaves prevent LDL oxidation and inhibit HMG-CoA Reductase activity<sup>39</sup>. Moringa leaves also contain vitamin C which plays a role in fat metabolism. The active compounds in Moringa leaves have very strong antioxidant activity and are able to prevent LDL from being oxidized. Apart from that, Moringa leaves also have anti-inflammatory effects which can reduce inflammation in blood vessels and prevent cardiovascular disease<sup>40</sup>. The phytosterol content in Moringa leaves can also help reduce cholesterol levels in the blood. In addition to its antioxidant properties, the saponins found in Moringa leaves have been shown to have potential anticancer effects<sup>41</sup>. This compound can inhibit the growth of cancer cells and induce apoptosis, making Moringa leaves a promising natural medicine for the prevention and treatment of cancer. In addition, the tannins in Moringa leaves are known to have antimicrobial properties, which can help protect against various bacterial and fungal infections<sup>42</sup>.

## CONCLUSION

The best dose of Moringa leaves for losing weight and reducing triglyceride levels in mice is 400 mg/kg body weight of mice. Meanwhile, the best dose to reduce glucose levels in mice is glibnclamide 0.09 mg/kg body weight of mice and Moringa leaf extract at a dose of 300 mg/kg body weight of mice. There was an effect of administering Moringa leaf extract on body weight, glucose levels, and triglyceride levels in white Wistar rats with type 2 diabetes induced by STZ (streptozotocin) with a p value of 0.001 for each variable. However, it should be remembered that the results of research on rats are not necessarily reliable. directly applied to humans. Therefore, further research and trials on humans are needed to ensure the effectiveness and safety of using Moringa leaves in reducing body weight and

triglyceride and glucose levels. The next research suggestion is to conduct clinical studies involving human participants. Clinical studies may provide stronger evidence of the effectiveness of Moringa leaves in reducing body weight and triglyceride and glucose levels in humans. Apart from that, it is also important to pay attention. The implication to human health and potential side effects of consuming Moringa leaves should be thoroughly investigated. This includes monitoring any adverse reactions, assessing long-term effects, and determining the appropriate dosage for different individuals. Additionally, it would be beneficial to compare the results of Moringa leaf consumption with other existing weight loss and glucose control methods to evaluate its comparative effectiveness.

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## Quality and Pattern of Breakfast Through the GEMPITA PROGRAM at Palu City, Central Sulawesi

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### ABSTRACT

Many school-aged children in Indonesia still skip breakfast, which can have an impact on their learning concentration and academic performance at school. This study aims to describe the quality and pattern of breakfast through the GEMPITA Program at Palu City, Central Sulawesi. This was a descriptive study with a sample size of 228 elementary and junior high school students in Palu City. Data collection was performed through interviews using structured questionnaires and anthropometric measurements. The study results show that the majority of respondents had pocket money of more than IDR 5,000/day, came from families with fathers of senior high school graduates and non-civil servants, the mothers generally had primary and secondary education and were housewives. Furthermore, the majority of respondents had a routine breakfast habit by 57.9%, 20.2% had breakfast sometimes and 21.9% never had breakfast. Furthermore, only 32.9% had quality breakfast menu. Regarding snack consumption habit, the majority of respondents by 77.2% consumed snacks more than three times a week and more than half of respondents by 58.3% had the habit of bringing packed meal, while 41.7% never brought packed meal. An assessment of the nutritional status of respondents showed that there were still 33.3% who were undernourished and 7.9% who were over nourished and obese. Stunting status occurred in 18.9% of respondents. The breakfast habit, quality and pattern of elementary and high school students still need to be improved. The GEMPITA program is an alternative program to improve the pattern and quality of breakfast for elementary and high school-aged children in Palu City.

**Keywords:** Breakfast, School-Aged Children, GEMPITA Program

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### INTRODUCTION

Breakfast is the activity of eating after a long period of fasting and sleeping at night which is the most important part of daily life <sup>1</sup>.

Breakfast will provide energy to carry out activities and contribute at least 26% to daily energy intake <sup>2</sup>. Breakfast is important for school-aged children to meet daily energy needs during the process of learning, thinking,



analyzing and doing activities.

The behavior of skipping breakfast is common among school-aged children and teenagers in Indonesia. A study that observed breakfast consumption among 2,629 Indonesian children aged 2–12.9 years found that only 31.6% had quality breakfast. Children with lower socioeconomic conditions tended to consume breakfasts with poor nutritional quality and only 10% of teenagers enjoyed a high-quality breakfast<sup>3</sup>.

Breakfast habit are related to school academic performance. A previous study conducted in Ethiopia explained that there was a correlation between breakfast and academic achievement and skipping breakfast could reduce academic performance, cognitive abilities as well as behavioral aspects<sup>4-6</sup>. Students who skipped breakfast had lower levels of school achievement<sup>7-9</sup>. Another study conducted in China further revealed that students' low frequency of breakfast was related to lower performance on the 20m shuttle sprint test to assess the strength, flexibility, speed and endurance of intermediate athletes<sup>10</sup>.

A good breakfast considers the quality of the food eaten. This is important since poor quality breakfast for school-aged children will also worsen health conditions. A study conducted in poor rural areas of Hubei Province, China, showed that 79.7% of elementary and middle school school-aged children had breakfast, but the nutritional quality of breakfast was poor, especially among female students and elementary school students<sup>9</sup>. The quality of breakfast for school-aged children could influence the physical activity and nutritional status of school-aged children<sup>11</sup>. In addition, a good quality breakfast could prevent weight gain among children and teenagers which was related to overweight and obesity<sup>12</sup>. A good quality breakfast should provide good quality nutrition or diet to support health performance and it was found to reduce the risk of insulin resistance (IR) since an early age among school-aged children<sup>13</sup>.

In Indonesia, the rate of malnutrition among school-aged students was still quite high. Elementary school students in Indonesia had many problems in daily consumption of breakfast and vegetables<sup>14</sup>. A study conducted in America showed that school-based culinary courses could increase the eating literacy of school-age children and improve their eating behavior. This study determines the impact of a

school-based culinary program on food literacy and consumption of vegetables, fruit, and breakfast among students aged 9 and 10 years<sup>15</sup>. Breakfast programs in collaboration with school canteens must be implemented comprehensively, and it should be linked to a food security and nutrition approach and designed and implemented in accordance with the food needs and specific socioeconomic needs of each region<sup>16</sup> and implemented in a consistent and flexible manner<sup>17</sup>. The school canteen is considered appropriate to provide breakfast for school-aged children<sup>18-26</sup>.

The Central Sulawesi Provincial Health Office, in collaboration with the Palu City Education Office, Al-Khairat University and the Palu Patkin Health Polytechnic, implemented the GEMPITA program (Mangande Padondo ante Kita Movement or the Joint Breakfast Movement) at School. The implementation of Breakfast Program for School-aged children was based on Central Sulawesi Province Regional Regulation Number 4 of 2021 concerning the Implementation of Regional Innovation. This movement aims to improve the pattern and quality of breakfast among school-aged children. The current study aims to describe the quality and pattern of breakfast through the GEMPITA Program at Palu City, Central Sulawesi.

## METHOD

This was a descriptive study conducted in September-October 2023. The study samples were selected using total sampling technique which involved 228 school-aged children aged 7-16 years. The data collected were characteristics including age, gender, parental education and pocket money. In addition, data on knowledge on nutrition and breakfast, nutritional status, stunting condition, breakfast habit, breakfast quality, snack consumption, and habit of bringing packed meal were also collected.

Data collection on children's characteristics, knowledge, quality and breakfast patterns were performed through interviews using structured questionnaires, while data on nutritional status were collected through anthropometric measurements. Knowledge about breakfast was categorized as poor if the percentage of correct answers was <60%, moderate if the percentage of correct

answers was 60-80% and good if the percentage of correct answers was >90%. BMI/Age nutritional status data was processed based on Z-Score values using the WHO AntroPlus application. Breakfast quality data was categorized as a quality breakfast if the breakfast menu contained 4 food ingredients consisting of carbohydrate sources, animal protein, vegetable protein and vegetables. Data analysis was carried out descriptively using the JASP statistical application.

Interventions through the GEMPITA Program were provided over a period of 20 days. Menu variations used a 5 day menu cycle. Breakfast was provided before 10.00 am. The average energy for this breakfast was  $\pm 500$  kcal. The menu given on day 1 consisted of white rice, fish with green chili sauce, clear spinach, carrots, fried tofu. Day 2 menu consisted of white rice, meatball soup, gambas and corn fritters. Day 3 menu consisted of white rice, flour fried chicken, tomato sauce, and stir-fried cauliflower and carrot. Day 4 menu consisted of white rice, vegetable omelette, tempeh with soy sauce, and sautéed water spinach. Day 5 menu consisted of white rice, chopped chicken with sweet and sour sauce, capcay, and fried tempeh.



**Figure 1. Intervention Menu Day 1**



**Figure 2. Intervention Menu Day 2**



**Figure 3. Intervention Menu Day 3**



**Figure 4. Intervention Menu Day 4**



**Figure 5. Intervention Menu Day 5**

## RESULTS

The age range of respondents in this study was around 7-16 years with the majority frequency of 7-12 years by 124 children (54.4%). Gender was dominated by female as many as 115 children (50.6%). The majority of fathers' education was senior high school as many as 78 people (35.1%) and the majority of mothers' education was elementary school as many as 78 people (34.2%). The majority of fathers' occupation were dominated by non-civil servants/TNI/Police as many as 189 people (82.9%) while the majority of mothers' occupation were dominated by working at home or as housewives as many as 193 people (84.6%) (Table 1).

The majority of school-aged children had pocket money of >Rp. 5,000 (77.6%). The category of knowledge on breakfast was dominated by good knowledge (>90%) as many as 123 people (53.9%). The classification of nutritional status (BMI/Age) and (Height/Age) was applied in accordance with WHO in 2007 which included 4 categories, namely Under Nutrition ( $-3 \leq SD < -2$ ), Good Nutrition ( $-2 \leq SD < +1$ ), Over Nutrition ( $1 \leq SD < +2$ ), and Obesity ( $> +2SD$ ). Based on this classification, the results showed that the majority of samples in this study were classified as having good or normal nutritional status, namely 134 people (58.8%). Meanwhile, nutritional status (Height/Age) category found 43 stunted children (18.9%) (Table 1).

**Table 1. Characteristics of the Study Samples.**

Variable	Total	
	N	%
<b>Age</b>		
7-12	124	54.4
13-16	104	45.6
<b>Gender</b>		
Male	113	49.5
Female	115	50.5
<b>Father's Education</b>		
College	10	4.4
SHS	78	35.1
JHS	45	20.2
Elementary	70	31.5
No Formal Education	19	8.5
<b>Mother's Education</b>		
College	15	6.5
SHS	70	30.7
JHS	55	24.1
Elementary	78	34.2
No Formal Education	10	4.4
<b>Father's Occupation</b>		
Civil	6	2.6
Servants/TNI/Police		
Non Civil	189	82.9
Servants/TNI/Police		
Unemployed	33	14.5
<b>Mother's Occupation</b>		
Civil	7	3.1
Servants/TNI/Police		

Non Civil	28	12.3
Servants/TNI/Police		
At home (housewife)	193	84.6
<b>Pocket Money</b>		
<IDR 5,000		
>IDR 5,000	51	22.4
<b>Knowledge on Nutrition and Breakfast</b>	177	77.6
Poor (<60%)		
Moderate (60-80%)	63	27.6
Good (>90%)	42	18.4
<b>Nutritional Status (BMI/Age)</b>	123	53.9
Under Nutrition ( $-3 \leq SD < -2$ )	76	33.3
Good Nutrition ( $-2 \leq SD < +1$ )	134	58.8
Over Nutrition ( $1 \leq SD < +2$ )	12	5.3
Obesity ( $> +2SD$ )	6	2.6
<b>Nutritional Status (Height/Age)</b>		
Stunting	43	18.9
Non-Stunting	185	81.1

Source: Primary Data, 2023

Regarding breakfast habit, it was shown that the majority of respondents (57.9%) had routine breakfast, while the rest only had breakfast sometimes (20.2%), and 21.9% never had breakfast. Data on breakfast quality showed that the majority of respondents had a poor quality breakfast. 32.9% of respondents had a quality breakfast menu, while 67.1% had non-quality breakfast menu. Data on snack consumption revealed that the majority of respondents (77.2%) consumed snacks more than three times a week, while 22.8% consumed snacks occasionally, namely three times or less a week. Such findings indicated that the frequency of snack consumption among respondents was quite high. Data on the habit of bringing packed meal showed that more than half of respondents (58.3%) had the habit of bringing packed meal, while 41.7% did not bring packed meal. This can be interpreted that most respondents had the habit of bringing packed meal as part of their diet (Table 2).

**Table 2. Habit and Quality of Breakfast**

Variable	Total	
	N	%
<b>Breakfast Habit</b>		
Often (routine)	132	57.9
Sometimes	46	20.2
Never		21.9
<b>Breakfast Quality</b>		
Good	75	32.9
Poor	15	67.1
<b>Snack Consumption</b>		
Frequent (>3x/week)	17	77.2
Occasionally (≤3x/week)	6	22.8
<b>Habit of bringing packed meal</b>		
Yes	133	58.3
No		41.7

Source: Primary Data, 2023



**Figure 6. GEMPITA Program Recipients**



**Figure 7. GEMPITA Program Recipients**

School-aged children are in an age group that requires good nutritional intake to increase their growth and development. It is important to pay attention to the quality and consumption patterns of food. The period of growth and development at school age is influenced by the consumption of quality food.

Quality food plays a direct role in the process of physical growth, development of the nervous system and brain, and the level of intelligence of children. Optimizing the nutritional status of school-aged children has the potential to produce quality human resources<sup>27</sup>.

Our findings showed that mother's education was better than father's education, this is a modality in the possession of knowledge about nutrition and child care<sup>28,29</sup>. Our further finding revealed that even though mother's education was higher than father's education, there were 84.6% of housewives who worked at home, this allowed children to get breakfast, because mothers did not work outside the home. A previous study found that breakfast consumption was closely related to family support factors. Parents who had higher education are expected to have good literacy regarding breakfast habits and behavior so that children may not skip breakfast<sup>30</sup>. Children of mothers with a high level of education were more likely to eat breakfast every day than children of mothers with a low level of education<sup>28,31</sup>.

The type of employment of parents can influence the quality of school-aged children's breakfast in several ways. This is related to parents' income, which determines children's breakfast habits. A previous study showed that the effect of income was closely related to food purchasing power. Such findings indicated that socioeconomic factors in the family significantly contributed to breakfast consumption<sup>32</sup>. Additionally, the type of work of parents can influence their ability to provide time and resources for their children's breakfast. For example, parents with demanding or irregular work schedules may find it difficult to ensure their children get a healthy breakfast every day. Long work hours or early morning shifts may limit parents' time in preparing breakfast for children or monitoring their breakfast habit. In some cases, financial constraints associated with certain types of work can also impact the quality of breakfast parents can give children.

The relationship between pocket money and the quality and pattern of breakfast among school-aged children might vary depending on cultural, social, and economic factors in the family<sup>33</sup>. A study conducted at the West Bank found that breakfast consumption was not significantly related to pocket money<sup>34</sup>. However, the study did not specifically address



breakfast quality or how pocket money may influence breakfast patterns.

Knowledge on breakfast can significantly influence the quality and breakfast pattern among school-aged children. Good knowledge on nutrition, choosing healthy snacks in the school canteen and the importance of breakfast among students would encourage children to not skip breakfast<sup>35</sup>. Good literacy among school-aged children could also increase understanding of knowledge and the habit of not skipping breakfast before going to school<sup>36</sup>. The role of comprehensive schools and canteens could may increase nutritional literacy, food consumption, as well as attitudes and structure of students' eating patterns in improving eating habits and choosing healthy snacks<sup>23,37</sup>. Social support from cross-sector roles such as community organizations, city government, police, educational institutions and mass media were considered to have an impact on increasing students' nutritional and health knowledge regarding breakfast habit<sup>38</sup>.

Under nutrition status of 33.3% indicated the importance of the need for implementing intake interventions. The breakfast intervention was chosen because this intervention is easier to observe and control compared to interventions in the form of lunch and dinner. It is expected that breakfast intervention can provide sufficient energy to carry out activities since it was found to contribute at least 26% to school-aged children's daily energy intake (39). Findings related to malnutrition status based on BMI/Age were more numerous than stunting status based on Geight/Age (33.3% vs 18.9%), indicating that acute problems were greater than chronic problems. The right menu composition to overcome the problem is by providing intervention in the form of 60% carbohydrates, 15% protein and 25% fat<sup>17</sup>.

The quality and pattern of a good breakfast could influence the level of health and had a positive impact on children's physical and mental health, energy and cognitive abilities<sup>11,39-45</sup>. A quality breakfast consisting of 4 stars, namely food sources of carbohydrates, animal protein, vegetable protein, vegetables and fruit, is the key to a quality breakfast menu<sup>46</sup>. A good breakfast provides important nutrients from macronutrients for children's growth and development, including fiber, potassium, calcium, vitamins C and D, folate, iron, zinc and magnesium which contribute an

average of around 474 kcal of energy<sup>39,47</sup>. Moreover, a good breakfast was able to control blood glucose levels, fulfill daily intake earlier, prevent overweight and obesity and reduce the risk of other metabolic diseases<sup>41,44,48-50</sup>. A good breakfast pattern includes various aspects to ensure children get adequate nutrition, the energy they need, and have healthy eating habits<sup>40-42</sup>.

Several studies have explored the relationship between snack consumption and breakfast habit. A study conducted in Portugal during the lockdown due to COVID-19 found a positive relationship between snack consumption and breakfast consumption. The habit of skipping breakfast seemed to be related to changes in snack consumption<sup>51</sup>. In addition, the habit of consuming snacks excessively or as a substitute for breakfast could have a negative impact on health due to imbalanced nutrition obtained, so that skipping breakfast was related to a lack of vitamin and mineral intake<sup>52,53</sup>.

The habit of bringing packed meal to school, especially a healthy breakfast, is related to school-aged children's learning achievement through its impact on nutrition, energy levels and cognitive function. Previous studies showed that healthy eating habits, including regular breakfast consumption, were related to higher perceived school performance, academic performance and cognitive control among teenager<sup>4,5,33,54</sup>. School-based breakfast programs are important in supporting improvements in the quality and pattern of breakfast for school-aged children. School-based breakfast programs has been implemented in various countries to meet nutritional needs, get a quality breakfast and a varied menu, save money, increase preferences for breakfast habit and provide benefits for students from low-income families<sup>17,40,55</sup>.

Improvement in breakfast habit and the quality of school-aged children's breakfast requires serious concern in Indonesia since the rate of malnutrition among school students was still quite high. Elementary school students in Indonesia have many problems in consuming breakfast and vegetables daily<sup>14</sup>. The Indonesian government, through Minister of Health Regulation Number 41 of 2014 concerning Guidelines for Balanced Nutrition, emphasizes the importance of breakfast as a special message for balanced nutrition for school-aged children. Breakfast programs in collaboration with school canteens must be

implemented comprehensively, and it should be linked to a food security and nutrition approach and designed and implemented in accordance with the food needs and specific socioeconomic needs of each region<sup>16</sup> and implemented in a consistent and flexible manner<sup>17</sup>.

The GEMPITA program is an alternative program based on Central Sulawesi Province Regional Regulation Number 4 of 2021 concerning Implementation of Regional Innovation to improve the pattern and quality of school-aged children's breakfast in Palu City. Fulfillment of breakfast for a period of 20 days provided to school and junior high school-aged children had a direct impact on student participation, fulfillment of quality breakfast intake, active participation from the canteen and school, as well as responsive support from parents to support the implementation of this alternative program.

## CONCLUSIONS

Data regarding breakfast habit revealed that there were still students who had breakfast sometimes and never had breakfast. Most of the breakfast menu consumed was not of good quality. Data regarding snack consumption habit also showed that most of students consumed snacks more than three times a week. Furthermore, almost half of respondents had the habit of not bringing packed meal to school. School breakfast programs can be an alternative solution in improving the quality and pattern of breakfast among school-aged children. Implementation of this program can meet intake needs, provide quality breakfast, and provide benefits for students, especially those from low-income families. The habit of bringing packed meal to school, especially a healthy breakfast, was closely related to learning achievement. The GEMPITA (Joint Breakfast Movement at Schools) program in Palu City is a local solution to improve the pattern and quality of breakfast.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Original Article

***Ethical Issues in Global Pandemic Covid-19: Attitudes and Perceptions of the People of Bandung City Toward Contact Tracing and the Confidentiality Issues it Can Raise***

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**ABSTRACT**

*The COVID-19 pandemic has created an innovative space for technology to become a solution, which, if implemented effectively, can help reduce the negative impact of the pandemic on society. For example, contact tracing, which if done manually, requires more resources and takes a lot of time, even though the spread of COVID-19 is happening very quickly, so a faster task force response is also needed. This research aims to determine public perceptions of confidentiality issues that may arise from implementing COVID-19 contact tracing, as well as public attitudes towards implementing COVID-19 contact tracing. This research will use a quantitative study method using a cross-sectional method. The researchers used a phenomenological theoretical approach to find out how people view contact tracing. The results of this research show that the majority of people in Bandung City who were respondents to this research have a positive attitude towards contact tracing and support the implementation of contact tracing. Most of the people in Bandung City who were respondents to this research had a good perception of contact tracing and felt that their privacy would not be disturbed by contact tracing. So the government needs to ensure that the public can easily access the contact tracing method used. Health officials need to explain contact tracing in a way that is easy for the public to understand so that the public understands the purpose of implementing contact tracing. And the public should also seek the latest information about health and obey the recommendations of the government and health officials.*

**Keywords:** COVID-19, Contact Tracing, Confidentiality

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**INTRODUCTION**

At the end of December 2019, a pathogen was discovered that is a new type of Coronavirus variant, which was later named Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)<sup>1,2</sup>. This pathogen causes a severe respiratory syndrome defined as Coronavirus Disease (COVID-19)<sup>3</sup>. As of March 11, 2020, COVID-19 cases spread rapidly to 114 countries with the number of cases exceeding 118,000 and causing more than 4,000 deaths. Due to the high severity, rapid spread, and slow response to this phenomenon, WHO declared COVID-19 a global pandemic. WHO hopes that with this declaration every country can increase responsiveness and accelerate strategies to deal with COVID-19. As

of March 11, 2020, COVID-19 cases spread rapidly to 114 countries with the number of cases exceeding 118,000 and causing more than 4,000 deaths. Due to the high severity, rapid spread, and slow response to this phenomenon, WHO declared COVID-19 a global pandemic. WHO hopes that with this declaration, every country can increase responsiveness and accelerate strategies to deal with COVID-19<sup>4-7</sup>. Cases increased so fast that the Ministry of Health issued various policies, from Large-Scale Social Restrictions (PSBB) which was later changed to a new form of policy, namely the Regulation of Restrictions on Community Activities or PPKM, to conveying the principles of 3M, 3T, and Vaccination to control the transmission of COVID-19<sup>8-10</sup>. This concept includes the 3M health behaviors of wearing,

distancing and avoiding crowds, and washing hands with soap; accompanied by the 3Ts of testing, tracing, and follow-up; and in line with vaccination dissemination efforts<sup>10,11</sup>.

One of the main strategies to break the chain of spread and reduce mortality from COVID-19 is contact tracing accompanied by thorough testing, isolation and case management<sup>5</sup>. Contact tracing has been an important pillar in controlling infectious diseases for many years, such as in the handling of SARS in 2003 and Ebola in 2013<sup>6</sup>. Although a COVID-19 vaccine has been found, identifying the source of the disease through case tracking is still very important to detect hidden chains of transmission so that it can be more effective in controlling the spread of the SARS-CoV-2 virus<sup>5</sup>.

Pandemi COVID-19 menciptakan ruang inovasi bagi teknologi untuk menjadi solusi, dimana jika diterapkan secara efektif dapat membantu mengurangi dampak buruk pandemi terhadap masyarakat<sup>12</sup>. For example in contact tracing, which if done manually requires more resources and takes a lot of time, even though the spread of COVID-19 occurs very quickly so that a more swift task force response is also needed<sup>6</sup>.

Various technologies including GPS, Bluetooth and WIFI are used to estimate the distance and duration of interactions between individuals. The technologies used have their own advantages, such as Bluetooth which requires less cost and energy usage, and GPS which can record the location of each individual<sup>13</sup>. Then there are also other technologies used such as WiFi, RFID and NFC<sup>14</sup>.

Indonesia itself has a Sijejak feature in the pedulilindungi application as a GPS and Bluetooth-based digital contact tracking tool to alert users if they enter high-risk areas, track contacts, and record travel history. The app utilizes a signal exchange whose data is stored on the user's device for 14 days anonymously. The system will ask for consent to share the stored data with the detected close contacts if the user is identified as a confirmed case of COVID-19<sup>15</sup>.

However, each technology used will have its own risks. On the one hand, contact tracing is important because it can limit transmission and reduce mortality<sup>5</sup>. But on the other hand, a certain amount of patients' personal information will be used, while the

technology is still vulnerable to attacks, piracy, and other risks. Authorities are obliged to minimize these risks as much as possible to maintain the confidentiality of the stored data because it can have a negative impact on users, even to the point of affecting public health<sup>16</sup>. Then the technology used can also raise issues of equality where not everyone has access to the devices needed to run the technology used, and not everyone has the ability to understand the instructions in running the technology<sup>16</sup>.

Public concerns regarding contact tracing can be seen through several studies, including a cross-sectional study conducted in Jordan involving 2000 respondents. According to the study, the main concerns in the use of technology in contact tracing are the confidentiality of information (88.6%) and the use of information collected through applications (82.5%)<sup>17</sup>. While a study in the United States showed that out of 1,964 respondents, only 42% supported and used contact tracing apps<sup>18</sup>. In the European region, the acceptance rate in Germany and Switzerland is as high as 70%, but only 25%-31% of the total population downloads contact tracing apps<sup>19</sup>.

The reasons for these differing levels of acceptance range from concerns about discrimination, privacy violations, to doubts about the security of data storage<sup>20</sup>. Another factor that caused unrest in the implementation of contact tracing was the community's hesitation towards the local government in terms of data protection<sup>21</sup>. There is also the fear of stigma leading to discrimination against the identified individual<sup>22</sup>.

Regarding the aspect of personal data protection, in the Pedulilindungi application, users are given an explanation of how the application works, the terms of use, and the privacy policy where user data is guaranteed security. However, there is no explanation of which parties are responsible and have the right to process the data stored in the application<sup>23</sup>.

Another app that uses GPS and Bluetooth technology is the Aarogya Setu App released by the Government of India. The Indian government was criticized for being less transparent, but later decided to be more open about the application system they use. Malaysia also utilizes Bluetooth technology in its MyTrace app, but not much information can be obtained about user data processing<sup>24</sup>. In fact, according to WHO recommendations, users should be able to get clear information about

data collection, storage, and processing in the application so that the workings of the system used can be better understood<sup>25</sup>.

Seeing the many concerns that can arise in the community and the issues that arise in contact tracing, the researcher is interested in examining the attitudes and perceptions of the people of Bandung City regarding contact tracing and the confidentiality issues it can cause. The researcher used a phenomenological theory approach to find out how people perceive contact tracing. Phenomenological theory itself is a way of thinking to find out how a phenomenon can occur in everyday life<sup>26</sup>.

Bandung was chosen as the research location because it is the capital city of West Java, which means that the social life in this city is very dynamic and it can be said that Bandung reflects the axis of life in West Java. The results of this study are expected to be useful to illustrate for clinicians to be more careful when dealing with patients' personal information and provide understanding to the community regarding the importance of contact tracing so that better communication between clinicians and the community can increase trust in health workers. The purpose of this study was to determine community perceptions of confidentiality issues that can arise from the implementation of COVID-19 contact tracing, as well as community attitudes towards the implementation of COVID-19 contact tracing.

## METHOD

This research is part of the Ethical Issue in Global Pandemic COVID-19 research series, specifically on the topic of Ethical Issues in Confidentiality. This research will use a quantitative study method using a cross-sectional method. The quantitative research method is a systematic and methodical scientific strategy that seeks to gather evidence that can be quantified and expressed in numerical form. The primary objective of this methodology is to examine the association between variables and assess hypotheses through the application of statistical techniques. The data to be used is primary data obtained from questionnaires that will be distributed online to the people of Bandung City. At the end of this research, data will be obtained regarding the Attitudes and Perceptions of the People of Bandung City towards Contact Tracing and the Confidentiality Issues that it can cause.

The target population in this study is the people of Bandung City who have a permanent and non-permanent domicile with an age of more than equal to 18 years. To determine the sample in this study, inclusion and exclusion criteria were used. The inclusion criteria consisted of people who live permanently and temporarily in Bandung City, people aged more than equal to 18 years, people who use cellular phones, and are willing to become research respondents. While the exclusion criteria consist of students in the field of health, students in the field of information technology, and health workers. This research will use convenience sampling technique. Convenience sampling is a type of non-random or non-probability sampling where each member in the population does not have the same opportunity to participate in the study. In convenience sampling, the target population meets certain criteria such as ease of access, geographical proximity, time availability, and availability to become respondents in the study<sup>27</sup>. Samples taken can sometimes also be used based on spontaneity factors so that convenience sampling can also be referred to as accidental sampling<sup>28</sup>.

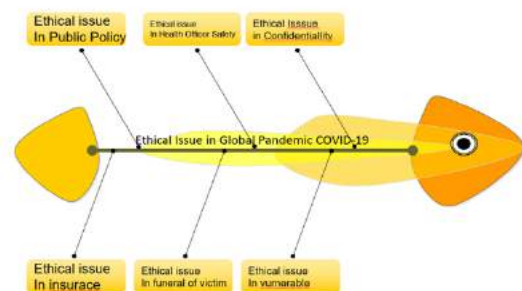


Figure 1. Research Framework

## RESULTS

### Validity Test Results

The validity test of this questionnaire involved 15 questions that were tested on 30 respondents. The data obtained is then processed using the IBM SPSS version 26 application. The question will be concluded valid if the rCount value is greater than the rTable value and declared invalid if the rCount value is smaller than the rTable value, with an rTable value of 0.361.

In the first validity test, there were 3 question items that were declared invalid, namely questions number 4, 5, and 12 because

they had an rcount value of 0.168; 0.059; and 0.193 respectively.

**Table 1. Validity Test Results 1**

Question Number	Value of r-Count	Value r-Table	Result
1	0,510	0,3494	VALID
2	0,504	0,3494	VALID
3	0,366	0,3494	VALID
4	0,168	0,3494	INVALID
5	0,059	0,3494	INVALID
6	0,540	0,3494	VALID
7	0,464	0,3494	VALID
8	0,359	0,3494	VALID
9	0,478	0,3494	VALID
10	0,593	0,3494	VALID
11	0,686	0,3494	VALID
12	0,193	0,3494	INVALID
13	0,401	0,3494	VALID
14	0,717	0,3494	VALID
15	0,404	0,3494	VALID

Based on the results obtained, changes were made to questions that had not been declared valid. The changes made are as follows:

Before	After
I am willing to share the following information with health workers if asked: Names of people encountered or had a history of physical contact during the given period Location data from mobile phones I prioritize personal freedom over the public interest	1. I am willing to share the following information with health workers if asked: i. Names of people who have been met over a period of time ii. Information on locations visited during a certain period of time, detected through a mobile phone  2. I Prioritize the public interest over personal freedom

**Reliability Test Results**

The reliability test was carried out using the IBM SPSS application. The results of this reliability test show that the Cronbach's Alpha value obtained is 0.696. This value is greater than 0.60, which means it can be concluded that the questionnaire is reliable.

**Table 2. Reliability Test Results**

Reliability Statistics	
Cronbach's Alpha	N of Items
.696	16

**Description of Research Subjects**

The following is a description of the number and percentage of research subjects based on age, gender, occupation, latest education, and monthly income.

**Table 3. Description of Research Subjects**

Variable	Frequency	Percentage
Age <sup>29</sup>		
1. 18 – 24 y.o	106	26.5%
2. 25 – 34 y.o	54	13.5%
3. 35 – 44 y.o	62	15.5%
4. 45 – 54 y.o	136	34%
5. 55 – 64 y.o	33	8.3%
6. 65 – 75 y.o	7	1.8%
7. ≥ 75 y.o	2	0.5%
Gender		
1. Male	213	53.3%
2. Female	187	46.8%
Profession <sup>30</sup>		
1. Not yet/ not working	11	2.8%
2. Housekeeping	30	7.5%
3. Student	77	19.3%
4. PNS	2	0.5%
5. TNI/Polri	0	0%
6. Retired	12	3%
7. Private Employee	26	6.5%
8. State-Owned Enterprises (SOEs)/Government-Owned Enterprises (SOEs) Employees	189	47.3%
9. Self-employed	13	3.3%
10. Teacher/Lecturer	23	5.8%
11. Others	17	4.3%
Education <sup>31</sup>		
1. Not in school	0	0%
2. Did not finish elementary school	0	0%
3. Elementary school	1	0.3%
4. Junior High School	10	2.5%
5. Senior High School	149	37.3%
6. Vocational High School	37	9.3%
7. D1/D2	7	1.8%
8. Academy/D3	25	6.3%
9. D4/S1	145	36.3%

10. S2	25	6.3%
11. S3	1	0.3%
Income per Month(32)		
1. ≤ Rp1.500.000	79	19.8%
2. Rp1.500.001 – Rp2.500.000	44	11%
3. Rp2.500.001 – Rp3.500.000	42	10.5%
4. ≥ Rp3.500.001	235	58.8%

**Table 4. Description of research subjects on factors related to contact tracing**

	Questions	Yes	No
1.	Have you previously heard the term “contact tracing”?	228	172
2.	Do you know the meaning of “contact tracing”?	166	234
3.	Have you had a contact tracing interview?	39	361
4.	Do you know the contact tracing procedure?	47	353
5.	Are you aware of the Pedulilindungi app (now SATUSEHAT)?	323	77
6.	Do you know the function of the Pedulilindungi app (now SATUSEHAT)?	279	121
7.	Are you aware of the Sijek feature in the Pedulilindungi app (now SATUSEHAT)?	86	314
8.	Do you know the function of the Sijek feature on the Pedulilindungi app (now SATUSEHAT)?	74	326

**Table 5. Respondents' Attitude towards Contact Tracers**

No.	Questions	STS	TS	S	SS
1.	I am willing to talk if any health worker contacts me regarding COVID-19 <sup>33</sup> .	20	22	229	129
2.	I am willing to report myself to health duty if confirmed positive for COVID-19 <sup>34,35</sup> .	15	14	236	135
3.	I am willing to share the following information with health workers if asked: <sup>33,36</sup>	7	30	275	88
	i. History of places visited during a certain period	8	47	259	86
		9	43	259	89

No.	Questions	STS	TS	S	SS
	ii. Names of people encountered or had a history of physical contact during the given period				
	iii. Information about the locations visited over a period of time, detected through the mobile phone				
4.	I will undergo centralized isolation (in the health facility provided) according to the time determined by health workers if exposed to COVID-19.	21	40	227	112
5.	I will undergo self-isolation according to the time determined by health workers if exposed to COVID-19.	5	15	212	168
6.	I fully support the implementation of contact tracing <sup>18</sup> .	13	35	219	133

**Table 6. Respondents' Perception of Contact Tracing**

No.	Questions	STS	TS	S	SS
<b>Privacy Issues</b>					
1.	I felt that my privacy would not be compromised by contact tracing.	24	63	242	71
2.	I feel that I have received sufficient information regarding the management of users' personal data, both in terms of digital contact tracing (pedulilindungi	16	68	239	77

No.	Questions	STS	TS	S	SS
	app) and manually.				
	<b>Technology issues</b>				
3.	I believe that the data collected in the Pedulilindungi app (now SATUSEHAT) is stored securely.	21	83	218	78
	<b>Accessibility Issues</b>				
4.	I found the Pedulilindungi app (now SATUSEHAT) easy to access and use.	10	40	267	83
	<b>Cultural Issues</b>				
5.	I prioritize the public interest over personal freedom.	6	23	258	113
	<b>Legal Issues</b>				
6.	I believe that there are laws that will protect me in the event of a personal data leak.	15	36	235	114
	<b>Volunteerism Issue</b>				
7.	I have no objection to participate in using the Pedulilindungi app (now SATUSEHAT).	6	24	251	119

## DISCUSSION

After the questionnaire was distributed, a sample of 400 people was obtained, consisting of 213 male respondents and 187 female respondents. Respondents were dominated by the age group 45-54 years, namely 136 respondents (34%).

Respondents were dominated by the final education level of high school / high school with 149 people (37.3%), followed by the D4 / S1 education level with 145 people (36.3%).

Then from the aspect of income, most respondents, as many as 235 people (58.8%), have an income of more than or equal to Rp3,500,000.00 per month.

In terms of professional background, the majority of the respondents are employees of state-owned enterprises (BUMN/BUMD), as many as 189 respondents (47.3%). Others were students (19.3%), housekeepers (7.5%), private employees (6.5%), teachers/lecturers (5.8%), self-employed (3.3%), retired (3%), not yet working (2.8%), civil servants (0.5%), and others (4.3%).

Regarding contact tracing, most respondents (57%) had heard of the term "contact tracing", but 234 respondents (58.5%) did not know the meaning of the term.

Only 39 respondents (9.8%) had undergone a contact tracing interview, while 361 had not (90.3%). It can also be seen that most respondents (88.3%) did not know the contact tracing procedure.

In contrast to the knowledge of the Pedulilindungi application, 323 people (80.3%) were aware of the application and 279 people (69.8%) knew the function of the application.

However, regarding the Sijek feature in the Pedulilindungi application, only a few people were aware of the feature (21.5%) and only a few also knew the function of the Sijek feature (18.5%).

A total of 229 respondents (57.3%) agreed and 129 respondents (32.2%) strongly agreed that they would talk if a health worker contacted them regarding COVID-19. Statements related to the willingness to report themselves to health workers if confirmed positive for COVID-19 were also dominated by answers of agree (58%) and strongly agree (33.8%).

Furthermore, regarding the willingness to share information, there are three aspects asked, namely:

1. History of places visited during a certain period
2. Names of people who have been met during a certain period of time
3. Information on the location visited during a certain period of time, which is detected through a mobile phone

Respondents' answers were still dominated by agreeing and strongly agreeing, but there were disagreeing answers of 30, 47, and 43 responses respectively, as well as strongly disagreeing answers of 7, 8, and 9 responses.

The statement regarding undergoing centralized isolation was the one that was answered the most with disagree and strongly



disagree. There were 40 people (10%) who answered disagree and 21 people (5.3%) who answered strongly disagree.

Meanwhile, the statement regarding independent isolation received a more positive response, where the answers to disagree and strongly disagree were only below 5% each. A total of 15 people (3.8%) answered disagree and 5 people (1.3%) answered strongly disagree.

More than half of all respondents, 219 people (54.8%) agreed that they fully support the implementation of contact tracing, 133 others strongly agreed. Meanwhile, 35 people disagreed, and 13 people strongly disagreed.

Respondents' perceptions of contact tracing are still dominated by positive responses from the community when you see that most people answered agree and strongly agree to the statements given. However, the number of people who answered disagree and strongly disagree was slightly higher than the statements regarding attitudes towards contact tracing, as in the data presented in the table below:

A total of 60.5% of respondents (242 people) answered agree regarding the statement that respondents felt that their privacy would not be disturbed by contact tracking. However, 15.8% (63 people) disagreed and 6% (24 people) strongly disagreed.

The same thing happened in the following statement which still touched on the issue of privacy, there were 238 respondents (59.8%) who answered in the affirmative. While those who answered disagree were 68 people (17%) and those who answered strongly disagree were 16 people (4%).

Of the total 400 respondents, regarding the issue of storing data in the application, disagreeing and strongly disagreeing statements received slightly more responses, namely 26.1% combined. 83 people disagreed, and 21 people strongly disagreed that they felt safe regarding the data collected in the Pedulilindungi application.

Respondents who agreed and strongly agreed with the next statement were more numerous than the previous statement, namely 66.8% and 20.8% or in numbers, namely 267 and 83 people. This statement is related to respondents who feel that the Pedulilindungi application is easy to access and use.

Then in this last statement, 258 respondents (64.5%) agreed that they would prioritize the public interest over personal freedom. Another 113 (28.2%) strongly agreed,

while 23 people (5.8) disagreed and 6 people (1.5%) strongly disagreed with the statement.

The majority of participants had a favourable disposition towards contact tracing. The significance of this measure in interrupting the transmission of COVID-19 and safeguarding the entirety of society was duly acknowledged. While a portion of the participants expressed their endorsement of contact tracking, a considerable number of respondents also raised apprehensions regarding the potential infringement on their privacy. The individual expressed a desire to guarantee the secure processing and storage of their personal data.

The respondents expressed a positive reception towards efforts aimed at augmenting public education and raising awareness regarding the advantages associated with contact tracing. It is widely held that enhanced access to accurate and comprehensive information can effectively mitigate privacy-related apprehensions. It is anticipated that the government and health authorities will exhibit transparency in the administration of the contact tracking programme. There was a desire among the general public to actively participate in the decision-making process pertaining to this particular policy.

## CONCLUSION

The majority of people in Bandung City who are respondents in this study have a positive attitude towards contact tracing and support the implementation of contact tracing. Most of the people in Bandung City who were respondents in this study had a good perception of contact tracing and felt that their privacy would not be disturbed by contact tracing. Therefore, there are several suggestions given, such as that the government increase efforts to socialise the function and importance of contact tracing during an infectious disease pandemic so that people understand the urgency of contact tracing. Then the government needs to ensure that the contact-tracing method used can be easily accessed by the public. Health workers need to explain in a way that is easy for the community to understand about contact tracing so that the community understands the purpose of implementing contact tracing. And also, the community should seek the latest information about health and obey the recommendations of the government and health workers. So that

further research examines the extent to which the level of education and public awareness about COVID-19 and contact tracing affects public attitudes and participation in the contact tracing programme, as well as identifying factors that affect the level of public trust and distrust of health authorities.

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## ***Predisposing Factors in Preventing The Transmission of Drug-Resistant TBC: A Qualitative Study in Jember***

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### **ABSTRACT**

*Drug-Resistant Tuberculosis (DR TB) is a form of tuberculosis caused by Mtb bacteria resistant to anti-tuberculosis drugs (OAT). The prevalence of DR TB in Jember has significantly increased over the years, and many still refuse treatment. These individuals actively spread the bacteria to people at home or in the workplace. This research aims to identify predisposing factors in preventing the transmission of DR TB based on knowledge, attitudes, and beliefs. It is a qualitative case study involving primary subjects, DR TB patients, additional information from patient support organizations, and health department officials in Kab. Jember. The criteria for research subjects are residing in Kab. Jember, undergoing treatment, and willing to participate. The subject selection technique uses purposive sampling, resulting in 10 individuals. Data collection techniques involve in-depth interviews and observations. Data presentation follows the guidelines of Milles and Huberman, employing Thematic Content Analysis (TCA) for analysis. Data validity checks use credibility and dependability tests with source and technique triangulation. The research results indicate varying knowledge among subjects regarding DR TB prevention, with most obtaining information from healthcare professionals and patient support. In terms of attitude perspectives, all subjects show a positive response, expressing willingness to prevent DR TB transmission. Belief perspectives reveal diverse actions in DR TB transmission prevention. Most trust advice from healthcare professionals and patient support, while a minority still believe in herbal treatments and the culture of "tirah" to support TB treatment. In conclusion, knowledge, attitude, and belief perspectives are positive, but there is room for improvement in the behavior of implementing DR TB transmission prevention measures.*

**Keywords:** Behaviour, Tuberculosis, Drug-Resistant

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### **INTRODUCTION**

Drug-Resistant Tuberculosis (DR TB) is a form of tuberculosis caused by the Mycobacterium tuberculosis (Mtb) bacterium that is resistant to anti-tuberculosis drugs (OAT). This disease poses a threat and is a

major public health issue in many countries worldwide, including Indonesia. Various efforts and methods to control DR TB have been undertaken by communities, governments, and related stakeholders; however, the transmission of DR TB continues to rise.

The situation of DR TB in Indonesia

ranks third globally, following India and China<sup>1</sup>. In 2019, approximately 11,500 DR TB patients were identified and reported, with 48% of them initiating second-line TB treatment, achieving a treatment success rate of 45%<sup>2</sup>. Furthermore, East Java is the eighth-ranked province in terms of TB Treatment Coverage in Indonesia, at 29.3724%. By mid-2022, 27,677 cases of diagnosed TB had been identified out of the target of 95,811 cases. The estimated number of DR TB cases in East Java in 2022 is 2,803, and by December 2022, 39% of the targeted DR TB cases have been identified<sup>1</sup>. The 2020 Health Department report revealed that Jember Regency ranked second in East Java with the highest number of identified TB cases, totaling 51,367 notified TB cases and 47,485 cases treated. In 2021, the Health Department of Jember Regency identified 3,166 cases out of an estimated 5,578 cases, indicating a significant gap between the actual cases and the target set by the Ministry of Health of the Republic of Indonesia<sup>1</sup>.

The Jember Regency government is committed to supporting TB control through the issuance of the 2019 Regional Action Plan (RAD) on TB control. Budgets from the national budget (APBN) and funds from Non-Governmental Organizations (NGOs) also contribute to TB control in Jember Regency. Despite active and extensive TB case detection efforts, the number of TB cases in Jember Regency continues to rise. Field phenomena suggest that the behavior of TB patients, which does not support TB transmission prevention, is a major cause of the high prevalence of TB in Jember Regency. Public health beliefs in Jember Regency are related to the transmission of DR TB.

Given such epidemiological trends, research on the behavior of TB patients becomes crucial to understanding epidemiological behavior, effective control efforts, and the impact on other sectors. Understanding the preventive behavior against DR TB in this community allows for control efforts to prevent new infections and behavioral changes regarding DR TB transmission risks. The objective of this study is to explore the behavior leading someone to become resistant to TB drugs, with an examination of preventive behaviors. This research aims to identify predisposing factors in preventing the transmission of DR TB based on knowledge, attitudes, and beliefs.

## METHOD

This research was conducted in Jember Regency, East Java, from May to July 2023. The study is qualitative and adopts a case study approach. Data collection involved in-depth interviews. The interviews were open-ended, guided by an interview script, and audio recordings were made using a smartphone. The primary subjects of the study were DR TB patients, with additional information sourced from patient support organizations and health officials from the Jember Regency Health Department. Ten research subjects were selected using purposive technique based on data saturation obtained by the researcher.

The criteria for selecting subjects included: a) residing in Jember Regency, b) undergoing the intensive treatment phase, c) not discontinuing medication, d) willing to provide informed consent and able to narrate their experiences as DR TB patients. The collected data were transcribed and analyzed. Thematic Content Analysis (TCA) was employed for data analysis in this qualitative research. The researcher ensured data validity through credibility and dependability tests, utilizing source triangulation and technique triangulation. Source triangulation involved posing the same questions to different sources, while technique triangulation involved observation and documentation. The tools and materials used in the study included the interview guide, smartphone for documentation, and a notebook.

Ethical considerations in research aim to maintain the quality of research, especially in the field of health<sup>3</sup>. Before conducting interviews, subjects were asked for their willingness to participate. Research subjects had the right to refuse or consent to being part of the study by signing an informed consent agreement. The researcher explained that the interview results would be kept confidential and only accessible to the researcher unless required by relevant parties. Research subjects received compensation in the form of a gift. The researcher submitted the ethical review to the Faculty of Public Health, University of Jember. This research was approved by the Research Ethics Committee of the Faculty of Public Health, University of Jember, on March 7, 2023, with registration number: 340/KEPK/FKM –UNEJ/III/2023.

## RESULTS

### Predisposing factors in preventing RO TB transmission

The research results indicate that the majority of subjects are distributed in the Subdistricts of Summersari, Kaliwates, Pakusari, Ajung, and Sukorambi in Jember Regency. Most of the research subjects are male. The majority of subjects fall into the productive age group, exposing them to a higher risk of contracting TB. Additionally, most subjects have a low educational background. The low level of education is associated with the subjects' knowledge about DR TB, as illustrated in the following table.

**Table 1. Characteristics of research subjects**

Characteristics	Category	Total
Age	Late adulthood (36 – 45 years)	2 persons
	Early elderly (46- 55 years)	4 people
	Late elderly (56 - 65 years)	2 persons
	Seniors over the age of 65 years	2 persons
Gender	Man	8 people
	Woman	2 people
Education	Not completed in primary school	1 person
	Finished elementary school	1 person
	Finished middle school	4 people
	Finished high school	2 persons
	Finished PT	2 persons
Work	Self-employed	7 people
	Government employees	1 person
	Housewife	2 persons
Duration of Treatment	Intensive phase (0 – 6 months)	1 person
	Early Advanced Phase (7 – 15 months)	7 people
	Final Advanced Phase (16 – 24 months)	2 persons

Source: Primary Data, 2023

Predisposing factors are elements within an individual that underlie behavioral changes. These factors encompass knowledge, attitudes, and beliefs, influencing the behavior of individuals or communities towards health. The results of the research are as follows:

#### a. Knowledge factors in preventing TB RO transmission

The subjects' knowledge regarding the prevention and transmission of DR TB varies. Most subjects acquire knowledge about DR TB transmission from healthcare professionals and companions. Subjects adhere to the medication schedule prescribed by the doctor, fearing a restart of the treatment process if medication is not taken regularly.

Education on knowledge and prevention of DR TB transmission can be conducted by healthcare professionals and communities, starting from the moment the patient is diagnosed with DR TB. Support from healthcare professionals and communities aims to enhance treatment success and increase awareness of TB prevention and transmission<sup>4</sup>.

Social media serves as an alternative research subject for obtaining information on the prevention and transmission of DR TB. Subjects seek a deeper understanding of their illness, prompting them to take the initiative to explore more through social media.

*"Oh, I don't really know. I used to only know about regular TB. But now, there's something called XDR too. I saw it on YouTube, how to deal with it and all. I get stressed when taking the medicine, stressed about the side effects. Even now, when it's almost time to take the medicine, I start feeling anxious beforehand. It stresses me out."* (IU.8, 54 years old).

This is reinforced by the results of observations made by researchers, which show that subject 8 is actively looking for TB RO disease on one of the social media pages, [www.youtube.com](http://www.youtube.com).

#### b. Attitude Factors in preventing TB RO transmission

The research results indicate that all subjects are willing to take actions to prevent the transmission of DR TB. Every subject provided a positive response, expressing their willingness to undertake preventive measures against DR TB transmission. The subjects' motivation to engage in preventive actions stems from their desire to prevent their family and those around them from suffering from TB, as expressed by IU.6.

*"Oh, of course, I want to, sister. I have grandchildren, almost every day they are here. I don't want my illness to transfer to my grandchildren." (IU.6, 62 years old).*

Attitude is the subject's response to a stimulus or object. The subject's response to being diagnosed with TB can be either positive or negative. In this study, it was noted that all subjects exhibited a positive response in taking preventive measures against DR TB, indicating that the transmission of DR TB could be controlled.

### **c. Trust Factor in preventing DR TB transmission**

The subjects' beliefs regarding the effectiveness of the actions taken in reducing the transmission of DR TB are diverse. The majority believe that the recommendations provided by healthcare professionals and companions can prevent the transmission of DR TB. This was expressed by IU.10.

*"I believe, sister. If we obediently follow what the doctor or healthcare workers say, like wearing a mask when told to, covering the mouth when coughing, not indiscriminately disposing of phlegm, that's enough." (IU.10, 46 years old).*

In this study, it was found that herbal treatment is still believed to be able to assist in healing comorbid conditions with TB.

*"In front of my house, there's a 'juar' tree, with yellow flowers like a frangipani tree, its fruit resembling 'pete' or 'lamtoro'... the leaves of the 'juar' tree, along with ¼ of turmeric and ¼ of black turmeric, are washed thoroughly and boiled every day to make a drink. Because I feel sorry for my kidneys, I chose this herbal drink for my diabetes." (IU.1, 66 years old).*

The tradition of "tirah" is still practiced by a small number of subjects. Subjects explain that "tirah" is undertaken as an effort to prevent the illness they are experiencing from spreading to others. The Indonesian Dictionary (Kamus Besar Bahasa Indonesia - KBBI) explains that "tirah" or "tetirah" is an activity of moving to

another place in order to recover one's health <sup>5</sup>.

*"Tirah" is believed to assist in the recovery of health conditions, as conveyed by IU.7.*

*"Originally, I'm here. I only stayed with my wife at her house. But when I got TB, my parents wanted to be close to visit, so eventually, I rented a house, was told to stay here, and this belongs to my sibling... yes, it's called 'tirah.' My parents rented it because they wanted to be close and visit their child." (IU.7, 42 years old).*

## **DISCUSSION**

### **Characteristics of research subjects**

The Ministry of Health of the Republic of Indonesia (Depkes RI) classifies age into several categories, namely toddler, child, early adolescent, late adolescent, early adulthood, late adulthood, early elderly, late elderly, and very elderly<sup>6</sup>. The research results indicate that the majority of the research subjects fall within the productive age group. In the productive age group, people are more active outside and interact with many individuals. The demands of work and community activities allow for interaction with others who have the risk of TB exposure.

Andayani's research in 2020 states that during the productive age, individuals are in the working stage, generating income for themselves and their families<sup>7</sup>. The density of activities, poor working conditions, and unhealthy lifestyles increase the risk of reducing immunity, making individuals more susceptible to diseases.

The proportion of research subjects was found to be mostly male. Males have a greater risk of exposure to Mycobacterium tuberculosis (Mtb) bacteria due to more interactions in their workplaces. This aligns with a 2015 study stating that males have a higher risk of contracting TB compared to females<sup>8</sup>.

The higher mobility of males increases the likelihood of exposure, and unhealthy lifestyle habits like smoking support the risk of respiratory diseases. Unhealthy lifestyles can lower immunity and are one of the causes of cardiovascular diseases. A study conducted in South Tangerang City in 2015 mentioned that smoking increases the risk of TB by 1.69 times<sup>9</sup>.

The educational backgrounds of the research subjects vary from incomplete elementary school to university graduates. Most subjects have a low educational background, ranging from incomplete elementary school to junior high school. A low level of education affects the knowledge of the informants regarding DR TB. Nurjana in his research stated that good knowledge influences prevention and treatment efforts when affected by TB<sup>8</sup>. Subjects can acquire knowledge from healthcare professionals or DR TB patient companions.

The duration of treatment for the subjects varies, with most subjects undergoing the first advanced treatment phase. Subjects in this phase feel that the complaints of DR TB have decreased, so they perceive themselves as healthy and tend to neglect using masks. Subjects feel uncomfortable wearing masks, even though it is recommended, due to discomfort and breathlessness. Observations by the researcher indicate the availability of medical masks at the subjects' homes. However, through triangulation with the subjects' neighbors, it was revealed that subjects rarely wear masks. Subjects only wear masks when healthcare professionals or companions visit.

### **Knowledge**

The research subjects' knowledge of preventing DR TB transmission is quite good. Subjects acquire knowledge from education provided by healthcare professionals and TB patient companions. A small number of research subjects actively seek information about the disease through social media.

Technological advancements facilitate quick and up-to-date access to information. Social media, as part of the internet, serves as a means for disseminating information in various fields, including education, health, religion, business, etc. However, the existence of social media is sometimes exploited by irresponsible parties to spread misinformation.

Inaccurate information can lead to misinformation and hinder efforts to prevent and control DR TB in society. The presence of healthcare professionals and companions is crucial in helping subjects clarify and accept the information received. Yuni and Fitriani's 2017 study emphasizes the wise use of social media, as misuse in its dissemination is regulated by the Electronic Information and Transactions Law (UU ITE)<sup>10</sup>.

### **Communication and Education (KIE):**

The provision of Communication, Information, and Education (KIE) by healthcare professionals and patient companions can be done not only through conventional methods. In the digital era, people are closely connected to technology. This can be utilized as an opportunity to provide KIE using electronic media. Broadcasting videos to increase knowledge about preventing DR TB transmission can be shown on social media widely accessed by the public. As mentioned in Rodiahwati's previous study in 2022, there is a positive influence from health promotion using e-KIE (electronic KIE) on the increased knowledge of pregnant women regarding integrated ANC services<sup>11</sup>.

### **Attitude**

Attitude is the response of the subjects to a stimulus/object. The response of the subjects to the diagnosis of TB can be either positive or negative. In this study, it was noted that all subjects exhibited a positive response in taking preventive measures against the transmission of DR TB. Subjects are willing to take preventive measures because they do not want their family and those around them to suffer from TB.

The knowledge provided by healthcare professionals, DR TB patient companions, and social media has an impact on the subjects' attitudes. Good knowledge and understanding positively influence attitudes towards preventing the transmission of TB. This plays a crucial role in the success of efforts to prevent the transmission of DR TB.

This aligns with the research conducted by Rahman<sup>12</sup> which states that there is a significant relationship between knowledge and attitudes in preventing the transmission of DR TB in society. Therefore, it is important to carry out socialization regarding the prevention of TB transmission. This is reinforced by a study conducted in 2021, which states that there is a better attitude from TB patients after receiving health education<sup>13</sup>.

### **Belief**

Research conducted by Sitio and Silalahi in 2021 states that education is very effective in efforts to empower and culturally empower the families of TB patients<sup>14</sup>, especially regarding knowledge of preventing TB transmission. The informant's trust in



healthcare professionals makes them willing to follow the advice of healthcare professionals to take preventive measures against TB transmission. The informant has trust in healthcare professionals, so the advice for a healthy lifestyle is followed without hesitation.

The results of this research show that there is still a cultural practice in society that increases the risk of TB transmission. The positive aspect of the cultural practice of "tirah" is a form of isolating TB patients to prevent transmission to the community. However, it is also essential to ensure that the movement of TB patients from one place to another does not create new sources of transmission in the surrounding community. Supervision and assistance from family and healthcare professionals are crucial in this regard.

The use of herbal medicine in Indonesia is one of the preferred options in society. Traditional treatment with herbal ingredients has been practiced for generations. Additionally, herbal medicines are believed to have fewer side effects compared to chemical drugs. The use of traditional medicine is recommended to be under the supervision of a doctor to ensure that it does not reduce the therapeutic effects of the TB drugs being consumed. Health education is needed for TB patients who consume traditional medicine, emphasizing that primary treatment must be continued to prevent loss to follow up (LFU).

### Prevention of DR TB Transmission

The behavior of preventing the transmission of TB can be manifested in daily actions. In general, all subjects have acquired knowledge and understanding of preventing TB transmission. Research results indicate that subjects have engaged in both positive and negative actions in preventing TB transmission.

Positive actions taken by subjects include opening doors and windows in the morning to ensure smooth air circulation. Subjects avoid indiscriminate spitting and adhere to proper cough etiquette by covering their mouths with tissues or sleeves. Subjects sunbathe in the morning when their bodies are in good condition. Research subjects diligently wash their hands with soap, a habit they practice daily.

Most subjects are aware of proper

cough etiquette, which minimizes the spread of saliva droplets.



*Caption: The figure shows a subject demonstrating proper cough etiquette*

### Figure 1. Proper Cough Etiquette

Some subjects are compliant in taking preventive measures against DR TB transmission. Among the actions taken, subjects isolate themselves by limiting interactions to avoid transmitting the disease to others, as expressed by IU.2.

*"Yeah, I keep to myself when there's a family gathering, so I don't spread it" (IU.2, 39 years old).*

From the researcher's triangulation, neighbors mentioned that subjects tend to keep to themselves during activities involving many people. This is done because subjects believe that such behavior can prevent transmission to those around them.

Negative behavior observed in some research subjects is their reluctance to use masks. The reasons for not wearing masks include discomfort, feelings of breathlessness, and only wearing them when guests or when visiting healthcare facilities.

While the subjects' knowledge regarding mask usage is quite good, in practice, not all patients comply with mask-wearing. This finding contradicts the research conducted by Veri in 2021, which stated a significant relationship between knowledge and patient compliance in mask usage.<sup>15</sup>

## CONCLUSIONS

The predisposing factors of DR TB patients are related to the behavior of preventing TB RO transmission. In terms of the knowledge perspective, it is known that information on preventing TB RO transmission is obtained from healthcare professionals, companions, and social media. Generally, the knowledge of the research subjects is already good. The perspective of attitudes shows a positive response to preventing TB RO transmission. From the belief perspective, there is trust in healthcare professionals and companions, as well as trust in herbal treatments and the cultural practice of tirah, which can impact the prevention of TB RO transmission.

The recommendation from this study is that the dissemination of accurate information regarding the prevention of TB RO transmission by authorities is necessary and should be done more intensively within the TB RO community. The spread of information can be carried out through social media or conventional means. The use of social media can be considered, as it is easily accessible to many people.

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Original Article

## ***Correlation Between Personality, Locus of Control, and Knowledge About Stunting with Mother's Responsibility Behavior Considering Toddlers at Posyandu***

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### **ABSTRACT**

*Stunting is a failure to thrive due to chronic malnutrition, psycho-social stimulation, and exposure to repeated infections, especially in the first 1,000 days of life. Can be eliminated if growth from newborn to toddler is always monitored. Data from the Kebayoran Baru District Health Center as of December 31, 2018, there were 19% of infants did not weigh themselves regularly. The low participation of mothers in weighing their toddlers regularly every month at Posyandu is a problem in itself. It is necessary to examine and examine further personality, Locus of control, and mother's knowledge which will influence the behavior of the mother's responsibility to regularly weigh her child every month. This research is analytically descriptive with a total of 360 mothers who have toddlers in the working area of the Kebayoran Baru Health Center, data were collected using a questionnaire with the big five personality variables, Locus of control, and knowledge about stunting, data were processed using The analysis was performed with a statistical test using correlation test Pearson's. The results showed that education level 60% graduated from high school, 54.4% were aged 25-34 years, and 52.2% had high knowledge about stunting. The biggest personality type (187 people) is agreeableness, 83% have an Internal Locus of Control. There is a correlation between neuroticism personality type and responsible behavior for weighing toddlers ( $p=0.005$ ) but there is no correlation between Locus of Control ( $p=0.067$ ) and level of knowledge with responsible behavior for weighing toddlers ( $p=0.088$ ).*

**Keywords:** *Personality, Locus of Control/LoC, Knowledge, Stunting, Responsibility*

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## **INTRODUCTION**

Stunting is a chronic malnutrition problem caused by a lack of nutritional intake for a long time, thus disrupting the growth of a child's height which causes the child to be shorter than the standard age have an impact on cognitive impairment, concentration making it difficult to learn, susceptible to non-communicable diseases as adults. Children are classified as stunted if their length or height is below minus two standard deviations (-2 SD) for children their age <sup>1</sup>. Globally, according to

WHO<sup>2</sup>, there were 144 million children under five were stunted, in the SIGIZI ePPGBM report (20 January 2021) from 34 provinces of 11,499,041 toddlers whose nutritional status was measured based on height for age (TB/U) were 1,325,298 toddlers with TB/U <-2 SD or 11.6%. toddlers are stunted <sup>2</sup>. From the graph, it can be seen that the province with the lowest percentage of stunting under five is Bangka Belitung Islands 4.6%, and the highest is in the province of NTT 24.2%<sup>3</sup>.

Factors that influence the low coverage of weighing for infants and toddlers in

Posyandu are the low Knowledge and Education of Housewives<sup>4</sup>. The incidence of chronic stunting in toddlers should be monitored and prevented if the monitoring of toddler growth is carried out routinely and correctly. Monitoring the growth of toddlers at the Posyandu is a very strategic effort to detect early growth disorders so that stunting can be prevented<sup>5</sup>.

Personal responsibility is defined as the ability to regulate thoughts, feelings, and behavior together with a willingness to take responsibility for choices made and the impact or consequences on the environment and oneself. Ma'mun<sup>6</sup> added that human

responsibility towards the individual is to fulfill physical and spiritual needs to maintain personal integrity. The body that requires food and drink, clothing, shelter, health, and so on is fulfilled as well as possible. Personality is a permanent pattern of traits with unique characteristics that give both consistency and individuality to a person's behavior

According to Goldberg in Pervin<sup>7</sup>, personality is divided into five major dimensions which are abbreviated as Big Five OCEAN, namely: Openness (O), Conscientiousness (C), Extraversion (E), Agreeableness (A), and Neuroticism (N) with the following details:

**Table 1. Traits, Dimensions, and Characteristics of the Five Personality Models**

Traits	Dimensions	Characteristics
Conscientiousness	<ol style="list-style-type: none"> <li>1. Competence</li> <li>2. Order</li> <li>3. Dutifulness</li> <li>4. Achievement striving</li> <li>5. Self-discipline</li> <li>6. Deliberation</li> </ol>	Highly conscientious individuals are orderly and planned, act dutifully and responsibly, and are patient and committed to success.
Extroversion	<ol style="list-style-type: none"> <li>1. Warmth</li> <li>2. Gregariousness</li> <li>3. Assertiveness</li> <li>4. Activity</li> <li>5. Excitement seeking</li> <li>6. Positive emotion</li> </ol>	Highly extroverted individuals are assertive and sociable, often self-confident, and talkative and they enjoy being in community and social circles.
Openness	<ol style="list-style-type: none"> <li>1. Fantasy</li> <li>2. Aesthetics</li> <li>3. Feelings</li> <li>4. Actions</li> <li>5. Ideas</li> <li>6. Values</li> </ol>	Individuals with very open personalities are generally cultured, generate new and interesting ideas, and have created, with a level of imagination and intellectual curiosity. They are open-minded and think independently and not traditional
Agreeableness	<ol style="list-style-type: none"> <li>1. Trust</li> <li>2. Straight-forwardness</li> <li>3. Altruism</li> <li>4. Compliance</li> <li>5. Modesty</li> <li>6. Tender mindedness</li> </ol>	Pleasant individuals are compassionate, respectful, tolerant, confident, trustworthy, cooperative, adaptable, and very helpful.
Neuroticism	<ol style="list-style-type: none"> <li>1. Anxiety</li> <li>2. Depression</li> <li>3. Impulsiveness</li> <li>4. Hostility</li> <li>5. Vulnerability to stress</li> <li>6. Self-consciousness</li> </ol>	Emotionally unstable individuals tend to experience negative emotions, such as anxiety, depression, irritation, and vulnerability in everyday situations, and their mood changes frequently

Source<sup>8,9</sup>

Rotter stated that Locus of Control (LoC) or locus of control is a general belief that someone can/cannot control their destiny, known as internal LoC if they believe that the success or failure experienced is personal responsibility or is their effort<sup>10</sup>.

Whereas individuals with external LoC believe that it is only luck or fate, success or failure is determined by forces that are outside of themselves. According to George and Jones, differences in opinions or perceptions of each individual are determined

by their LoC. Because LoC is a person's perception of why something happened to him, or what power pushed him to do something<sup>11</sup>.

In the world of health locus of control can be classified as internal (individuals believe they are responsible for their health), external (individuals believe that others are responsible for their health), or coincidental (individuals believe that their health depends on chance)<sup>12</sup>.

Knowledge is the result of scientific activities or thoughts that combine basic sensations. is the result of a complex process in which external objects stimulate the five or more senses that cause changes in the organs of the body. Humans seek knowledge in the hope that knowledge can be useful to help solve life problems they face.

## METHOD

The type of research used is descriptive-analytic with a cross-sectional study approach, and the sample is determined randomly. The data was obtained by giving questionnaire sheets to the respondents to be filled in immediately, if the respondent had difficulties, the enumerator was assisted by an enumerator to explain the intent of the questions in the questionnaire. The questionnaire contains questions from all variables of Personality, Locus of Control, and Knowledge about stunting. The number of respondents is 360 mothers who have toddlers

SPSS software was used to perform the statistical analyses. The data obtained were then analyzed using Pearson Test with a significance level of  $p < 0.05$ . The protocol of this study was approved by the Research Ethics Committee of the Ethics Commission of Poltekkes Kemenkes Jakarta II, Number LB.02.01/I/KE/33/909/2022. Written informed consent was obtained from all respondents.

## RESULTS

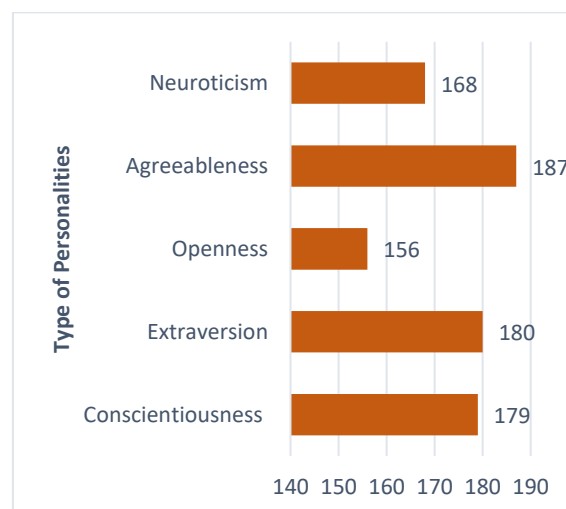
In this study, 360 respondents were housewives who had babies and toddlers living in the working area of the Kebayoran Baru District Health Center. The distribution of respondents based on general

characteristics can be seen in Table 2 below:

**Table 2. Distribution of Characteristics of Respondents Based on Education, Age, and Income.**

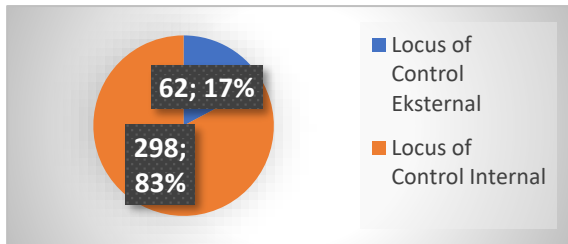
Characteristics	N=(Total Sample)	Percentage
<b>Education</b>		
Elementary/junior high school graduate	89	24,7
High school graduate/ equivalent	218	60,5
Diploma/Post Graduate	52	14,4
Under Graduate / Doctor	1	0,3
<b>Ages (Year)</b>		
45- 54	4	1,1
35 – 44	123	34,1
25 – 34	<b>196</b>	<b>54,4</b>
18 - 24	37	10,3
<b>Working</b>		
Yes	73	20,3
No	<b>287</b>	<b>79,7</b>
<b>Salary</b>		
< Rp 4 million/month	<b>248</b>	<b>68,9</b>
Rp 4 million/month until Rp 8 million/month	85	23,6
> Rp 8 million/month	11	3,1
Missing	16	4,4

From the type of personality possessed by housewives, most of them are agreeableness or friendly, which is the character of Indonesian people in general.



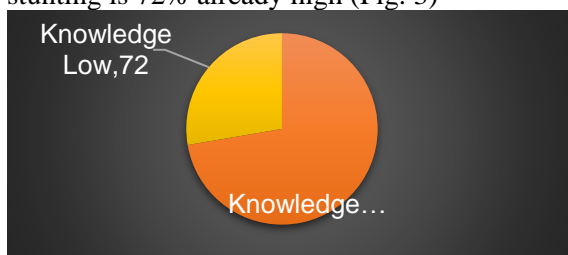
**Figure 1. Personality Types of Housewives in the Kebayoran Baru-South Jakarta**

The LoC variable used a questionnaire made by Rotter with 29 questions, the results are as shown below:



**Figure 2. Locus of Control of Housewives in the Kebayoran Baru – South Jakarta**

The level of knowledge of housewives about stunting is 72% already high (Fig. 3)



**Figure 3. Knowledge about stunting of Housewives in the Kebayoran Baru – South Jakarta**

**Table 3. Results Of Statistical Calculations On Personality Type Variables and Knowledge With Responsible Behavior In Bringing Toddlers To The Posyandu**

Variable	Value	Information
Personality Type		
Conscientiousness	0,126	Not significant
Extroversion	0,492	Not significant
Openness	0,939	Not significant
Agreeableness	0,343	Not significant
Neuroticism	0,005	significant
Locus of Control	0,067	Not significant
Knowledge	0,088	Not significant

Results of Statistical Calculations Between Personality Types, Locus of Control, Knowledge, and Behavior of Mothers Bringing Their Children Routinely to Posyandu in the

Kebayoran Baru Area, South Jakarta, can be seen in Table 3.

## DISCUSSION

The characteristics of housewives in education obtained 60% (216 respondents) are high school graduates/equivalent. This level of education will generally affect the ability to receive information and its application in everyday life. As stated by Devenport et al<sup>13</sup>, the ability to digest and explore the information obtained will be easier if someone has a high level of education, then a mother with this level of education will have better knowledge and will apply it to the health of her family. In another study, it was found that the level of the mother's education affected the mother's knowledge and understanding of stunting<sup>14</sup>. It is known that the lower the mother's education, the greater the chance of finding a stunted child<sup>15</sup>.

Maternal educational status and stunting of Children were found to be significantly positively associated; children from mothers with no formal education, primary and secondary education increased the odds of getting stunting by 3.07 times (AOR = 3.07, CrI 2.79, 3.39), 2.62 times (AOR = 2.62, CrI 2.38, 2.88) and 1.86 times (AOR = 1.86, CrI 1.69, 2.04) than children born to mothers with higher educational levels<sup>16</sup>.

When viewed from the age of 196 people (54.4%) are aged 25-34 years, are of productive age, and in good stamina, so they still have optimal ability to maintain family health. At this age, it is also a mature adult age, and mothers already can sort out useful information or knowledge to protect their families and prevent their children from stunting.

Adequate nutrition can be met by the intake of foods rich in fat, protein, and carbohydrates. The provision of nutritious food must be supported by the purchasing ability of the community. Most (68.9%) of respondents with a family income of less than Rp 4 million/month. The results of the study by Sagita and Tri (2022)<sup>17</sup> found that families with low incomes had a five times higher risk of experiencing stunting compared to high incomes. In this study, it was found that 20.3% of mothers worked outside the home to supplement the family income, thereby



increasing purchasing power and meeting family needs. Housewives have the potential to give a contribution to household income, especially in poor households<sup>17</sup>.

Personality is a distinctive way of thinking, feeling, and behaving, includes moods, attitudes, and opinions, and is most clearly expressed in interactions with others, encompassing the behavioral characteristics, inherent and acquired, that distinguish one person from another and can be observed in people's relationships with the environment and social groups<sup>18</sup>. Most of the 187 respondents have an Agreeableness personality. Highly extroverted individuals are assertive and sociable people, often self-confident, and talkative and they like to be in the community and social environment Conformity / Friendly and 180 respondents with Extra-version personalities. This type of personality is characteristic of the Indonesian people, namely people who are assertive and easy to get along with, often confident, and talkative and they like to be in the community and social environment. These personality types are personality types that are easy to accept change and willing to change, this can be the basis for changing the mother's behavior to regularly monitor the growth of her child, which only needs to be encouraged by reinforcing the form of increasing knowledge and personal approach.

In this study, it was found that most of the housewives had an internal locus of control, which means that the health of their families was caused by the behavior of mothers to maintain the health of their families. As stated by Sunhwa and Lee<sup>19</sup> that the internal health locus of control in adults helps reduce mental health problems, and it acts as a factor in improving health behavior<sup>20</sup>.

This can be a force for increasing visits by mothers to bring their children to Posyandu because mothers believe that their family's health is in their control, even though Wardle Such health locus of control is associated with socioeconomic factors<sup>21</sup>. As it is known, internal locus of control describes perception which refers to an individual's tendency to believe that health outcomes are primarily caused by the individual's behavior and within their control. In contrast to external Locus of Control, they refer to an individual's tendency to believe that health outcomes are primarily caused by other people or chance factors. Other research also proves that ethnic groups will also

affect the external locus of control<sup>22</sup>. The results of other studies also get such health locus of control is associated with socioeconomic factors<sup>20</sup>

Knowledge is a crystallization of various information obtained formally and informally and will be seen in one's behavior. The mother's understanding of the occurrence of stunting, its consequences, and how to prevent it will form a more permanent behavior compared to just imitating without a good understanding. In this study 172 people (47.8%) mothers had low knowledge about stunting, causing mothers not to feel the need to routinely come to the Posyandu to monitor the growth and development of their children. Improving mothers' knowledge about stunting is one way to make mothers want to visit Posyandu regularly. Research by Indah, et al<sup>23</sup> found that there was a relationship between maternal knowledge about nutrition and the incidence of stunting in toddlers in the Puskesmas Sawan 1 area, Buleleng Regency, Bali. The same thing from Salsabila research, et al, found that there was a relationship between a mother's knowledge about nutrition and the incidence of stunting<sup>24</sup>. The level of knowledge of the mother will also determine how the parenting style of the mother is in the growth and development of the child. The results of research by Sukmawati et al<sup>25</sup> found that parenting parents play an important role in the occurrence of stunting in toddlers. This emphasizes the importance of paying attention to good parenting practices that support the growth and development of children.

A person's level of knowledge is also influenced by age, some opinions state that with increasing age, the level of mental maturity is getting better, and intelligence for learning and abstract thinking is also getting better, in this study, some respondents were aged 25-34 years which is a productive age for seeking knowledge and add insight, as well as the level of education, most of whom have graduated from high school.

Of all the variables tested statistically with the responsible behavior of the mother taking her child to the Posyandu, only the neuroticism personality type affected the mother's responsible behavior in this case (sign value 0.005) while the other variable's Sign value > 0.005).

The neurotic personality type is characterized by negative emotions such as



anxiety, worry, and insecurity<sup>26</sup>. So mothers with high neuroticism personalities will have high anxiety and worry about their children's health if they do not take their children to Posyandu. So there is a correlation between the personality of neuroticism with the behavior of being responsible for monitoring the health of their children to the Posyandu. On the other hand, mothers with low neuroticism personalities make the mother quite satisfied with what she currently gets, so their motivation to improve their child's health becomes less because the mother feels that what she has done for their child's health is enough.

## CONCLUSION

From this study, it can be concluded that to improve the behavior of housewives to bring their children to the Posyandu, an appropriate approach model is needed to increase the personality of neuroticism and motivation so that the mother's knowledge about stunting increases, the mother will be responsible for routinely bringing her child, to the Posyandu.

## ACKNOWLEDGMENTS

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## CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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Original Article

## ***Prevalence and Risk Factors of Anemia in Adolescent Girls in Donggala District, Central Sulawesi***

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### **ABSTRACT**

*This study aims to assess the prevalence and risk factors of anemia in adolescent girls in Donggala District. It employed an observational analytical study design with a cross-sectional approach. The research was conducted in Senior High Schools (SMA) and Islamic Senior High Schools (Madrasah Aliyah) in Donggala District in May 2023. The sample included 428 respondents. Hemoglobin levels were measured by the laboratory staff of the Central Sulawesi Health Department. Respondents provided data through Kobocollect: <https://ee.kobotoolbox.org/x/uZVqfjnh>. Respondent characteristics included age, the occupation of both parents, family income, upper arm circumference, hemoglobin levels, body mass index, menstrual status, consumption of iron supplements, anemia education and knowledge, medical conditions, smoking status, physical activity status, and the frequency of iron-rich food intake (fish, eggs, meat, and milk). Data analysis was performed using percentages and RR (95% CI) with SPSS 22.0. Ethical approval was obtained from the Ethics Committee of the Poltekkes Kemenkes Palu with approval number 0016/KEPK-KPK/I/2023, and research permission was granted by the Central Sulawesi Provincial Government, Regional Unity of Community and Political Affairs, with approval number 070/0409/Bid.III-BKBPD/2023. The research results indicated a prevalence of anemia risk among adolescents in Donggala District at 9.8%. Risk factors included upper arm circumference <23.5 cm, a history of kidney disease, limited knowledge of anemia, and infrequent meat consumption. The researchers recommend that adolescents increase their food intake to improve upper arm circumference, manage dietary patterns for those with kidney disease, enhance knowledge about anemia, and increase meat consumption frequency.*

**Keywords:** Anemia, Adolescent, Donggala

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## **INTRODUCTION**

Teenage anemia is a popular public health issue worldwide<sup>1-6</sup>. The prevalence of teenage anemia varies and tends to change every year<sup>4,7-10</sup>. In the Toto tribal community in

West Bengal, India, it is 88.35%<sup>11</sup>. In In the District of Maharashtra, India, 65.7% of study participants showed that the prevalence of mild and moderate anemia was 32.6% and 29.8%, respectively, in India, it was 26.66%<sup>12</sup>. In Ethiopia was 23.02%<sup>10</sup> in Cuba was 21.4%<sup>13</sup>, in

Indonesia was 14.0%<sup>14</sup> and in Mexico 13.1%<sup>5</sup>.

The risk of anemia is found in females with an upper arm circumference of <23.5 or in women classified as having chronic energy deficiency<sup>15-18</sup>. Anemia risk is also identified in individuals with a history of kidney disease<sup>19-24</sup>, insufficient knowledge about anemia<sup>25-32</sup>, and in people with low intake of animal protein or meat<sup>33,34</sup>.

The lack of data on anemia among adolescent girls in Donggala Regency, Central Sulawesi, forms the basis of this research. Data on anemia among adolescent girls is crucial to determine appropriate interventions in the management of anemia within this age group. The research objective is to assess the prevalence and risk factors of anemia among adolescent girls in Donggala Regency.

## METHOD

This is an observational analytical study with a cross-sectional design. The research was conducted in High Schools (SMA) and Islamic Senior High Schools (Madrasah Aliyah or MA) in Donggala Regency in May 2023. The sample consisted of 428 respondents. Hemoglobin levels were measured by the laboratory staff of the Central Sulawesi Health Department. Respondents filled out data through KoboCollect: <https://ee.kobotoolbox.org/x/uZVqfjnh>.

Respondent characteristics included age, father and mother's occupation, family income, upper arm circumference, hemoglobin levels, body mass index, menstrual status, iron supplement tablet consumption, anemia education and knowledge, diseases suffered, smoking status, exercise status, and frequency of iron-rich food intake (fish, eggs, meat, and milk). Data analysis was conducted in the form of percentages, and RR (95% CI) using SPSS 22.0. Ethical approval was obtained from the Ethics Committee of the Palu Health Polytechnic (Approval Number: 0016/KEPK-KPK/I/2023), and research permission was granted by the Central Sulawesi Provincial Government, Regional Unity and Political Affairs Agency (Permission Number: 070/0409/Bid.III-BKBPD/2023).

## RESULTS

**Table 1. Characteristics of Adolescent Girls with Anemia Research Respondents in Donggala Regency, Central Sulawesi**

Characteristics	n	%
Age		
Mid-Adolescent	246	57,5
Early Adolescent	182	42,5
Father's occupation		
Civil Servant	58	13,6
Private Employee	42	9,8
Military/Police	8	1,9
Self-Employed	82	19,1
Farmer	56	13,1
Fisherman	72	16,8
Laborer	82	19,2
Unemployed	28	6,5
Mother's occupation		
Civil Servant	70	16,4
Private Employee	16	3,7
Farmer	6	1,4
Self-Employed	56	13
Laborer	4	1
Housewife	246	57,5
Abroad worker	2	0,5
Not working	28	6,5
Family income		
< Rp. 2.594.454	228	53,3
≥ Rp. 2.594.454	200	46,7
LILA category		
Risk of KEK	248	57,9
No risk of KEK	180	42,1
Hemoglobin level		
Risk of Anemia	42	<b>9,8</b>
No risk of Anemia	386	90,2
BMI/Age category		
Malnutrition	44	10,3
Good Nutrition	336	78,5
Overweight	30	7,0
Obesity	18	4,2
Menstrual status		
Yes	294	68,7
Not yet	32	7,5
First menstruation	102	23,8
Category menstrual cycle (n=294)		
Normal	156	53,1
Abnormal	132	46,9
Consumption of Fe Tablets		
Yes	184	43
No	244	57
Consumption of Fe tablets one tablet in week (n=184)		
Yes	36	19,6
No	148	80,4
Place to get Fe tablets		
Buying	40	9,3

Distributed by schools and health workers	428	89,7
Non-governmental organization	4	0,9
Received anemia education		
Yes	104	24,3
No	324	75,7
Educational media (n=104)		
Teacher	6	5,8
Health workers	54	51,9
Social media	40	38,5
KKN's students	4	3,8
Kidney disease sufferers		
Yes	8	1,9
No	420	98,1
TBC sufferers		
Yes	6	1,4
No	422	98,6
Smoking		
Yes	16	3,7
No	412	96,3
Active smokers (n=16)		
Yes	2	12,5
No	14	87,5
Exercising		
Yes	70	16,4
No	358	83,6
Knowledge		
Not enough	56	13,1
Enough	372	86,9
Frequency of eating fish/marine protein sources		
Seldom	160	37,4
Often	268	62,6
Frequency of eating eggs		
Seldom	308	72
Often	120	28
Frequency of eating meats		
Seldom	350	81,8
Often	78	18,2
Frequency of drinking milks		
Seldom	274	54
Often	154	36

Source: Primary Data, 2023

Mid-Adolescents (57.5%): The majority of respondents are in the mid-adolescent age group. Early Adolescents (42.5%): A small portion of respondents are in the early adolescent age group. Most of the fathers of respondents are laborers (19.2%) and self-employed (19.1%). Civil servants (13.6%)

and private employees (9.8%) are also relatively common occupations. The majority of the mothers of respondents are housewives (57.5%). Civil servants (16.4%) and self-employed individuals (13%) also make up a significant portion.

Most of the respondent's families (53.3%) have an income of less than Rp. 2,594,454. The remaining (46.7%) have an income equal to or greater than Rp. 2,594,454. The majority of respondents (57.9%) are categorized as at risk of Chronic Energy Deficiency (CED), while the rest (42.1%) are not at risk of CED. A small number of respondents (9.8%) are at risk of anemia, while the majority (90.2%) are not at risk of anemia. The majority of respondents (78.5%) have good nutrition. A small number of respondents have poor nutrition (10.3%) and overnutrition (7.0%), and some are obese (4.2%).

Most respondents (68.7%) experience menstruation. Some have not experienced menstruation (7.5%), and others have had their first menstruation (23.8%). Among respondents who menstruate, the majority (53.1%) have a normal menstrual cycle, while others (46.9%) have an abnormal menstrual cycle. Most respondents (57%) do not consume Iron and Folic Acid Tablets (IFAT). Among those who do, only a small portion do so once a week (19.6%).

The majority of respondents who consume IFAT obtain them from schools or healthcare workers (89.7%). Most respondents (75.7%) have not received education about anemia. Among those who have received education, the majority was provided by healthcare workers (51.9%). The majority of respondents do not have kidney disease (98.1%) or tuberculosis (98.6%). Only a small percentage smoke (3.7%) or engage in physical activity (16.4%).

Most respondents (86.9%) have sufficient knowledge about anemia. The majority of respondents frequently consume fish, seafood, and eggs (more than 50%). However, most consume meat and milk infrequently.

**Table 2. Risk of Anemia in Adolescent Girls in Donggala Regency, Central Sulawesi**

Variable	Risk of Anemia		No Risk of Anemia		Nilai p	RR (IK 95%)
	n	%	n	%		
Age						
Mid-Adolescent	26	10,6	220	89,4	0,655	1.20 (0.67-2,17)

Early Adolescent	16	8,8	166	91,2		
Family income						
< Rp. 2.594.454	24	10,5	204	89,5	0,714	1,17 (0,65-2,09)
≥ Rp. 2.594.454	18	9	182	91		
LILA category						
Risk of KEK	20	8,1	228	91,9	0,207	0,66 (0,37-1,17)
No risk of KEK	22	12,2	158	87,8		
Menstrual status						
Yes	40	10,1	356	89,9	0,757	1,62 (0,41-6,38)
No	2	6,3	30	93,8		
BMI/Age category						
Not good nutrition	6	6,5	86	93,5	0,317	0,61 (0,27-1,40)
Good nutrition	36	10,7	300	89,3		
Category menstrual cycle (n=294)						
Normal	16	10,3	140	89,7	0,857	0,89 (0,46-1,70)
Abnormal	16	11,6	122	88,4		
Consumption of Fe tablets						
Yes	20	8,2	224	92,8	0,258	0,69 (0,39-1,22)
No	22	12	162	88		
Consumption of Fe tablets one tablet in week (n=184)						
Yes	18	12,2	130	87,8	1,000	1,10 (0,39-3,04)
No	4	11,1	32	88,9		
Received anemia education						
Yes	32	9,9	292	90,1	1,000	1,03 (0,52-2,02)
No	10	9,6	94	90,4		
Kidney disease sufferers						
Yes	0	0	8	100	1,000	1,11 (1,08-1,15)*
No	42	10	378	90		
TBC sufferers						
Yes	2	33,3	4	66,7	0,109	3,52 (1,09-11,32)
No	40	9,5	382	90,5		
Smoking						
Yes	0	0	16	100	0,386	1,11 (1,08-1,15)*
No	42	10,2	370	89,8		
Exercising						
Yes	8	11,4	62	88,6	0,782	0,83 (0,40-1,72)
No	34	9,5	324	90,5		
Knowledge						
Not enough	2	3,6	54	96,4	0,144	0,33 (0,08-1,34)
Enough	40	10,8	332	89,2		
Frequency of eating fish/marine protein sources						
Seldom	18	11,3	142	88,8	0,546	1,26 (0,70-2,24)
Often	24	9	244	91,0		
Frequency of eating eggs						
Seldom	30	9,7	278	90,3	1,000	0,97 (0,52-1,84)
Often	12	10	108	90		
Frequency of eating meats						
Seldom	38	10,9	312	89,1	0,184	2,12 (0,78-5,76)
Often	4	5,1	74	94,9		
Frequency of drinking milks						
Seldom	24	8,8	250	91,2	0,419	0,75 (0,42-1,34)
Often	18	11,7	136	88,3		



**Figure 1. Blood sampling for the measurement of Anemia in Adolescent Girls in Donggala Regency, Central Sulawesi**



**Figure 2. Blood sampling for the measurement of Anemia in Adolescent Girls in Donggala Regency, Central Sulawesi**

## DISCUSSION

In terms of the age variable, the Relative Risk (RR) for the Mid-Adolescent group is 1.20 with a 95% confidence interval between 0.67 and 2.17. This indicates that in the Mid-Adolescent group, the risk of anemia is 1.20 times higher compared to the Early Adolescent group, but the difference is not statistically significant because the confidence interval includes the value 1. Adolescence, which spans the ages of 10 to 19, is a transitional period experienced by individuals characterized by physical and psychological changes. These changes during adolescence can give rise to several health issues. One of the health problems that can occur during adolescence is anemia. Adolescent girls are one of the groups vulnerable to anemia. This is because the primary cause of nutritional anemia in adolescent girls is a lack of nutrient intake through their diet, while the iron requirements are relatively high due to growth and menstruation needs<sup>35</sup>.

The family income variable indicates that the Relative Risk (RR) for the group with an income of less than Rp. 2,594,454 is 1.17 with a 95% confidence interval between 0.65 and 2.09. This suggests that in the low-income group, the risk of anemia is 1.17 times higher compared to the high-income group, but the difference is not statistically significant because the confidence interval includes the value 1. Family income can influence the risk of anemia among adolescent girls, as evidenced by previous research conducted by Indrawatiningsih et al. (2021)<sup>36</sup>.

The variable "menstrual status" shows an RR value of 1.62 for the group with "Yes" status, with a 95% confidence interval between 0.41 and 6.38. This indicates that in the "Yes" status group, the risk of anemia is 1.62 times higher compared to the "No" status group. However, the wide confidence interval suggests a high level of uncertainty in this estimation. Menstrual conditions that occur in adolescent girls can increase the occurrence of anemia because of the monthly blood loss. Abnormal menstrual patterns also increase the risk of anemia occurrence, as supported by previous research.<sup>36,37</sup>

For the variable "Iron and Folic Acid Tablet (IFAT) consumption," the "Yes" group has an anemia risk rate of 8.2%, while the "No"

group has a risk rate of 12%. The RR for the "Yes" group is 0.258 with a 95% confidence interval between 0.39 and 1.22. This RR indicates that the "Yes" group has a 0.258 times lower risk of anemia compared to the "No" group, but the difference is not statistically significant because the confidence interval includes the value 1. Research conducted by Sulistiyani et al. (2022) showed a relationship between the consumption of iron tablets during menstruation and the occurrence of anemia in adolescent girls in the Wirengan Masaran Sragen Village<sup>38</sup>. Furthermore, other literature also indicates the existence of a significant relationship between compliance in consuming iron and folic acid tablets and the reduction of anemia risk in adolescent girls<sup>39,40</sup>.

In the variable "kidney disease," there are two groups: "Yes" and "No." The "Yes" group has a 100% risk of anemia (high), while the "No" group has a 10% risk of anemia. The RR for the "Yes" group is 1.000 with a 95% confidence interval between 1.08 and 1.15. This indicates that the "Yes" group has a significantly higher risk of anemia. Kidney disease can significantly increase the occurrence of anemia due to impaired kidney function. It is known that the prevalence of anemia increases with the development of CKD and HF diseases. The pathophysiological mechanism of anemia is caused by a decrease in endogenous erythropoietin and oxygen transport, leading to tissue hypoxia, peripheral vasodilation, stimulation of neurohormonal activity, and dysfunction of kidney and heart function<sup>20</sup>.

In the variable "receiving anemia education," there are two groups: "Yes" (32 individuals) and "No" (10 individuals). The "Yes" group has an anemia risk rate of 9.9%, while the "No" group has an anemia risk rate of 9.6%. The RR for the "Yes" group is 1.000 with a 95% confidence interval between 0.52 and 2.02. This indicates that there is no significant difference in the risk of anemia between these two groups. However, these results may warrant further investigation. This is supported by earlier research showing that education provided to adolescent girls can reduce the occurrence of anemia<sup>41-43</sup>.

Respondents who have TB have a significantly higher risk of anemia compared to those who do not have TB. The p-value (0.109) indicates a nearly statistically significant difference. The RR is 3.52 with a 95%



confidence interval between 1.09 and 11.32. Research conducted by Dasaradhan et al. (2022) shows that patients with TB conditions have low Hb levels, and anemia is a common condition among them. Low Hb levels at the time of TB diagnosis or during the course of the infection directly impact the treatment outcomes and the patient's lifestyle. Repeated occurrences of TB infection in individuals can lead to low Hb levels<sup>44</sup>.

The frequency of meat consumption among respondents is still low, with 38 respondents rarely consuming meat, which is associated with a higher risk of anemia compared to 4 respondents who claim to frequently consume meat. Meat consumption can reduce the risk of anemia because it provides an adequate supply of iron, which is essential for nutrition. Therefore, ensuring adequate nutritional intake is necessary starting from adolescence to reduce the risk of anemia<sup>45</sup>.

## CONCLUSION

Factors such as age, family income, menstrual status, Iron and Folic Acid Tablet (IFAT) consumption, kidney disease, anemia education, tuberculosis (TB), and meat consumption can influence the risk of anemia in adolescent girls. Although some of these differences are not statistically significant, they still represent important factors to consider in efforts to prevent and manage anemia in the adolescent female population. Further studies and appropriate interventions can help address this anemia issue and improve the overall health of adolescent girls.

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## CONFLICT OF INTEREST

The author declares no conflicts of interest in the publication of this article.

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## ***Determinant Factors of Low Birth Weight in Loa Janan District: A Retrospective Cohort Study***

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### **ABSTRACT**

*In Samarinda in the Loa Janan Ilir sub-district, 8.23% (93 cases) of babies were born with low birth weight in 2021, two times from the previous year. The research is needed to understand the risk factors of LBW during pregnancy, such as anemia, chronic energy deficiency (CED) and the appropriateness of weight gain, in order to determine prevention programs. This study used a retrospective cohort method by looking at exposure during pregnancy and the baby's birth weight. The data used in this research is secondary data using a total sampling technique on the population of mothers who gave birth from January to May 2023. Analysis was carried out by looking at causal relationships and relative risk (RR) using the Chi-Square test and multivariate logistic regression. There was no relationship between anemia (p-value= 0.634) dan CED (p-value= 0.794) and appropriate weight gain (p-value= 0.189) during pregnancy and the incidence of LBW. Based on a multivariate test, it was found that pregnant women < 20 years old had a 45.16 times greater risk of having a LBW child (p=0.017). Meanwhile, mothers with inappropriate weight gain have a 7.6 times risk of having LBW children compared to those with (p-value=0.054). This is likely to occur because the majority of pregnant women have applied double doses to anemic pregnant women, but have not yet determined the adequacy of maternal's diet based on inadequate weight. Community health center is expected to carry out behavioral change interventions related to diet during pregnancy, apart from the importance of consuming supplements, as well as education regarding the impact of adolescent pregnancy.*

**Keywords:** LBW, Anaemia, Pregnant Women, Weight Gain, CED

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## **INTRODUCTION**

Low Birth Weight (LBW) is defined by the World Health Organization as a birth weight of less than 2500 grams<sup>1</sup>. The prevalence of LBW has been on the rise in Indonesia in recent years. In 2021, 12.27% of babies experienced LBW, marking an increase of 0.95% from 2019 (11.32%). The trend of LBW has also been observed at the provincial level in East Kalimantan from 2017 to 2019. Despite a decrease in cases in 2020, there were still 3,114

LBW babies<sup>2-5</sup>. The sub-district of Loa Janan Ilir in the city of Samarinda experienced a twofold increase in LBW cases in 2021 (93 cases or 8.23%) compared to the previous year<sup>6</sup>. LBW incidents in 2020 in Indonesia and East Kalimantan were identified as the leading cause of neonatal deaths (0-28 days) compared to other causes<sup>4,7</sup>.

The impact of Low Birth Weight (LBW) on the risk of growth and development in children is evident in several meta-analyses of observational studies. For instance, in

Indonesia, LBW has been associated with stunting in children aged 12-23 months (OR= 1.74; 95% CI= 1.38 – 2.19; p<0.001)<sup>8</sup>, language delay in children (aOR= 2.52; 95% CI= 1.90 – 3.35; p<0.001)<sup>9</sup>, and an increased risk of adult-onset diseases such as high blood pressure, asthma, metabolic diseases, cancer, respiratory diseases, allergies, cerebral palsy, and heart diseases<sup>10,11</sup>.

A systematic review conducted by Lestari et al., (2020) identified several significant risk factors for LBW, including maternal age (< 20 years), parity, low upper arm circumference, anemia, and gestational age <37 weeks<sup>12</sup>. Other factors influencing LBW include maternal nutritional status<sup>13</sup>, maternal education, maternal age over 35 years, and economic status<sup>14</sup>.

In Indonesia, there have been several observational studies examining the risk factors for LBW. However, there is a lack of research at the community level, particularly the absence of the use of a retrospective cohort design in the Samarinda City region. Based on the background and the importance of supporting data in policy recommendations, this study aims to explore the risk factors for LBW by examining the exposures experienced by pregnant women during pregnancy.

## METHOD

This study employs a retrospective cohort study design by identifying exposures (risk factors) in the past. The research is conducted in the Loa Janan sub-district within the working area of the Harapan Baru Community Health Center. The population in this study includes all pregnant women whose data are recorded in the pregnancy and birth medical records at the Harapan Baru Community Health Center. These medical records contain basic respondent data (gender, father/mother's education, maternal age, address), maternal nutritional status before pregnancy, Hb levels, upper arm circumference during pregnancy, and maternal weight at each visit. There is no data on compliance with consumption, socioeconomic status, and only 2 mothers experienced complications such as hypertension. The sampling method in this study is total sampling, where 124 infants are sampled based on birth data within the timeframe from January to May 2023. Exclusion criteria in this study include mothers

who gave birth prematurely (<37 weeks) and post-mature (>42 weeks), mothers giving birth to twins, and neonatal births with congenital anomalies.

The exposure variables observed in this study are Chronic Energy Deficiency (KEK) status in the third trimester, adequacy of weight gain based on the Institute of Medicine (IOM) from early pregnancy to the end, and maternal anemia status in the third trimester. The data type in this study is secondary data analyzed by determining the Relative Risk (RR). Statistical tests are conducted using the Chi-Square test.

## RESULTS

Out of 124 infant data, the majority were male (56.6%), and the parents' education level was predominantly equivalent to high school for both the father and mother of the infants. This indicates that only 18% to 23% of parents exceed the mandatory 12 years of education. Regarding the mothers' occupation, 79.8% of them were unemployed or housewives.

In Table 1, it is observed that before pregnancy, nutritional status issues were evident in 8% of mothers classified as undernourished and 34.7% of mothers classified as overweight. In terms of maternal age characteristics, mothers were categorized into ideal and non-ideal age groups for pregnancy. Two mothers were found to be pregnant under the age of 20, while 25 mothers, or 20.2% of them, were pregnant above the ideal threshold of 35 years.

**Table 1. Characteristics of Respondents**

Characteristics	Number	Persentase (%)
Gender		
Male	70	56.5
Female	54	43.5
Father's Education		
<= Junior High School	24	19.35
Senior high school	77	62.09
>= Diploma/graduate	23	18.54
Mother's Education		
<= Junior High School	23	18.54
Senior high school	63	50.8
>= Diploma/graduate	28	22.58
Mother's age		
< 20 years	2	1.61
20 - 35 years	97	78.2
>35 years	25	20.2
Mother's BMI before		

pregnancy		
Severe underweight	3	2.4
Mildly underweight	7	5.6
Normal	71	57.3
Mildly overweight	15	12.1
Severe overweight	28	22.6
Mum's occupation		
Employed	25	20.2
Not working	99	79.8

Comparison of the ratio of exposure and non-exposure of risk factors is presented in Table 2. This can explain the real condition of the population because it has used the total sampling technique. Of the 124 mothers, 29 (23.38%) were anaemic, which when compared to public health significance, is included in the moderate level of public health problems. The exposure ratio of pregnant women who were anaemic in the third trimester compared to those who were not was 1:4.5. The mean haemoglobin level of pregnant women was  $11.33 \pm 1.00$  g/dL, which with a standard deviation of 1, is still considered normal in the first trimester.

In the nutritional status of mothers during pregnancy, there were only 118 data available in the medical records. There were 20 mothers (21%) who experienced CED during pregnancy, with an exposure ratio of 1:4.5. The mean upper arm circumference in the pregnant population was  $26.5 \pm 3.5$  cm, which is considered normal. From the ratio data, it can be seen that there is still a lower number of exposures compared to non-exposed samples. Whereas in the discrepancy of weight gain during pregnancy from the beginning of pregnancy to the final trimester, there is a ratio of 3:1. This shows the high number of mothers who did not gain weight according to nutritional status (74.2%) compared to those who did.

**Table 2. Sampling of exposure and non-exposure**

Variable	Total (%)	Ratio	Mean
3rd Trimester Anaemia			
Yes	29 (23.4)	1:4.5	$11.33 \pm$
No	95 (76.6)		1.00 g/dL

Variable	Total (%)	Ratio	Mean
Chronic Energy Deficiency (CHD) (Trimester 3)			
Yes	20 (21)	1:4.5	$26.5 \pm$
No	98 (79)		3.5 cm
Inappropriate weight gain (IOM)			
Yes	92 (74.2)	3:1	-
No	32 (25.8)		

### The Relationship between Sample Characteristics and Pregnancy History with Stunting Incidence

Based on the results of the Chi-Square test, although the relative risk data indicate the presence of risk factors for the occurrence of anemia (RR= 1.35), Chronic Energy Deficiency (KEK) (RR = 1.256), and inappropriate weight gain (2.435) concerning Low Birth Weight (BBLR) occurrences, these results do not show a significant relationship with p-values > 0.05, which are 0.634, 0.794, and 0.162, respectively. However, when considering the prevalence of exposure, about 20% of the three variables have resulted in children with Low Birth Weight (Table 3).

Further investigation of respondent characteristics by the researchers revealed no relationship between the parents' education and the occurrence of Low Birth Weight. Similarly, with employment status, working mothers had an RR value of 1.32, meaning working mothers had a 1.32 times likelihood of having a child with Low Birth Weight, but this data is not significant.

Regarding the age characteristics that influence whether the mother's age during pregnancy is ideal or not, a significant relationship with Low Birth Weight occurrence was found (p-value = 0.039). However, in terms of the mother's nutritional status before pregnancy, there was no association with Low Birth Weight occurrences. This is supported by only 10 out of 124 individuals experiencing underweight, while the rest comprised 71 individuals with normal weight and 43 individuals classified as overweight.

**Table 3. Factors associated with LBW incidence**

Variable	LBW status		Relative Risk (RR)	95% CI	p-value
	Yes (%)	No (%)			
<b>Anaemia</b>					
Yes	7 (24.1)	22 (75.9)	1.35	0.62 – 2.93	0.634
No	17 (17.9)	78 (82.1)			
<b>Severe</b>					
Yes	6 (23.1)	20 (76.9)	1.256	0.555 – 2.843	0.794
No	18 (18.4)	80 (81.6)			
<b>Inappropriate weight gain</b>					
Yes	21 (22.6)	71 (77.4)	2.435	0.778 – 7.620	0.162
No	3 (9.7)	29 (90.3)			
<b>Gender</b>					
Male	15 (21.4)	55 (78.6)	1.286	0.610 – 2.712	0.663
Female	9 (16.7)	45 (83.3)			
<b>Age</b>					
< 20 years	2 (66.7)	1 (33.3)			
20 - 35 years	20 (20.8)	76 (79.2)	-	-	0.039*
>30 years	2 (8)	23 (92)			
<b>Father's education</b>					
<= Junior High School	4 (15.4)	22 (84.6)			
Senior High School	18 (23.4)	59 (76.6)	-	-	0.307
>= Diploma/Graduate	2 (9.5)	19 (90.5)			
<b>Mother's Education</b>					
<= Junior High School	8 (25.8)	23 (74.2)			
Senior high school	12 (18.5)	53 (81.5)			0.517
>= Diploma/graduate	4 (14.3)	24 (85.7)			
<b>Mother's BMI before pregnancy</b>					
Severe underweight	0 (0)	3 (100)	-	-	0.055
Mild underweight	4 (57.1)	3 (42.9)			
Normal	15 (21.1)	56 (78.9)			
Mildly overweight	1 (6.7)	14 (93.3)			
Severe overweight	4 (14.3)	24 (85.7)			
<b>Mother's occupation</b>					
Employed	6 (24)	19 (76)	1.32	0.585 – 2.977	0.573
Not working	18 (18.2)	81 (81.8)			

Notes: \* Significant relationship

According to the requirements of logistic analysis data processing after candidate selection, there were only 3 variables, including: BMI before pregnancy ( $p=0.055$ ), maternal age ( $p=0.039$ ) and mismatch of maternal weight gain ( $p=0.162$ ) that had a value below 0.25. However, other variables such as SEVERITY and anaemia were included in the

analysis due to their importance as theoretical risk factors. Table 4 presents the estimates from the multivariate logistic regression analysis.

The model summary statistics show that the Nagelkerke R Square is 0.15, indicating that 15% of the variability in LBW can be explained by the mother's age at pregnancy.

**Table 4. Multivariate regression analysis of risk factors for LBW.**

Factors	B	S.E.	p-value	RR Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
Weight gain mismatch	2.029	1.051	0.054	7.608	.970	59.67
Age of the expectant mother			0.022			
< 20 years	3.810	1.599	0.017	45.163	1.969	1036.17
Constant	-4.751	2.433	0.051	.009		



With weight gain during pregnancy. Although true, multivariate logistic regression cannot be calculated in the same way as multivariate linear regression.

Multivariate analysis showed that having a gestational age under 20 years was the most significant risk factor with an RR of 45.16, which means that pregnant women under 20 years of age are times more at risk than pregnant women over 20 years of age (p value = 0.017).

While in the weight gain mismatch, it was found that there was a decrease in the p-value to 0.054. The RR results showed that mothers with inappropriate weight gain during pregnancy had a 7.6 times greater risk of having a LBW child compared to those with appropriate weight gain during pregnancy (95% CI = 0.97 - 59.6).

## DISCUSSION

### Data characteristics

Of all the respondent characteristics available in the medical record data, it is known that the age of the pregnant mother has the most significant risk factor. This result was also seen in several studies such as Lizindy (2023), who found that mothers at risk age had 15.89 times greater risk of giving birth to low birth weight babies compared to pregnant women at non-risk age (20-35 years)<sup>15</sup>.

This study is also supported by a meta-analysis study by DeMarco, et al (2021) which found that adolescent pregnant women are at 1.5 times the risk of having LBW children compared to adult women. This is probably because the reproductive organs are still not fully developed. Likewise, nutritional needs are not yet optimally fulfilled due to competition for nutrients between mothers and babies who are simultaneously in the growth and development period<sup>16</sup>.

In this study, parental education did not appear to have an association with LBW birth. This can also be seen in Arsyi and Bersal's (2020) study using data from the Indonesian Demographic and Health Survey in 2017<sup>17</sup>. This phenomenon may be explained by the accessibility of information sources using internet technology, so that mothers with low education can seek sources of knowledge or consult online with health workers.

### Anaemia

In this study there was no association of anaemia during pregnancy with LBW, but if

using public health indicators, then the prevalence of anaemia of 23.38% falls into the category of moderate public health problems<sup>18</sup>. This is in line with a similar study where the same number of anaemic and non-anaemic mothers (82 people) were found not to be associated with LBW (p value 0.148 > 0.05)<sup>19</sup>.

However, a study by Wulandari (2017) found an association between anaemia during pregnancy and LBW (p=0.021, OR=3.66). In that study, the researcher used a sample with a ratio of exposure and non-exposure of 1:1 with a prospective design, while in this study the ratio was 1:4,5<sup>20</sup>.

It was found that the mean haemoglobin level of the population in this study was 11.34 ± 1.005 g/dl, while the mean in the anaemia group was 10.09 ± 1.01 (normal data distribution). This could be related to the anemia intervention for pregnant women at Harapan Baru health centre which has provided double dose. So that even though there were anaemic pregnant women, the majority of haemoglobin levels were still around the anaemia threshold and had not yet reached the emergency limit. This may have caused the absence of a significant relationship.

### Chronic Energy Deficiency (CHD)

The absence of an association between CED during pregnancy and LBW was also seen in other studies. Wijoyo's (2005) study, where out of 63 pregnant women with CED and 176 non CED mothers, there was no significant relationship between the incidence of CED and LBW<sup>19</sup>.

In a study by Purboningti (2021) using the case control method, there was also no relationship between SEEK and LBW. The study used a sample with a ratio of 1:3 where the number of non-exposure samples was greater than exposure, similar to this study<sup>21</sup>.

Matos (2010), with a sample of 167 infants, found a significant association between LBW (p=0.000, OR=8.54)<sup>22</sup>, as well as research by Sumiaty et al (2016) (p=0.000, RR=4.215)<sup>23</sup>.

The absence of a significant relationship may be due to the fact that there were only 6 pregnant women out of 124 mothers who had a history of LBW. The mean upper arm circumference (Lila) in the group of pregnant women with CED was 22.5 ± 1.2 cm, this average is still close to the CED threshold of 23.5 cm. Meanwhile, the population mean for the upper arm circumference (LiLa) of mothers

was  $26.56 \pm 3.55$  cm (normal data distribution).

Considering that there were only 10 out of 124 mothers who were malnourished before pregnancy, the majority of the mothers had normal or improved nutritional status. So it can prove that even though the mother's arms were detected to be small, it is likely that the pregnant woman's weight is not deficient. Several studies have proven that low pre-pregnancy BMI has a risk of LBW<sup>24,25</sup>.

The pre-pregnancy BMI in this study had a p-value that was closer to significance than the upper arm circumference (p-value=0.055). So it is more likely that the mother's BMI before pregnancy is more influential than upper arm circumference during pregnancy. This is also evident from the more significant weight gain especially when using the regression model along with maternal age.

### **Discrepancy in weight gain during pregnancy**

In the results of this study, although there was no significant association, the RR value in the variable of appropriateness of weight gain was the highest. There were only 3 pregnant women who did not experience appropriate weight gain who had LBW children. This was also seen in Sari's (2017) study with similar methods on 766 pregnant women also showed no association of weight gain during pregnancy with LBW<sup>26</sup>. Meanwhile, based on the research of R Khulafa'ur (2015), there is no relationship between the nutritional status of pregnant women and the incidence of LBW<sup>27</sup>.

In Ningrum and Cahyaningrum's (2018) study, it was found that pre-pregnancy BMI had a significant relationship with birth weight. So if you look at the data of this study, there were only 8% of pregnant women who were underweight before pregnancy (Table 1), the majority of mothers were normal weight and overweight<sup>28</sup>.

After using the multivariate test results, there was an increase in the significance of the p-value although it was not below 0.05. However, this proves the influence of the age of the pregnant women. There is an increase in the risk probability value of LBW when there is a mismatch in weight gain.

We can refer to the research of Putri (2023), with similar methods found that in 146 pregnant women, there was a significant relationship between weight gain and the

incidence of LBW (p=0.027; OR=2.9)<sup>29</sup>. Likewise, Gunawan's research (2019), with the number of case and control groups of 37 people each, found a significant relationship (p=0.000; OR = 15.46)<sup>30</sup>.

This incident can be explained by the mother's food consumption during pregnancy. If the mother does not meet the adequacy of food and insufficient body weight during pregnancy is at risk of giving birth to a low birth weight baby, while women who experience excessive weight gain are at higher risk of preeclampsia, giving birth to macrosomal babies, and gestational diabetes. Therefore, addressing low birth weight requires a more holistic and multi-sectoral approach such as behaviour change communication and comprehensive preconception care<sup>31</sup>.

## **CONCLUSIONS**

In this study, there was no significant association between pregnancy history of anaemia and LBW and the incidence of LBW. This is probably because in the study the number of mothers who were exposed and had children with LBW was small and the number of non-exposure was low. Another influencing factor is the average maternal Hb level which is still in the normal category due to the use of double dose anaemia at the puskesmas. Maternal BMI before pregnancy is a possible risk factor for LBW, supported by inappropriate weight gain during pregnancy and maternal age below ideal is a risk factor for LBW. There is a need for behaviour change communication interventions that help mothers improve their eating behaviour beyond supplementation.

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## **CONFLICT OF INTEREST**

The authors declare no conflict of interest

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## Uncovering Determinant of Anaemia Among Adolescent Girls

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### ABSTRACT

Anaemia is a significant global public health issue that primarily affects adolescent girls. Smoking, malaria, and low family income are associated with teenage Anaemia in girls. The purpose of the study was to uncover determinant Anaemia among adolescent girls. This type of research is cross-sectional. The research location was at the high schools in Central Sulawesi from March to September 2023. The study sample was teenage girls, with as many as 384 respondents. Simple random sampling was the method used for the sample. The study's independent variables included the respondents' anthropometrics, sociodemographics, and infectious illnesses. The dependent variable was haemoglobin levels. The research instrument used a Kobotoolbox application questionnaire. They measure weight with digital scales, height with Length board measuring, and arm circumference with mid-upper arm circumferences. Laboratory analysts carried out measurements of haemoglobin levels. Chi-square test analysis of research data with a 95% confidence level. Test of logistic regression in multivariate analysis. The findings indicated that 20.3% of teenage girls suffered from Anaemia. Adolescent girls who smoke (OR=3.2, 95% CI (1.10, 8.70)), have malaria (OR=1.9, 95% CI (0.80, 5.00)), and come from an income family with less than Rp. 2.599.546 (OR=1.7, 95% CI (1.00, 2.90)) are at risk for Anaemia. Adolescent girls' anaemia prevalence was a moderate public health concern. Teenage girls who smoke, have malaria and have a family low income below are determinants for Anaemia.

**Keywords:** Determinant, Anaemia, Adolescent Girls, Sigi

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## INTRODUCTION

Anemia in adolescent girls is still a public health problem worldwide, particularly in developing countries<sup>1-3</sup>. The prevalence of Anaemia among teenage girls varies depending on the region, but it is generally high. For example, in Indonesia, the prevalence of Anaemia in adolescent girls was found to be 32%<sup>4,5</sup>. A study of high school girls in South Kalimantan, Indonesia, found 29.3% had Anaemia<sup>6</sup>. In a survey conducted in West Java, Indonesia, 41% of the adolescent girls were

anaemic<sup>7</sup>. In a rural area in Indonesia, the prevalence of Anaemia in children and adolescents was reported to be 53.9%, with a higher prevalence of IDA in younger children<sup>8</sup>. Similarly, in a rural area of Tamil Nadu, India, the prevalence of Anaemia among adolescent girls was found to be 48.63%<sup>9</sup>. In conclusion, Anaemia in teenage girls remains a significant public health issue worldwide, particularly in developing countries.

The consequences of Anaemia in

adolescent girls can significantly impact their health and development. Anaemia can lead to heart and lung problems, pregnancy complications, growth and development issues, and difficulty performing daily activities<sup>5,10</sup>. If left unaddressed, Anemia can hinder adolescents' development and ability to become productive, creative, and competitive in the future<sup>5,10</sup>. Several studies have found that Anemia has a significant impact on adolescent girls. Anaemia during adolescence hurts growth, cognitive, and performance abilities, severely impacting overall health<sup>6</sup>. Acute and chronic inflammation, parasitic infection, iron deficiency, folate deficiency, vitamin B12 deficiency, vitamin A deficiency, and inherited or acquired disorders that impact haemoglobin synthesis, red blood cell production, or red blood cell survival are among the causes of Anemia in adolescent girls<sup>11</sup>. Poor academic performance, increased morbidity, absenteeism, and cognitive impairment are just a few of the adverse effects that Anemia can have<sup>11</sup>. Furthermore, a lack of red blood cells, or haemoglobin, is linked to Anemia in teenage females, which may hinder their physical and psychological development as they approach maturity<sup>4</sup>. To address this serious public health concern and lessen its adverse effects on adolescent girls' health and well-being, efforts must be made to prevent and cure Anemia in them.

Numerous reasons, such as poor diet, iron deficiency, excessive blood loss, parasite infections, both acute and chronic illnesses, and the existence of additional micronutrient deficiencies, can lead to Anaemia in adolescent girls<sup>12</sup>. The most prevalent cause of Anemia is iron deficiency, which is brought on by inadequate food intake. Anaemia can also result from dietary deficiencies in essential vitamins, such as C, folic acid, and B<sub>12</sub><sup>13</sup>. Due to a period of physical growth, reproductive maturation, and cognitive changes, adolescent girls are more susceptible to Anemia. Socioeconomic issues, inadequate nutrition from insufficient food intake, improper hand cleanliness, irregular eating patterns, and worm infestation can also be caused by teenage girls' Anemia<sup>13</sup>. Also, studies have found that Anemia among adolescent girls is associated with low protein and iron intake<sup>4</sup>. Overall, Anemia in teenage

girls is a complex issue that requires a multifaceted approach to address its various causes.

The Government of the Republic of Indonesia has tried to prevent and treat Anemia in adolescent girls through various strategies and collaborations. Some of these efforts include balanced nutrition education, food fortification, school-based health checks, weekly Iron and Folic Acid Supplementation (WIFAS) program, multisectoral collaboration, and community awareness and socialization<sup>5,14-16</sup>. The frequency of Anemia in Indonesian teenage females persists despite these attempts. Thus, we must maintain and expand these activities to treat and further lessen the burden of Anemia in this age group. Another measure taken by the government to stop teenage girls from becoming anaemic is the distribution of pills with blood added. Around 2018, the Ministry of Health of the Republic of Indonesia simultaneously pushed for giving adolescent girls pills with blood added. According to a study conducted at one of the East Kalimantan Public Health clinics in Indonesia, 97.1% of recipients received tablets that add blood over a year. However, Anemia affects three out of ten teenage girls.<sup>17</sup> Similarly, 3 out of 11 adolescent females at one of the Sigi Regency Community Health Centers showed Anemia when anaemia screening was performed<sup>18</sup>.

Different countries and areas have various risk factors for Anemia in adolescent girls. Food intake habits, low socioeconomic level, malaria, aging, menstruation, smoking, and low educational attainment have all been found to be significant risk factors for iron deficiency anaemia (IDA) in female adolescents in developing nations<sup>19-21</sup>. Low iron intake was identified as a potential risk factor for IDA in an Indonesian investigation that revealed the frequency of nonanemic iron insufficiency to be higher than that of IDA<sup>22</sup>. Furthermore, a Korean study revealed that a family history of the disease was an independent risk factor for IDA in teenagers<sup>23</sup>. It has also been shown that low iron intake and absorption, blood loss during menstruation, and higher iron requirements are all associated with a higher risk of Anemia in female teenagers<sup>24</sup>. These findings underscore the importance of considering regional and country-specific factors when addressing

Anemia in adolescent girls.

Research on risk factors for Anemia in Sigi Regency, Central Sulawesi, has never been conducted. This research is helpful for local governments, especially the health and education offices of Sigi Regency, Central Sulawesi, to determine the right strategy for preventing and managing Anaemia. The purpose of the study was to uncover determinants of Anemia: A Study on Adolescent Girls in Sigi District, Central Sulawesi, Indonesia.

## METHOD

This research uses a cross-sectional design and observational analytics to examine the anaemia risk factors in teenage girls in Sigi Regency, Central Sulawesi, Indonesia. From March to September 2023, a Senior High School (SMA) in the Sigi Regency, Central Sulawesi, served as the study's site. The teenage girls at Sigi Regency's challenging high schools in Central Sulawesi made up the study population. The study sample consisted of 384 individuals. Simple random sampling is the method used for sampling.

The independent variables were the occupation of mother with measuring results work and not work, family income by calculating results  $<Rp.2.599.546$  dan  $\geq Rp.2.599.546$ , class rank with measuring results 1-5, 6-10 and  $>10$ , upper arm circumference with the measuring results of less caloric energy and no less caloric energy, length of menstruation by measuring results  $<7$  days and  $\geq 7$  days, iron supplementation with measuring results given and not given, anemia education with measuring results provided and not given, infectious diseases with the results of measuring the sick and not sick of sickness, smoking with measuring results smoking and non-smoking, malaria with malaria and no malaria measurement results, exercise habits with measuring results of do or not do, knowledge of nutrition with measuring results are good, enough and less, frequency of eating fish with measuring results are rare and frequent, eggs with measuring results are occasional and regular, meat and drinking milk every day with measuring results are rare and frequent. The dependent variable is haemoglobin levels,

with the measuring results being Anemia and not Anemia.

The research instrument uses questionnaires containing the characteristics of respondents., knowledge about balanced nutrition, frequency of use of foodstuffs, anthropometric data, exercise habits, history of infectious diseases, and haemoglobin measurement data. The research data was collected using questionnaires tested on different respondents. Questionnaires have also been tested for validity and reliability. The data collection questionnaire has been tested in one of the other high schools. The data collection questionnaire is carried out by enumerators trained before conducting research data collection activities. Measure weight with digital weight scales, height with Length board measuring, and upper arm circumference using mid-upper arm circumference (MUAC). Health analysts from the Central Sulawesi Provincial Health Laboratory measured haemoglobin levels. Respondents' blood samples were taken as much as 1 millilitre. Haemoglobin levels are calculated using the Haemoglobin Hematology Analyzer method. This research has obtained recommendations from the Central Sulawesi Provincial Education Office with letter number 873/1512.SEK/DISDIK and permission from Central Sulawesi province's National and Regional Political Unity Agency with letter number 070/6711/Bid.III-BKBPD/2023. Before collecting research data, respondents were first explained and asked for approval. The Ministry of Health in Palu, Central Sulawesi, and Indonesia's Poltekkes Research Ethics Commission have approved this study. M2A23/0063/IGPK-KPK. At the 95% ( $\alpha 5\%$ ) confidence level in the survey, bivariate analysis was performed using the chi-square test, and multivariate analysis was performed using logistic regression analysis.

## RESULTS

From June to August of 2023, a high school in Sigi, Central Sulawesi, served as the data collection site for this research. The research sample that was obtained consisted of 384 respondents. The results of the study can be seen in Table 1 below:

**Table 1. Sociodemographic characteristics of respondents.**

Variable	Sum	%
Age		
Early Adolescence	20	5.2
Mid-teens	336	87.5
Late Adolescence	28	7.3
Mother's Occupation		
Work	104	27.1
Does not work	280	72.9
Family Income		
<Rp. 2.599.546	196	51.0
≥Rp. 2.599.546	188	49.0
Upper Arm Circumference		
Less calorie energy	115	29.9
No Less Energy Calories	269	70.1
Length of Menstruation		
<7 days	207	53.9
≥7 days	177	46.1
Ranking in Class		
Ranks 1-5	152	39.6
Ranks 6-10	130	33.9
Ranks >10	102	26.6
Nutritional Status (IMT/U)		
Underweight	144	37.5
Normal	187	48.7
Overweight+Obecity	53	13.8
Iron Supplementation		
No	328	85.4
Yes	56	14.6
Get Anemia Education		
No	277	72.1
Yes	107	27.9
Kidney Disease		
Yes	3	0.8
No	381	99.2
Tuberculosis		
Yes	1	0.3
No	383	99.7
Malaria		
Yes	22	5.7
No	362	94.3

Smoking		
Yes	17	4.4
No	367	95.6
Exercise		
No	309	80.5
Yes	75	19.5
Knowledge		
Less	66	17.2
Enough	178	46.4
Good	140	36.5
Fish Feeding Frec/See Protein Source		
Infrequently	175	45.6
Often	209	54.4
Frec Eats Eggs		
Infrequently	261	68.0
Often	123	32.0
Frec Eating Meat		
Infrequently	288	75.0
Often	96	25.0
Frec Drink Milk		
Infrequently	243	63.3
Often	141	36.7
Anemia		
Yes	78	20.3
No.	306	79.7

Table 1 shows that most respondents in order are middle adolescence (87.5%), non-working mothers (72.9%), and family income < Rp. 2,599,546 (51%), No Fewer Energy Calories (70.1%), menstrual length <7 days (53.9%), rank 1-5 (39.6%), not taking iron supplementation (85.4%), not receiving anaemia education (72.1%), not suffering from kidney disease (99.2%), not suffering from Tuberculosis (99.7%), not suffering from malaria (94.3%), not smoking (95.6%), not exercising (80.5%), sufficient knowledge (46.4%), often eating fish (54.4%), rarely eating eggs (68%), eating meat (75%), and rarely drinking milk (63.3%). The prevalence of Anemia among respondents was 20.3%.

**Table 2. Bivariate Analysis of Determinants of Adolescent Anemia in Sigi Regency, Central Sulawesi (n-384).**

Research Variables and Anemia Status	Anemia		Not Anemic		Nilai p*
	n	%	N	%	
Age					
Early Adolescence	5	25.0	15	75.0	0.851
Mid-teens	67	19.9	269	80.1	
Late Adolescence	6	21.4	22	78.6	
Mother's Occupation					
Work	26	25.0	78	75.0	0.164
Does not work	52	18.6	228	81.4	



Family Income					
<Rp.2.599.546	48	24.5	148	75.5	0.038**
≥Rp.2.599.546	30	16.0	158	84.0	
Upper Arm Circumference					
Less calorie energy	19	16.5	96	83.5	0.227
No less energy calories	59	21.9	210	78.1	
Length of Menstruation					
>7 days	46	22.2	161	77.8	0.314
≥7 days	32	18.1	145	81.9	
Achievement					
Level 1-5	30	19.7	122	80.3	0.239
Level 6-10	32	24.6	98	75.4	
Level 10	16	15.7	86	84.3	
Nutritional Status (IMT/U)					
Underweight	34	23.6	110	76.4	0.087
Normal	39	20.9	148	79.1	
Overweight+Obesity	5	9.4	48	90.6	
Iron Supplementation					
No.	69	21.0	259	79.0	0.393
Yes	9	16.1	47	83.9	
Get Anemia Education					
No.	54	19.5	223	80.5	0.522
Yes	24	22.4	83	77.6	
Kidney Disease					
Yes	1	33.3	2	66.7	0.574
No.	77	20.2	304	79.8	
Tuberculosis					
Yes	1	100.0	0	0.0	0.047**
No.	77	20.1	306	79.9	
Malaria					
Yes	7	31.8	15	68.2	0.167
No.	71	19.6	291	80.4	
Smoking					
Yes	7	41.2	10	58.8	0.029**
No.	71	19.3	296	80.7	
Exercise					
No.	62	20.1	247	79.9	0.806
Yes	16	21.3	59	78.7	
Knowledge					
Less	12	18.2	54	81.8	0.757
Enough	39	21.9	139	78.1	
Good	27	19.3	113	80.7	
Fish Feeding Frec/See Protein Source					
Infrequently	36	20.6	139	79.4	0.908
Often	42	20.1	167	79.9	
Frec Eats Eggs					
Infrequently	56	21.5	205	78.5	0.417
Often	22	17.9	101	82.1	
Frec Eating Meat					

Infrequently	60	20.8	228	79.2	0.660
Often	18	18.8	78	81.3	
<b>Frec Drink Milk</b>					
Infrequently	45	18.5	198	81.5	0.251
Often	33	23.4	108	76.6	

\*Chi-Square Test

\*\*Significant  $p < 0.05$  (95% CI)

Table 2 shows that the p values of variables associated with Anemia were family income <Rp.2,599,546 (0.038), Tuberculosis (0.047), and smoking (0.029).

**Table 3. Multivariate Analysis of Anemia Determinant (Logistic Regression Test).**

Variable	OR	Nilai p	95% CI	
			Lower	Upper
<b>Smoking</b>				
Yes	3.2	0.025	1.1	8.7
No.	1.0			
<b>Malaria</b>				
Yes	1.9	0.157	0.8	5.0
No.	1.0			
<b>Family Income</b>				
<Rp. 2.599.546	1.7	0.039	1.0	2.9
≥Rp. 2.599.546	1.0			

Table 3 shows that adolescent girls who smoke have a 3.2 times determinant of Anemia, malaria 1.9 times, and family income <Rp. 2,599,546 1.7 times.

## DISCUSSION

According to the findings, 20.3% of teenage girls in Sigi, Central Sulawesi, were anaemic. This number is lower than the 32% prevalence of Anemia among those in the 15–24 age group in 2018. The prevalence of Anaemia is still high but is falling compared to Southeast Asian nations like Malaysia and Thailand. According to a study on high school-aged girls, 8.3%, or 19 out of 227 respondents, had Anemia<sup>25</sup>. In Malaysia, teenage girls between the ages of 13 and 17 have an average 12.5% anaemia prevalence<sup>26</sup>. Therefore, efforts from various parties and multisector handling are still needed to reduce the prevalence of Anemia from year to year.

According to the findings, teenage girls who smoked had a 3.2 times higher chance of developing Anemia. This study is consistent with a survey by Vivek al. (2023) that indicates there is a high correlation between smoking and adolescent girls' iron deficiency anaemia<sup>19</sup>. Smoking hurts haematological parameters such as

haemoglobin, average haemoglobin concentration, red blood cell count, and hematocrit<sup>27</sup>. The adverse effects of smoking on serum ferritin and other haematological markers are corroborated by additional research. One of the best markers of iron status is serum ferritin<sup>28</sup>. Smoking can decrease iron absorption and reduce the body's ability to absorb essential nutrients that maintain blood haemoglobin levels. Smokers have lower haemoglobin levels<sup>29</sup>. Therefore, it is essential to prevent adolescent girls from smoking because it has an impact on haematological parameters.

The results also showed that malaria was a risk factor for Anemia. Malaria is the leading cause of Anemia in tropical areas<sup>30</sup>. Anemia was linked to diseases like bacteremia, hookworm, and HIV, according to a recent study among children from Malawi. Children under the age of six are more likely to develop Anemia when they have clinical malaria. According to different research, Anemia and malaria are both

prevalent illnesses that mainly afflict children in Africa, and there is a direct link between the two<sup>31</sup>. Particularly in young infants, severe malaria can cause Anemia. The effect of the host's iron status on future malaria has been studied. Consequently, it is yet unknown if having better iron status raises the risk of malaria<sup>32</sup>. Because of the intricate relationship between iron and malaria parasites, which can worsen morbidity, there is a need to integrate iron supplementation with malaria control efforts. Because folic acid negates the medication's antimalarial effects, folic acid supplementation should also be restricted<sup>33</sup>.

In addition to the two previous risk factors, family income <Rp.2,599,546 was also a risk factor for Anemia in adolescent girls. The minimum wage standard of Sigi Regency is Rp.2,599,546. Family income below this figure can cause Anemia in teenage girls. Low family income will affect the ability to prepare food for the household. Low-income families are more prone to experience food insecurity, which is the limited or erratic availability of healthful, safe foods. Poorer nutrition quality has consistently been linked to lower household income. People with lower incomes tend to eat a worse-quality diet, consuming more sugar-sweetened beverages and fewer fruits and vegetables than those with higher incomes. Lower-income households are less likely to purchase fit-recommended items like veggies and spend a significant portion of their shopping money on less healthful foods like frozen desserts<sup>35</sup>. Low-income people who experience housing instability may face difficulties getting, storing, and cooking wholesome meals for the family<sup>36</sup>. low-income households purchase fewer healthful foods than high-income households.

Healthy and nutritious food can prevent Anemia in adolescent girls. Girls throughout their adolescence are more at risk for malnutrition since they are developing more quickly than at any other point after birth. They require protein, iron, and other minerals to sustain the teenage growth spurt and meet the body's increased need for iron during menstruation. Around age one, infants can develop Anemia, and the most common cause of Anemia globally is iron deficiency, which causes growth spurts in children and

adolescents<sup>37,38</sup>. Iron is needed to make haemoglobin, a protein that carries oxygen throughout the body. The bulk of the iron in the body is stored in haemoglobin. Iron deficiency: Anemia is caused by the body's inability to manufacture haemoglobin, which requires iron<sup>37</sup>. Teenagers who suffer from conditions like celiac disease, which impairs the body's ability to absorb iron from food, as well as those who drink tea, consume insufficient amounts of iron-rich foods, and consume more than 500 milliliters of cow's milk per day—especially when they are still toddlers—may develop iron deficiency anaemia<sup>38</sup>. Adolescent girls who have regular, lengthy, or weighty periods run the risk of developing iron deficiency anaemia since blood loss can also lead to an iron shortage<sup>37,38</sup>. To enhance iron absorption and avoid Anemia, adolescent girls should eat vitamin C-rich citrus fruits, drink at least eight glasses of water throughout the day, and have healthy snacks between meals<sup>38</sup>.

Furthermore, an Indonesian study found that six food-based recommendations would guarantee dietary adequacy for nine out of twelve nutrients except for iron, folate, and calcium. Milk and liver were selected as two likely nutrient-dense foods to solve the nutrient gaps<sup>37</sup>.

Teenage girls' health, general growth, and general well-being are among the many reasons preventing Anaemia in them is crucial. Anemia can impair an adolescent girl's health and well-being by causing weakness, exhaustion, and a lowered immune system<sup>39,40</sup>. Development can negatively impact cognitive development, school performance, and physical growth, especially during adolescence<sup>41</sup>. The consequences of longevity during adolescence can have long-term effects on girls' health and productivity as they transition into adulthood<sup>42</sup>. The socioeconomic impact is that Anemia can perpetuate the cycle of poverty by affecting adolescent girls' ability to participate fully in education and later in the workforce<sup>43</sup>. Various interventions have been studied and implemented to prevent Anemia in teenage girls, including dietary interventions, deworming, micronutrient fortification, and iron-folic acid supplementation<sup>39,41,42</sup>. Adolescent girls' general health has improved,

and the prevalence of Anemia has decreased because of these efforts. Thus, to successfully prevent and cure Anemia in these vulnerable populations, immediate action is required to adopt and scale up these interventions.

## CONCLUSION

Adolescent girls' anemia prevalence was a moderate public health concern. Teenage females' Anemia was influenced by smoking, malaria, and a family income of less than 2,599,546. Various variables, including a deficiency in iron, folic acid, protein, and vitamin C, can cause Anemia in adolescent females. For this reason, prevention and management of Anemia require a multisector strategy.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest

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## *Predictor of Postpartum Depression: Literature Review*

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### **ABSTRACT**

*The incidence of postpartum depression is quite high. The largest percentage occurs when they have their first child, and have a family history of mood disorders. The incidence of postpartum depression is 50 - 60% in mothers when they have their first child, and around 20% in mothers who give birth to subsequent children. This study aims at reviewing and synthesizing the determinants factor of depression among adolescent in rural area. This study design was a systematic review using the PICO framework. This data was carried out from various journal databases 2012-2022, including Scopus, ScienceDirect, PubMed. 16 articles meet the inclusion criteria and meet the qualifications for review. A systematic procedure is used to collect articles, as well as a critical appraisal and data synthesis with qualitative synthesis. The analysis of the literature review found that aspects of findings related to predictors of postpartum depression are as follows: socio-demographic factors (age, socio-economic status, education, risk age group), maternal factors (pregnancy spacing, parity, pregnancy condition, birth experience, postpartum complications), biological factors (hypothalamus function, prolactin, CRH, inflammatory process), psychosocial factors (negative mood, anxiety, unpreparedness, history of depression), cultural factors (children care stress, wisdom), support system (support husband, family support, decision-making patterns). Healthcare professionals should be aware of this phenomenon and strategies such as primary, secondary, and tertiary prevention interventions may be applied. Women should be screened for potential risk factors and depressive symptoms during pregnancy and postpartum periods so that appropriate interventions if needed, can be initiated in a timely fashion.*

**Keywords:** *Postpartum, Depression, Predictor*

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## **INTRODUCTION**

Postpartum depression is a mood disorder that occurs after childbirth and reflects psychological dysregulation which is a sign of major depressive symptoms. The condition of postpartum depression is a serious condition where a study proves that 25% of mothers who

have given birth for the first time experience severe postpartum depression and about 20% of mothers who have given birth to their next child. This mood disorder usually occurs 2-6 weeks after giving birth with characteristics, namely feelings of depression, excessive anxiety, insomnia, and changes in body weight<sup>1</sup>.

The incidence of postpartum



depression is quite high. The largest percentage occurs when they have their first child, and have a family history of mood disorders. The incidence of postpartum depression is 1 to 2 in 1000 births and about 50 to 60% of mothers experience postpartum depression when they have their first child, and about 50% of mothers who experience postpartum have a family history of mood disorders <sup>2</sup>.

The impact of postpartum depression does not only occur on mothers but can also occur on babies. Mothers with postpartum depression have a depressed mood, loss of interest in activities, appetite disturbances, sleep disturbances, physical agitation or psychomotor slowing, weakness, feeling useless, difficulty concentrating, and even suicidal ideation. Babies will experience delays from various aspects, both cognitive, psychological, neurological, and motor, and tend to be more fussy in response to seeking and getting attention from their mothers <sup>3</sup>.

The cause of postpartum depression is the complexity of various aspects, both internal and external. The literature review aims to analyze the predictor factors of postpartum depression. It is important to know the causes and risk factors to prevent the effects of postpartum depression, as well as to manage women who have been diagnosed so that their condition does not worsen.

## **METHODS**

A literature search was conducted using the following electronic databases: Scopus, ProQuest, PubMed, Science Direct. Such terms as postnatal depression, postpartum depression, puerperal depression, risk factors, predisposing factors, and predictor factors were entered separately and in combination during the search. Studies were included in this review if they (a) examined and identified risk factors for PPD, (b) using quantitative and qualitative methodologies, and (c) were published in English peer-reviewed journals between 2012 and 2022. The primary goals of this literature review are to provide updated description, possible relationships among study variables,

scope of existing studies, and a comprehensive understanding of the predictor of postpartum depression. Integration of findings from both qualitative and quantitative perspectives, which provides a much broader summary of the literature, has the potential to accomplish the goals, of illustrating possible links between PPD and its pertinent variables. Furthermore, studies undertaken within a 10-year period were included as they are more likely to reflect the current state of knowledge concerning PPD. This process aims to prevent the inclusion of poor-quality research, which may distort the conclusion of research findings. In this literature review, the authors examined each individual research and provided an overall critique of the existing studies in terms of knowledge gaps and methodological limitations. The inclusion of qualitative and quantitative research in this review requires different sets of criteria for each type of research. This may increase the complexity of the appraisal process and produce difficulties in determining and comparing quality across studies.

This review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, including identification (n=378), screening (after removal of duplicates (n=115) and screened based on title (n=53)); eligibility using inclusion criteria (n=16). To determine the articles' validity, the authors conducted a careful and structured evaluation using the Critical Appraisal Skill Program (CASP). Each article is assessed for quality according to the research design at CASP. The quality of the journals reviewed passed the critical appraisal, namely 16 articles. To answer the research question, data abstraction was carried out to find every necessary point (meet the inclusion criteria). The implementation process is carried out in an electronic form (MS Excel). Data extraction forms can reduce the need for authors to refer back to the original studies. Analysis and Qualitative synthesis were carried out to find essential points/ characteristics of each relevant article and describe the research findings. the author makes a matrix to facilitate the delivery of information.

## RESULTS

**Table 1. Synthesis of Results.**

Title	Method (Design, sample, Variable)	Results
The psychosocial impact of nausea and vomiting during pregnancy as a predictor of postpartum depression <sup>4</sup>	<p><b>D</b> : Retrospective, cross-sectional</p> <p><b>S</b> : Participants were women above 18 years of age who had been pregnant at least once.</p> <p><b>V</b> : PPD, Physical characteristic of NVP and HG</p> <p><b>I</b> : Self-report online survey. The Hyperemesis Impact of Symptoms Questionnaire (HIS)</p> <p><b>A</b> : Hierarchical logistic regression models</p>	The psychosocial impact of nausea and vomiting in pregnancy appears to be predictive of postpartum depression. Our findings indicate that assessing the psychosocial impact of nausea and vomiting in pregnancy during antenatal care may identify women at risk of postpartum depression.
Can Insomnia in Pregnancy Predict Postpartum Depression? <sup>5</sup>	<p><b>D</b> : Cohort-longitudinal</p> <p><b>S</b> : Participants were women post partum with insomnia.</p> <p><b>V</b> : Insomnia, post partum depression.</p> <p><b>I</b> : The Bergen Insomnia Scale (BIS) was used to assess for insomnia. Pittsburgh Sleep Quality Index (PSQI), and The Edinburgh Postnatal Depression Scale (EPDS)</p> <p><b>A</b> : For categorical data with chi square. Differences in prevalence of insomnia were tested by McNemar's test. Pearson's correlation and Multivariate linear regressions were used for testing associations.</p>	High EPDS scores and anxiety in pregnancy, fear of delivery, previous depression, primiparity, and higher educational level were risk factors for both postpartum insomnia and depression. Insomnia did not predict postpartum depression in women with no prior history of depression, whereas women who recovered from depression had residual insomnia.
Anxiety and fear of childbirth as predictors of postnatal depression in nulliparous women <sup>6</sup>	<p><b>D</b> : Prospective longitudinal survey design</p> <p><b>S</b> : Women were eligible to participate if they were experiencing a healthy Pregnancy (no complications) and had a Body Mass Index (BMI) of between 19.6 and 26.</p> <p><b>V</b> : Depression, anxiety, post natal</p> <p><b>I</b> : State-Trait Anxiety Inventory (STAI) and Childbirth Attitudes Questionnaire (CAQ) and EPDS.</p> <p><b>A</b> : Pearson Correlation, logistic regression, two-way ANOVA.</p>	The findings from this study suggest that antenatal state and trait anxiety, assessed by interview, is an important predictor of postpartum depression. Therefore, it should be Routinely screened in order to develop specific preventive interventions.
Hair cortisol levels, psychological stress and psychopathological symptoms as predictors of postpartum depression <sup>7</sup>	<p><b>D</b> : Cohort-longitudinal</p> <p><b>S</b> : 44 pregnant women was assessed during 3 trimesters of pregnancy and the postpartum period using psychological questionnaires and hair cortisol levels.</p> <p><b>V</b> : Hair cortisol, Maternal perceived stress, Psychopathological symptoms, Pregnancy-specific stress, postpartum depression</p> <p><b>I</b> : salivary ELISA cortisol kit; Spanish version of the Perceived Stress Scale (PSS); Prenatal Distress Questionnaire (PDQ);</p>	Hair cortisol levels could predict 21.7% of the variance of postpartum depression symptoms. In conclusion, our study provided evidence that psychopathological symptoms, pregnancy-specific stress, and hair cortisol levels can predict postpartum depression symptoms at different time points during pregnancy. These findings can be applied in future studies and improve maternal care in clinical settings.

	EPDS	
	<b>A</b> : ANOVA	
Loss of Resources and Hurricane Experience as Predictors of Postpartum Depression Among Women in Southern Louisiana <sup>8</sup>	<b>D</b> : longitudinal study <b>S</b> : 208 women residing in New Orleans and Baton Rouge, Louisiana, who were pregnant during or immediately after Hurricane Katrina's landfall. <b>V</b> : hurricane experience, social support, and demographics <b>I</b> : Loss of Resources Scale, EPDS, Hurricane experience score <b>A</b> : Wilcoxon test, log-linear regression	Both tangible and nontangible LOR were associated with depression cross-sectionally and prospectively. Severe hurricane exposure (high HES) was also associated with depression. Regression analysis showed LOR-associated depression. Consistent with COR theory, however, nontangible LOR explained some of the association between severe hurricane exposure and depression in our models.
Predictors of postpartum depression in a sample of Egyptian women <sup>9</sup>	<b>D</b> : cross-sectional study <b>S</b> : Sixty female patients with PPD were compared with 60 healthy postpartum females (control group). <b>V</b> : psychosocial stressors, level of hormone, marital status, residence, parity, method of delivery, complicated puerperium, positive history of premenstrual tension syndrome and baby variables <b>I</b> : EPDS, Hormonal assay <b>A</b> : t-test, Pearson product-moment, linear regression Model	There were high statistical differences between PPD females and controls as regard psychosocial stressors, level of (estradiol, thyroxin [T3], and cortisol), marital status, residence, parity, method of delivery, complicated puerperium, positive history of premenstrual tension syndrome and baby variables (eg, unwelcomed, with a negative attitude of parents toward the baby, underweight, female, artificially feeding, unhealthy baby).
Adverse life events, psychiatric history, and biological predictors of postpartum depression in an ethnically diverse sample of postpartum women <sup>10</sup>	<b>D</b> : cross sectional study <b>S</b> : (549 cases, 968 controls) at 6 weeks postpartum from obstetrical clinics in North Carolina. <b>V</b> : life events, psychiatric history, and biological <b>I</b> : EPDS, MINI-Plus <b>A</b> : logistic regression	Psychiatric history and multiple exposures to adverse life events were significant predictors of PPD in a population of minority and low-income women. Genetic ancestry and hormone levels were not predictive of case status. Increased genetic vulnerability in conjunction with risk factors may predict the onset of PPD.
Predictors of Postpartum Depression <sup>11</sup>	<b>D</b> : A prospective cohort study <b>S</b> : 1,423 pregnant women at a university-based high risk obstetrics clinic <b>V</b> : depression, sociodemographic, chronic medical problems, stressors. <b>I</b> : Patient Health Questionnaire-9 (PHQ-9), (ICD-9), The Prenatal Psychosocial Profile Stress Scale <b>A</b> : t-test and models	Specific sociodemographic and clinical risk factors for PPD were identified that could help physicians target depression case finding for pregnant women.
Luteinizing Hormone-Follicle Stimulating Hormone ratio as biological predictor of post-partum depression <sup>12</sup>	<b>D</b> : case control study <b>S</b> : 450 postpartum women were screened at 6 Th week post-delivery for PPD. <b>V</b> : PPD, Hormone <b>I</b> : direct competitive immunoassay by chemiluminescence technology <b>A</b> : normality test, t-test, Mann-Whitney, Kruskal-Wallis ANOVA, and spearman rho.	Our study demonstrated that low LH/FSH ratio after delivery was associated with increased risk for the development of PPD. Low LH/FSH ratio at six week post delivery can be used as a robust biochemical predictor of post-partum depression.
Prenatal $\beta$ -endorphin as an early predictor of	<b>D</b> : cross sectional <b>S</b> : Three hundred and seven women	$\beta$ -Endorphin may be a useful early predictor of PPD symptoms in women

postpartum depressive symptoms in euthymic women <sup>13</sup>	<p>with a singleton, full-term (&gt;37.0 weeks' GA) pregnancy were recruited early in pregnancy and followed up into the postpartum period.</p> <p><b>V</b> : <math>\beta</math>-endorphin levels, PPD  <b>I</b> : EPDS.  <b>A</b> : Person product moment, regressions logistic, t-test</p>	who do not report depressive symptoms in mid-pregnancy.
Predictors of Postpartum Depression in the Eastern Province Capital of Saudi Arabia <sup>11</sup>	<p><b>D</b> : cross-sectional study  <b>S</b> : Four hundred and fifty mothers — visiting the health centers for immunizing their children at age two to six months  <b>V</b> : PPD, family history, lifetime history, stressful  <b>I</b> : EPDS  <b>A</b> : Regression analysis</p>	It was found that 17.8% of the women had PPD. The strongest predictor of PPD was a family history of depression, followed by non-supportive husband, lifetime history of depression, unwanted pregnancy, and stressful life events.
Predictors of Postpartum Depression Among Immigrant Women in the Year After Childbirth <sup>14</sup>	<p><b>D</b> : prospective cohort study  <b>S</b> : 519 immigrant women who were recruited from two hospitals in one urban city and delivered full-term singleton infants.  <b>V</b> : PPD, demographic data  <b>I</b> : EPDS, The Mother's Questionnaire  <b>A</b> : Binary logistic regression</p>	<p>Living in Canada for <math>\leq 2</math> years, poor perceptions of health, and lower mental health functioning were other important predictors of PPD. Living in communities with a high prevalence of immigrants and low income also was associated with PPD. Complex individual and community-level factors are associated with PPD in immigrant women.</p> <p>Understanding these contextual factors can inform a multifaceted approach to addressing PPD</p>
An overview of risk factors associated to post-partum depression in Asia <sup>3</sup>	<p><b>D</b> : overview study  <b>S</b> : PubMed and Psych INFO databases  <b>V</b> : The keywords Used were risk factors, post partum, postnatal, after child birth, Asia and depression.  <b>I</b> : PRISMA flow diagram  <b>A</b> : summary data of reviewed.</p>	There are several risk factors for this highly prevalent problem of postpartum depression in Asian countries, some of which are Child-related factors, Husband/marriage related factors, Miscellaneous, Psychosocial factors, Clinical factors, Demographic factors
Prediction of incidence and bio-psycho-socio-cultural risk factors of post-partum depression immediately after birth in an Iranian population <sup>15</sup>	<p><b>D</b> : A longitudinal cohort study  <b>S</b> : 2279 eligible women during weeks 32–42 of pregnancy to determine bio-psycho-socio-cultural risk factors of depression at 2 weeks post-partum  <b>V</b> : PPD, bio-psycho-socio-cultural risk factors  <b>I</b> : EPDS, General Health Questionnaire (GHQ)  <b>A</b> : Sequential logistic regression</p>	The findings indicated that a combination of demographic, sociological, psychological and cultural risk factors can make mothers vulnerable to PPD.
Experience of pregnancy and delivery as predictors of postpartum depression <sup>16</sup>	<p><b>D</b> : survey study  <b>S</b> : A total of 492 completed questionnaires were returned, and of these we excluded 52 respondents whose infants were older than 12 months  <b>V</b> : PPD, pregnancy  <b>I</b> : EPDS  <b>A</b> : Hierarchical regression</p>	Influence of pregnancy- and birth-related factors on overall EPDS scores is likely to subsume separate covert effects. Accounting for these differential emotional responses to experiences of the different elements of pregnancy and delivery may contribute to greater understanding and more appropriate treatment for specific

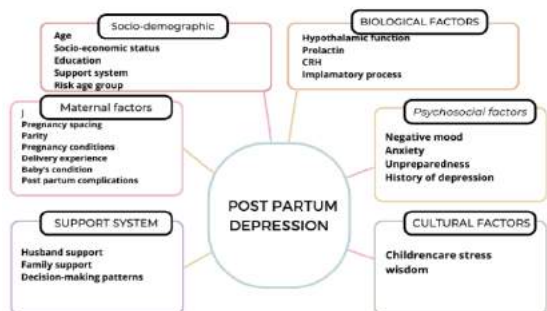
Predictive Factors of Maternal Depression in Indonesia : a Systematic Review <sup>17</sup>

**D** : Systematic Review  
**S** : 5 databases from 1 January 2019 to 31 September 2019 following the PRISMA Guidelines and found 20 articles that met the criteria with a total of 1079 samples.  
**V** : Maternal Depression  
**I** : EPDS; PDSS; CESD-R and WHOQOL-BREF  
**A** : critical Appraisal Skills Program (CASP) of a Qualitative Research Checklist.

components of PPD. Future research should aim to substantiate the tridimensional structure of the EPDS used here, and should investigate the role of other risk factors associated with PPD.

Fifteen predictive factors of maternal depression in Indonesia were revealed. The ranking of the following predictors is based on the number of studies that included them in the study: marital relationship (19), social support (18), various physical complaints (17), maternity blues (17), parity (17), education (15), age at risk (14), children care stress (14), pregnancy-related complication (13), housewives (12), low economic status (11), unplanned pregnancy (11), prenatal anxiety (10), history of depression (2) and history of stillbirths (1). This study also identify three new predictors of maternal depression: various physical complaints, pregnancy-related complications and housewives.

The results of the analysis of the literature review found that aspects of findings related to predictors of postpartum depression are as follows: socio-demographic factors (age, socio-economic status, education, support system, risk age group), maternal factors (pregnancy spacing, parity, pregnancy condition, birth experience, baby condition, post partum complications), biological factors (hypothalamus function, prolactin, CRH, inflammatory process), psychosocial factors (negative mood, anxiety, unpreparedness, history of depression), cultural factors (children care stress, wisdom), support system (support husband, family support, decision making patterns). The framework of the review results can be described as follows:



**Figure 1. Analysis framework for predictors of postpartum depression.**

## DISCUSSION

Postpartum depression is a condition where mothers who have just given birth experience changes in mood that reflect psychological dysregulation which is a sign of major depressive symptoms that last for seven days to one year after the birth of the baby <sup>1</sup>. According to Kaplan, risk factors for postpartum depression include genetic factors, neuroendocrine factors, husband's support, age, parity, mother's education, stressful life, and previous history of depression. Based on the experts' explanations, it can be concluded that postpartum depression is caused by several factors, namely hormonal (biological) factors; demographic factors; pregnancy and childbirth factors such as experience in the pregnancy/childbirth process and obstetric factors (cesarean section, instrumental delivery); previous history of depression; psychosocial background; and physical factors <sup>9</sup>.

The results of a review of all journals show that many aspects make postpartum depression occur in mothers. Various predictors of postpartum depression include:

### 1. Internal factors

Including the factors of age, pregnancy distance, socio-economic conditions, the

role and function of the partner, and the efforts made by the family, all of which are important triggers for the occurrence of post-partum depression .

2. External factors

Factors obtained from outside include support from the family, decision-making patterns, conditions of pregnancy and the birth process, and the competence of the helper which will make a person vulnerable or not in being ready to care for a baby.

3. Support system

Not only what is obtained from the family, but the main support comes from the partner. Other factors that are also important are the condition of the family, the decision-making process, progress in the relationship, the family's ability to provide welfare, and the readiness of siblings <sup>2</sup>.

4. Officer factor

Staff communication, the ability to implement policies about patients, will provide a different meaning in the approach to the relationship between patients and staff.

5. Community culture

Postpartum depression is closely related to existing cultural factors, the role of culture plays a key role in fully empowering women.

6. Biological

Biological processes are hypothalamic-pituitary-adrenal regulation, inflammatory processes, and genetic susceptibility. Regarding the biological aspect, the hormone Prolactin has anxiolytic properties and is thought to contribute to the stress-buffering effect of lactation.

The CRH hormone increases exponentially during pregnancy, this occurs because CRH, which is normally released by the hypothalamus, is also produced by the placenta. Because cortisol stimulates placental CRH production as a feedback loop, increased cortisol early in pregnancy may lead to an accelerated increase in CRH during pregnancy <sup>4</sup>.

7. Psychological

The strongest predictors are severe life events, some form of chronic tension, negative mood, cognitive difficulties, and increased anxiety characteristic of depressive disorders.

8. Prenatal beta-endorphin

The increase in  $\beta$ -endorphin can be the cause of the disruption of the negative feedback system that controls the activity of the HPA axis. HPA feedback disorder is a high-risk for affective disorder.

9. Experience of pregnancy and delivery

Difficult pregnancies influence susceptibility to nonspecific depression, Spousal support increases a mother's self-esteem, which can emphasize feelings of self-worth and reduce the negative effects of stress. This feeling of confidence and happiness makes the mother's soul more mature and steady.

The diversity of causes of postpartum depression, maternal impacts, and risks to the baby means that maternal and child services are urgently needed from multidisciplinary medical personnel, including psychiatrists, psychologists, nurses, and social workers. Where the goal is prevention, early diagnosis, appropriate intervention, and minimal impact. With a support system, mothers who experience postpartum depression can be handled properly <sup>16</sup>.

## CONCLUSION

Limitations concerning this literature review need to be addressed. First of all, all studies examined in this review were published in English, peer-reviewed journals. Publications in Asian languages, which may contain useful and insightful information, were excluded, leading to limited generalisability of the findings. Secondly, integrating findings from both qualitative and quantitative methodologies, which differ in their philosophical stances, may compromise an ability to draw accurate conclusions across studies.

Referring to the results of the study, various predictor factors for postpartum depression were obtained. It is of great importance that health care professionals become aware of this phenomenon and provide effective interventions in a timely fashion. Strategies such as primary, secondary, and tertiary prevention interventions may be applied. Primary prevention interventions include indentifying risk factors associated with PPD in the target populations and delivering appropriate preventive measures. Secondary

prevention interventions encompass early detection and treatments of disabling depressive symptoms. Routine screening for PPD by using a self-reported questionnaire during pregnancy and postpartum periods is strongly encouraged. Finally, tertiary prevention interventions entail preventing relapses of depressive symptoms. Routine follow-up and home health visits during the pregnancy and postpartum periods are strongly recommended.

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### CONFLICTS OF INTEREST

The author declare no conflict of interest.

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## ***Digital Variation of Machine Learning Through Basic Diagnostic Test Application Approach: an Integrative Literature Review***

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### **ABSTRACT**

*Electronic Medical Records (EMRs) are digital applications of machine learning models that function to receive and store clinical data related to medical information for the purposes of basic clinical diagnostic tests. The integrative review aims to provide a synthesis of new findings from several articles on EMRs for the early detection of basic clinical diagnoses with a variety of existing populations. Using four databases, we reviewed 11 articles. All authors involved review abstracts and full text according to predetermined criteria. The selected articles are then integrated into the publication quality assessment matrix, further included in machine learning algorithms for diagnostic determination of the disease. Reviewed articles are excluded in the form of artificial intelligence. The PRISMA flowchart identified 1962 articles and the final selection found 11 articles. Circulating system networks dominate machine learning models (66.6%). The study netted an average population of 490.5 and the artificial intelligence system managed to detect 9 body systems from different body systems. A total of 11 articles were selected, more than half of which were Caucasian (80.90%) and white (72.95%), but only 1 article was represented by Caucasian ethnicity, while white race was almost in every article. African-American and Black racial groups were in the middle position at 29.95% and 17.50%. The racial representation with the least percentage below 10% was Hispanic and Asian (6.10% and 2.17%). This machine learning has proven to be very accurate for detecting disease diagnoses in hospital, other health clinics. Therefore, the further development of this application for the purpose of establishing clinical diagnosis precisely and accurately.*

**Keywords:** Machine Learning, Diagnosis, Electronic Medical Records

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## **INTRODUCTION**

In the era of the industrial revolution 4.0 manufacturing the health industry is growing very rapidly, at least in 2020 it is reported that there are around 2.3 trillion gigabytes of patient data<sup>1</sup>. The complexity of the data, if not managed properly, will cause serious problems, especially related to the process of storing and managing and security of patient electronic data in health care facilities. To answer these challenges, an electronic

digitization system is needed that is designed to solve problems and

accelerate services to patients in health care facilities, especially in hospitals. The existence of information technology will greatly help accelerate the process of storing and processing patient electronic data to reduce workload beyond the capacity and work ability of human resources, besides that this system will improve and develop new data automatically in order to help doctors and other health workers to determine early and appropriate diagnosis.

With the increasing number of patient

visits in hospitals, it certainly has logical consequences for the analysis of very large amounts of data. Therefore, synchronization of electronic digital systems, especially informatics engineering and medical technology, is very important to be created. Some digital applications in the health sector that are often used one of them is the electronic medical record system (EMRs). Within seven years there was an increase in the use of EMRs from 9.4% to 83.8% in the period 2008 – 2015<sup>2</sup>. In its development, the EMRs system is continuously undergoing improvements so as to allow more data to be analyzed. These EMRs have the ability to store and process patient medical record data, both structured and unstructured data, there are about 80% of unstructured data successfully secured by this system (EMRs)<sup>3</sup>.

One of the most important advantages of this system is that it helps the basic diagnosis process quickly. The sophistication of this EMRs system greatly assists hospital management in receiving, storing and distributing comprehensive patient data for the benefit of making a quick initial diagnosis.

Some of the patient's medical record data include, symptoms, vital signs, family history, demographic data, drug consumption, laboratory result data and many other supplementary data. With the variety of learning models of this digital system, this system is able to detect electronic data of patients quickly, and diagnose patients quickly who are exposed to diseases. The process of standardizing this application tool is able to predict the patient's health condition and disease. Most cases are diagnosed using comprehensive diagnostic parameters. These EMRs are capable of storing as many as 70,000 disease codes according to the International Code of Diagnosis (ICD-10). The application of EMRs models is able to recognize the pattern and distribution of disease experienced by patients. Standardization calibration of hasrus tools is carried out because it will have an impact on the soft skills of a student<sup>4-6</sup>.

The utilization of machine learning techniques in the application of basic diagnostic tests will result in significant advancements and the effectiveness and adaptability of machine learning algorithms as a whole across multiple domains.

How can the application of digital machine learning affect the process of basic

diagnostic tests and what factors contribute to the effectiveness and adaptability of machine learning algorithms in this approach?

This study aims to provide an integrative literature review of several peer-reviewed articles on electronic medical records (EMRs) for early detection of basic clinical diagnoses, including the expediency and traceability aspects of machine learning.

## METHOD

This study used an integrative literature review method, following PRISMA<sup>7</sup>.

The paper selection mechanism, orchestrated in accordance with the PRISMA diagram, serves as the linchpin for methodological rigor and transparency in systematic literature reviews. Commencing with a comprehensive identification phase across diverse databases, researchers strategically employ predetermined keywords and criteria tailored to their research focus. The PRISMA diagram then becomes the guiding compass during the subsequent screening phase, visually delineating the number of articles identified, screened, and deemed eligible for inclusion. The importance of clear inclusion and exclusion criteria is underscored, ensuring that only studies meeting predefined standards contribute to the refined pool. Quality assessment takes center stage as researchers scrutinize the reliability and validity of each selected article. The PRISMA diagram, with its structured flow, provides a visual narrative of the intricate paper selection process, culminating in a transparent and reproducible foundation for subsequent stages of synthesis and analysis. In essence, the PRISMA-guided paper selection mechanism stands as a testament to the commitment to methodological precision, elevating the systematic review to a robust and credible endeavor.

Machine learning focuses on the decision-making processes, where algorithms learn through trial and error to maximize rewards in dynamic environments. Within these broad categories, there exists a myriad of specific algorithms such as linear regression, decision trees, support vector machines, and neural networks, each tailored to address specific tasks and challenges. The understanding of these algorithms is essential for practitioners and researchers alike, as it forms the basis for the informed selection,

implementation, and optimization of machine learning solutions across diverse domains.

Selection of this method by following the following steps: search for reference sources, filtering publication quality, withdrawing, synthesis, and descriptive information. Furthermore, we together with peer-reviewed tracked reputable international journals indexed by Scopus, Pubmed, Compass Digital Library and / or ACM Digital Library which describes the application of EMRs programs for basic diagnostic test applications.

Ethical considerations tied to the utilization of demographic data and the potential introduction of bias in machine learning algorithms are intrinsically linked to the sensitive nature of patient data. As machine learning increasingly integrates into healthcare systems, the responsible handling of demographic information becomes paramount to ensure equitable and unbiased outcomes. Concerns arise from the risk of perpetuating or exacerbating existing biases present in healthcare datasets, potentially leading to disparities in diagnosis, treatment, or resource allocation. Striking a balance between harnessing the power of demographic data for improved healthcare outcomes and safeguarding against unintended consequences is crucial. This necessitates the establishment of robust ethical frameworks, transparent practices, and ongoing scrutiny to mitigate the risk of algorithmic bias and ensure that the deployment of machine learning in healthcare aligns with principles of fairness, accountability, and patient-centric care.

### **Literature Search and Selection**

We search for reference sources by utilizing 4 databases, namely Scopus<sup>8</sup>, Pubmed<sup>9</sup>, Compass Digital Library<sup>10</sup> dan ACM Digital Library<sup>11</sup>. The keyword search process, we are guided by Medical Subject Headings (MeSH) by using a single base word related to search results. The keywords used in this literature search are electronic medical records, machine learning, and diagnosis, except for image-based articles. Eligible review process using the keywords entered (1) AND (2) with NOT (3) with the following details: Machine learning OR related terms: neural networks, natural language processing, OR knowledge bases; diagnosis, computer assisted OR clinical decision-making; diagnostic imaging OR computer-assisted image processing.

Article selection system based on article eligibility criteria, namely articles published in the period 2002 - 2023 in English editions that focus on machine learning based on EMRs for the determination of basic diagnostic tests. We narrowed down our literature search strategy by applying eligibility criteria. Articles should include EMRs usage data and basic diagnostic tests. Integrative literature review excludes on monitoring aspects of EMRs in first-level basic health care facilities (community health centers, doctor's clinic, independent health clinic, nurse independent practice, private practice midwife and so on). In addition we also perform data extraction on methodology, expert recommendations, dan ulasan editorial. We identified articles that have to do with machine learning and basic diagnostic test applications. We focus on text-based papers and not image content such as x-ray notes. However, if nontext aspects support broader data analysis are also included, for example an electrocardiogram.

This article deliberately omits the exploration of image-based applications and their associated reviews within the realm of Artificial Intelligence. The decision to focus on non-image-based facets is driven by a specific scope, perhaps dictated by the need for a more targeted analysis or a deliberate emphasis on certain AI applications. By excluding image-based applications, the article narrows its focus, allowing for a more in-depth examination of specific AI domains without the added complexity introduced by visual data processing.

The limitations of research on artificial intelligence (AI) underscore the need for a nuanced understanding of its applications, particularly in the context of non-image-based diagnostics. While AI has made significant strides, particularly in image-based diagnostics, there exists a critical gap in the exploration of its capabilities beyond visual data analysis. This gap poses challenges in comprehensively assessing the broader landscape of AI applications, potentially hindering the development of holistic and versatile solutions. By emphasizing non-image-based diagnostics, this research acknowledges the significance of diversifying the AI discourse, shedding light on areas where AI can contribute meaningfully outside the realm of visual data. However, it's crucial to recognize that this focus also

introduces limitations, as insights derived may not be universally applicable across all AI domains. Thus, a balanced perspective on the limitations and opportunities within both image and non-image-based AI applications is essential for a comprehensive understanding of the field.

We issue an article if the displayed data is not in the EMRs standard. If non-context articles that lead to specific analysis are not included as well, include image-based analysis. Another factor we release is when the data discusses therapy and disease progression. Articles affiliated to animals and languages other than English were also issued. In addition, articles that generally review the topic and do not use the clinical dataset model are also issued.

Furthermore, we select articles through the application of eligibility criteria, especially in titles and abstracts. One author selects the full text for inclusion criteria. Discussion of articles to determine the certainty of including or not, discussed with all authors, so that a common consensus is reached. The integrative literature review will take place from August 25, 2023, to September 10, 2023.

### **Article Quality Assessment**

We conduct independent article reviews using the National Institute of Health (NIH) instrument to assess the quality of submitted articles. This NIH is used to assess the quality of studies, especially case studies. The majority of articles choose 2 types of designs, namely prospective and retrospective case studies. This instrument has nine questions determined by two types of answers, namely "yes" or "no". The assessment of publication quality is based on three categories, including good grades for answer categories 7 - 9, sufficient scores for answer categories 4 - 6 and bad scores for answer categories  $\leq 3$ <sup>12,13</sup>. These results then, we only choose those that are in the good category. If there is a dissenting opinion among peers, then resolve it through discussion between them.

### **Data Extraction and Synthesis**

The data extraction process is carried out through two stages, including the first stage consisting of reference, year of publication, author, affiliation, diagnosis, number of samples, ethnic ratio. If there is heterogeneity of methodology and report results, then we

conduct a narrative comparison.

The second stage is a comparison of the EMRs system framework using machine learning whether the assessment is periodic or continuous.

EMRs programs are particularly suited to adding new data patients enter each day, and how they address any problems and challenges found. The framework of the machine teaching system adopts multiple patient data methods, data transmission methods, and data server security<sup>14</sup>.

## **RESULTS**

Efforts to control demographic representation bias have become increasingly pivotal in various fields, recognizing the imperative of fair and equitable representation in data-driven decision-making processes. This multifaceted challenge involves mitigating disparities in demographic representation within datasets, ensuring that algorithms and models are reflective of the diversity inherent in the real-world population. Strategies encompass a comprehensive reassessment of data collection methodologies, emphasizing inclusivity and addressing historical biases. Additionally, there is a growing emphasis on developing algorithms that are not only accurate but also sensitive to demographic nuances, with ongoing research aiming to strike a balance between model performance and fairness. Collaborative initiatives involving interdisciplinary teams, ethical guidelines, and community engagement are emerging as essential components in navigating and rectifying demographic representation bias, thereby fostering a more equitable and inclusive landscape in the application of data-driven technologies.

### **Study Identity Review**

Based on the results of searching articles using the Boolean Operator keyword "AND" "OR" "NOT" with the guidance Medical Subject Heading (MeSH) in the Pubmed database, we found 1962 articles. The databases used are Scopus, Pubmed, Compass Digital Library and ACM Digital Library. Furthermore, a duplicate article was checked and 785 articles were found. The characteristics of the selected study were 11 articles (table 2). A grouping of the number of studies by publication year starting 2002 - 2023 is shown in the figure 2.

### **Literature search and selection**

The process of searching and developing keywords using Scopus, Pubmed, Compass Digital Library, ACM Digital Library search database. Next the article is reviewed on the topic selected by the authors involved. We managed to find 1962 articles.

In the process of identifying relevant topics, we issue 1118 by title and/or abstract. The next process was a thorough article review and 48 articles were successfully issued, and the remaining 11 articles for us to include in this integrative literature review.

### **Data collection**

In the process of extracting data carried out by one reviewer with the following arrangement; number of patients, gender ratio, race, type of trial, type of article analyzed, source of data, algorithm used, type of validation test, performance measures and primary and secondary results. If in sorting out the data of different research locations, then what is recorded is the location of the research. Furthermore, in one paper there are several institutional affiliations, so what is taken is the main institution. In the data collection process, reviewers always coordinate and collaborate to expedite the research data review process.

### **Publication Characteristics**

Articles selected by 7 countries consist of USA, China, Francis, Tunisia, Romania, Israel and North America. The highest number of studies came from the USA (45.5%), the remaining six countries shared the same percentage (9.1%).

### **Body Systems**

There were 11 cases of disease diagnosis selected according to the results of paper selection. Some of the selected disease diagnoses are then incorporated into 7 body systems, where the cardiovascular system dominates as many as 5 articles (45.5%) as shown in table 3.

### **Artificial Intelligence**

The most numerous type of algorithm

in the literature review was the 3-article circulatory system network (27.3%). circulation system using backpropagation, 2 articles (66.6%). Next using a multilayer perceptron network, 1 article (33.3%).

### **Race/Ethnicity**

Data collection through race characteristics is carried out by two methods, namely 1) original publication and 2) available data set. If there is data needed, but not available in both methods, the author conducts participant correspondence via email. The authors collected race data before and after contacting respondents. The racial data collected by the authors totaled 5 authors (45%), included in contact via email. There were 6 authors who were contacted via email and they responded, but unfortunately did not provide the data needed, 3 (50%) of them provided information that the data was no longer owned.

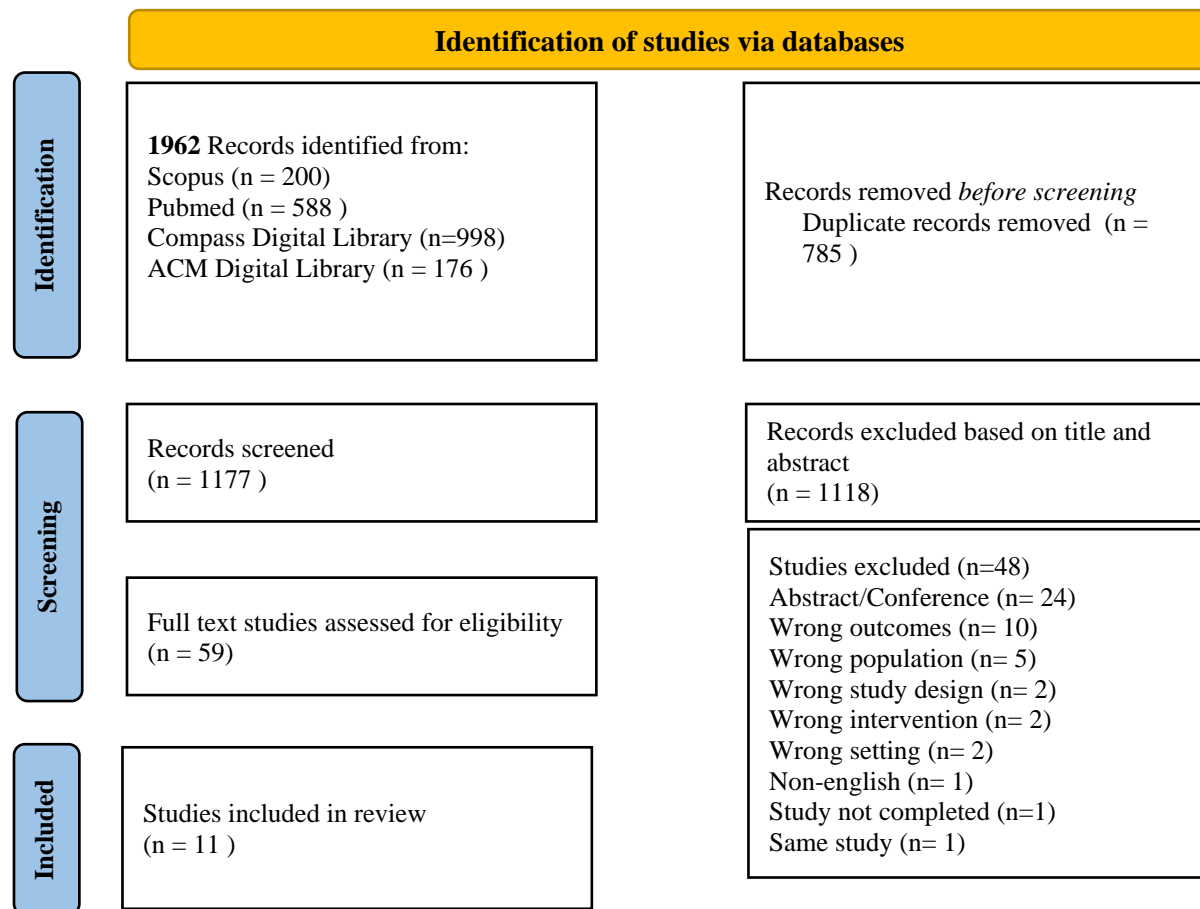
A total of 11 articles were selected, more than half of which were dominated by Caucasian ethnicity (80.90%) and white race (72.95%), but only 1 article was represented by Caucasian ethnicity, while white race was almost in every article. African-American and Black racial groups were in the middle position at 29.95% and 17.50%. The racial representation with the least percentage below 10% was Hispanic and Asian (6.10% and 2.17%).

### **Number of samples**

Of the 11 articles selected, the average number of patients in the interquartile range was 28,124 patients out of a total of 281,244 patients. There is one article for which the number of patients is not available or is not specific in number. This number includes the inclusion and exclusion criteria that have been set.

### **Quality Assessment**

From the results of the case series study assessment related to publication quality, we selected 11 publications with a "good" rating level in the range of scores 7 - 9 (Table 1).



**Figure 1. Flow diagram of included and excluded studies.**

**Table 1. Study quality ranking according to NIH quality assessment tool for case study series<sup>15</sup>**

Quality Assessment Tool	Study										
	Ginestra <sup>16</sup>	Levy et al. <sup>17</sup>	Baxt et al. <sup>18</sup>	Li et al. <sup>19</sup>	Jorge et al. <sup>20</sup>	Corey et al. <sup>21</sup>	Danford et al. <sup>22</sup>	Sahli et al. <sup>23</sup>	Antohi et al. <sup>24</sup>	Danford et al. <sup>25</sup>	Natarajan et al. <sup>26</sup>
1. Was the study question or objective clearly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Was the study population clearly and fully described, including a case	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

definition?												
3. Were the cases consecutive?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Were the subjects comparable?	CD	CD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	CD	Yes	Yes
5. Was the intervention clearly described?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Were the outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Was the length of follow-up adequate?	CD	CD	CD	CD	CD	CD	CD	CD	CD	CD	CD	CD
8. Were the statistical methods well-described?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Were the results well-described?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quality rating consensus (GOOD, FAIR, POOR)	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Abbreviations: *CD*, cannot determine; *NIH*, National Institutes of Health

**Data Extraction and Synthesis**  
**Table 2. Study Characteristics**

Reference	Publication year	Author	Institution	Disease or condition	Number of patients	Race ratio
16	2019	Ginestra	Hospital of University of Pennsylvania	Severe Sepsis and Septic Shock	724	N/A
17	2017	Levy et al.	Stanford University, USA	Autism Spectrum Disorder (ASD)	4532	N/A
18	2002	Baxt et al.	Hospital of University of Pennsylvania USA	Cardiac Ischemia	2204	Asian 1.4 %, African American 54.6%, Hispanic 0.8% White 40.7%
19	2020	Li et al.	Ping An Technology, Beijing, China	Sepsis	24819	N/A
20	2019	Jorge et al.	Harvard Medical School	Systemic lupus erythematosus (SLE)	1322	White 73.9% Black 13.8% Asian 3.52% Hispanic 5.8%
21	2018	Corey et al	Duke Institute for Health Innovation,	high-risk surgical	245359	White 72.0%, Black or African American 21.2%, Asian 1.6%

			USA			2 or more races 0.8%, merican Indian or Alaska Native 0.4% Other 4.0%
23	2021	Danford et al.	Université Lyon, Francis	Cancer	1600	N/A
24	2013	Sahli et al	Biochemistry Laboratory, Tunisia	Thalassemia	384	N/A
25	2019	Antohi et al.	University of Medicine Carol Davila, Romania	Acute decompensated Heart Failure	N/A	N/A
23	2021	Danford et al.	Division of Gastroenterology and Hepatology, Israel	Steatohepatitis Cirrhosis	300	Caucasian 80.9%, African American 5.3%, Hispanic 11.7%, Asian 2.1%
26	2023	Natarajan et al.	Philips Research North America	Low Birthweight Neonates	1348	White 64% Black 11% Other 25%

Data available for papers by year

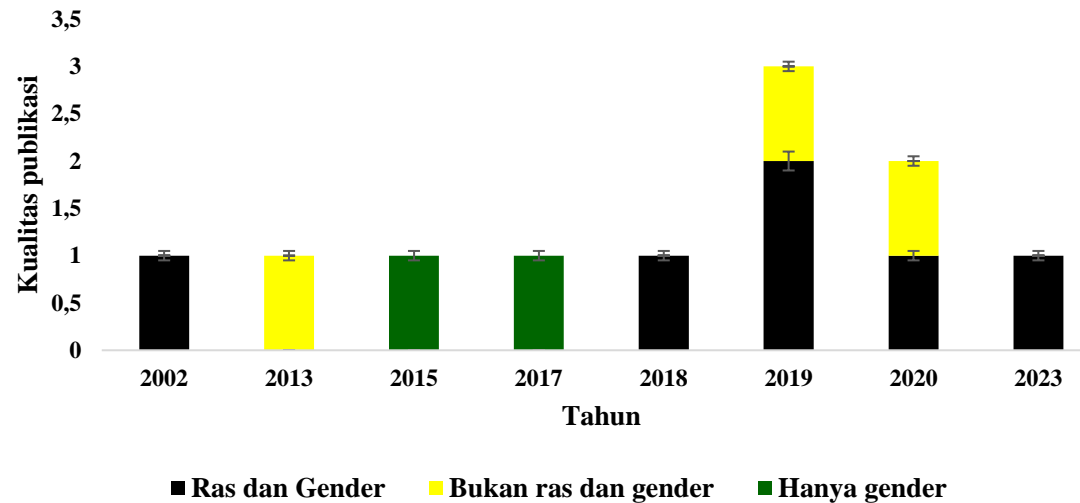


Figure 2. A paper applying text-based machine learning to diagnosis, with data available and published 2002 through 2023.



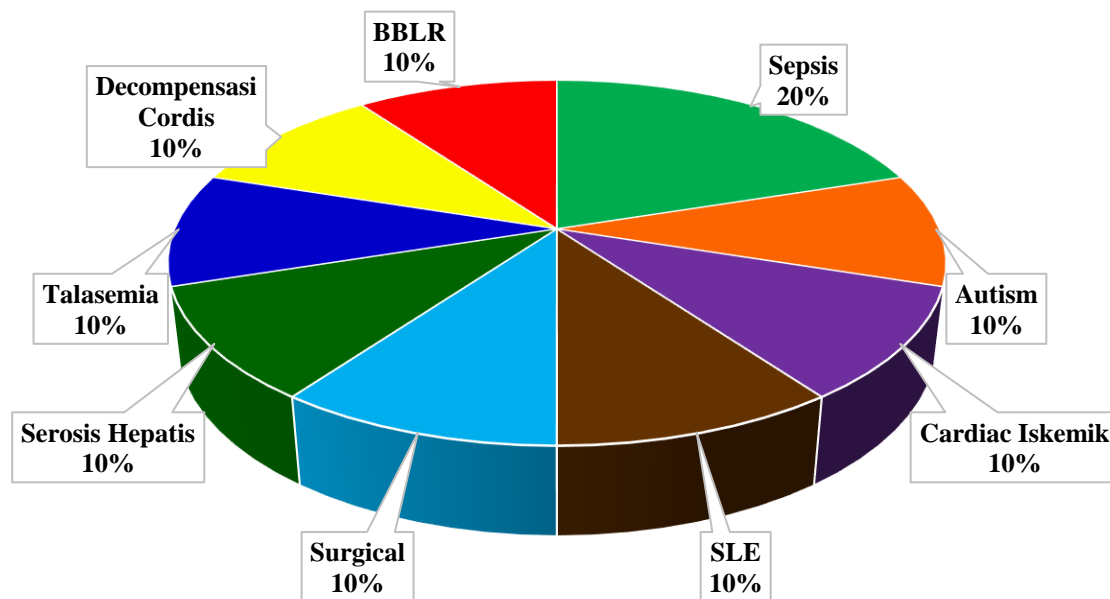


Figure 3. Diseases and conditions are studied in several papers

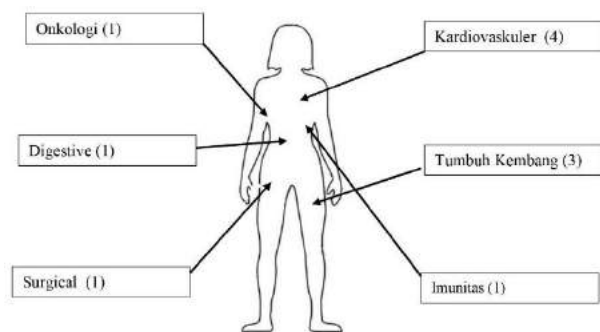


Figure 4. The number of papers studying diseases in each body system.

## DISCUSSION

Literature studies on test-based health analysis of basic health information with the use of machine learning show significant improvement.

Our literature search proved that EMRs are an appropriate instrument and widely used today, so that this can facilitate the formulation of diagnoses relevant to the patient's clinical condition<sup>27</sup>.

The process of reporting patient demographic information must be correct by matching electronic medical record data with clinical data in the field. The categorization of data sources should be clear and specific and sorted according to alphabetical collection format. Demographic diversity on the characteristics of larger populations will make it easier to generalize machine learning models. Generalizing to unrepresented population

groups will widen the gap and potentially bias the results<sup>28,29</sup>.

The genome-wide association study found a number of problems related to long-term genetic testing, and the end result was that they found that the disease was dominated by whites, even though they were not classified as a vulnerable group. Fragmentation of health data in various body systems is experienced by vulnerable populations with low socioeconomic status and they regularly visit health care centers. Models that rely on quantity and programmed testing processes will have adverse implications for vulnerable groups. Despite the negative impacts, proper documentation is still carried out, while still being guided by demographic characteristics and representative samples, available racial categories and subcategories, especially in articles that provide white race data<sup>30</sup>. The availability of racial/ethnic data is critical because it is an early stage of natural machine learning that requires a diverse study population to achieve successful diagnosis of complex patients. The concept of comparison to be made is to include a racial component in population studies, descriptive statistics, and a menu of features that will be the basic components of machine learning algorithms. The idea that genetic differences are due to race and trying to formulate an outcome algorithm based on race is risky to widen the racial gap that has been previously available in medical catalogs<sup>31,32</sup>. But race should not be completely ignored in decision-making. Although the genetics

component k, race, sex and social become faktor determinants of health that impact the experience of patients experiencing disease. To ensure that the evaluation of machine learning algoritma goes well, it is very important to consider the overall representativeness of the population including some of the components mentioned above<sup>32</sup>.

Understanding and skills of accessing diagnostic tools are essential for both a researcher and practitioner. Therefore, dissertation recommendations with detailed and clear explanations will help to accurately establish the clinical diagnosis by the doctor. In addition, the application of good machine learning models will help improve clinical decision making through fast and accurate diagnosis. Conversely, a lack of understanding and skill in machine learning models will reduce the level of accuracy in determining basic clinical diagnoses through deep learning applications<sup>33</sup>.

This review is limited to inclusion criteria that may not represent the whole breath of machine learning integration into healthcare. By excluding image-based applications, their scope is narrowed; However, by focusing first on diagnostics, research can be applied to additional areas. We do not look beyond peer-reviewed literature, it is possible that studies from relevant conferences or congresses are missed. Because conferences typically report incomplete work, abstracts may have no impact on results. The evidence in the review is limited by the availability of information. By contacting the authors to provide additional data, other factors such as how responsive a researcher is or if an email address is up to date come into play. Factors like these should be understood when considering calculated statistics for gender, race, and race information.

Understanding and skills of accessing diagnostic tools are essential for both a researcher and practitioner. Therefore, dissertation recommendations with detailed and clear explanations will help to accurately establish the clinical diagnosis by the doctor. In addition, the application of good machine learning models will help improve clinical decision making through fast and accurate diagnosis. Conversely, a lack of understanding and skill of machine learning models will decrease the level of accuracy in determining basic clinical diagnoses through deep learning

applications<sup>1,7</sup>.

Our study offers the advantage of providing a comprehensive picture of the current state of machine learning applications in basic diagnostic testing, synthesizing insights from a wide range of studies. This broad scope allows the identification of general patterns, emerging trends, and overarching themes in the literature. By combining findings from different disciplines and methodologies, the review takes a holistic approach, increasing the richness and depth of understanding in this rapidly evolving field. In addition, the integrative nature of the review enables the identification of practical implications, guiding practitioners and researchers in the effective deployment and advancement of machine learning technologies in diagnostic contexts. The synthesis of existing knowledge, when executed well, can serve as a valuable resource for professionals seeking evidence-based insights in this dynamic and transformative domain.

The study's potential weakness lies in the inherent risk of bias stemming from the selectivity of the included studies. If a review favors a specific database, time period, or journal, it may introduce skewed representations of the literature, which has the effect of generalizing findings. In addition, the quality of individual studies integrated into the review is critical, and limitations in their methodology or data collection procedures may compromise the overall reliability of the synthesized conclusions. The dynamic nature of machine learning technology poses another challenge, as literature reviews may not capture the latest advances or emerging trends, potentially making parts of the analysis outdated. It is critical for the review to transparently address these limitations to ensure a nuanced interpretation of its findings and to guide future research efforts in addressing these gaps.

Our review of studies limited only to inclusion criteria and generally did not represent channels for integrating machine learning into healthcare systems. We also exclude reviews that are image-based. However, we focused more on the study of machine learning literature based on basic clinical diagnostic tests that were added with additional software supporting the program. In this literature review we also narrow the search to the original article only. It is based on the

aspect of variable homogeneity to access information more quickly and accurately and reduce bias.

We recognize that the diversity of machine learning application models for health services has been widely applied in healthcare facilities<sup>34</sup>. However, we focus on basic clinical diagnostic applications<sup>35,36</sup>. Articles that are text-based and diagnosed with data or demographic characteristics are not reviewed.

Overall, this information synthesis underscores that the utilization of EMRs and machine learning in the context of early detection of clinic baseline diagnosis is a potential step forward to improve the quality of health care. However, ongoing efforts to address privacy, data security, and bias related challenges are integral to the development of these technologies to ensure their application provides maximum benefit to patients and healthcare practitioners<sup>7,8</sup>.

Our findings proved to be consistently very precise with the chosen topic. The process of inputting and storing medical record data by EMRs greatly accelerates access to the application of informatics, especially assisting doctors in establishing diagnostics quickly, precisely and accurately, thus obtaining several benefits, including; The health service process becomes fast, patient satisfaction increases, public trust in hospitals or clinics increases, treatment duration is shorter, patient care and treatment costs are more efficient, effective and efficient

### **Research Limitations**

An Integrative Literature Review only focuses on text-based articles, so the scope of electronic medical records (EMRs) applications has not been comprehensively reviewed. Therefore, reviewers need careful analysis to get maximum review results. These studies are limited by the inclusion of selective studies, potentially introducing bias if a particular database, journal, or time period is preferred. The quality of included studies may vary, with some pointing out limitations in their methodology or sample size, impacting the overall reliability of the findings synthesized. The rapidly evolving nature of machine learning technology and the dynamic landscape of the field can result in the omission of recent advances or emerging trends. Potential publication bias, language bias, and exclusion

of primary research can also affect the completeness of a review. These limitations underscore the need for a nuanced interpretation of the review's findings and highlight avenues for future research to address these gaps in understanding.

### **CONCLUSION**

The increasing trend of using machine learning applications for clinic basic diagnostic tests reflects the huge potential of technology in improving the quality of healthcare. Further development in this area can contribute significantly to efficiency and accuracy in establishing clinical diagnosis. However, keep in mind that these advances must be accompanied by strict ethical and data security considerations, especially when handling sensitive patient information. Careful measures in considering the demographic characteristics of populations are key to generating relevant and effective applications, given variations in disease presentation and response to treatment among specific demographic groups.

In this context, it is important to encourage collaboration between health experts, data scientists, and technology developers to achieve optimal alignment between technological innovation and medical needs. Continued efforts in research and development of machine learning applications for clinical diagnosis will bring long-term benefits in improving diagnosis precision, speeding up the treatment process, and ultimately, improving clinical outcomes for patients. Thus, while the digital age opens the door to positive transformation in the world of healthcare, the sustainability of multidisciplinary approaches and concern for ethical aspects become key in portraying a successful future for these applications.

### **ACKNOWLEDGEMENTS**

The reviewers expressed their gratitude to the Academic Supervisor of the Faculty of Informatics Engineering Education, Makassar State University.

### **CONFLICTS OF INTEREST**

There is no conflict of interest in this integrative literature review.

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## *The Impact of Environmental and Behavioral Factors on the Incidence of Dengue Hemorrhagic Fever in Indonesia: Meta-analysis*

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### ABSTRACT

Cases of dengue fever in Indonesia will increase to 143,000 by the end of 2022. The aim of the research is to examine the impact of environmental and behavioral factors on the incidence of dengue hemorrhagic fever in Indonesia. This research uses the Meta-Analysis Method with PICOS technology. Some sources of information used include Google Scholar, Research Gate, and Plos ONE, with the help of keywords such as "Environmental factors" and "Behavior." 193 articles were obtained, 151 articles came from Google Scholar, 37 articles from Research Gate, and 5 articles from Plos ONE. The articles obtained were filtered using inclusion criteria such as articles that had a 2x2 table, and discussed dengue fever and behavior with the number of selected articles being 21. At the screening stage, researchers used a cross-sectional research design. JASP application version 0.16.3.0 was used to process meta-analysis data. The key findings show that the habit of hanging clothes has a 2.386 higher risk as a cause of dengue hemorrhagic fever, with the pooled OR value as follows  $e^{0.87} = 2.386$  (CI 95% 0.17-1.57). The presence of larvae has a risk of 2.075 for dengue fever with the following pooled value  $e^{0.73} = 2.075$  (CI 95% 0.12-1.33). Meanwhile, the 3M movement has a risk of 0.406 for the incidence of dengue fever with the following pooled value  $e^{-0.90} = 0.406$  (CI 95% -1.66-0.15). the conclusion is There is an influence of the habit of hanging clothes, the presence of larvae and the 3M movement on the incidence of dengue hemorrhagic fever.

**Keywords:** Presence of Larvae, Habit of Hanging Clothes, 3M Movement, Dengue Hemorrhagic Fever

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### INTRODUCTION

Dengue Virus (DENV) is a virus that causes dengue fever, a viral infection spread by the *Aedes aegypti* and *Ae. albopictus* mosquito<sup>1,2</sup>. DENV infection sufferers experience various clinical manifestations, ranging from asymptomatic to severe dengue fever, such as dengue hemorrhagic fever and dengue shock syndrome, or dengue fever<sup>3,4</sup>. Dengue fever infections are estimated to occur 390 million times a year, of which 96 million cause symptoms due to the increasing incidence of

DENV infections.<sup>5</sup> In addition, it is estimated that there were 565,900 disabilities and 9,110 deaths in 2013 due to dengue virus infection<sup>6-8</sup>. The first licensed recombinant attenuated dengue fever vaccine (Dengvaxia) was recently clinically available. However, high risks and adverse effects were found among vaccinated individuals.<sup>9-12</sup> Severe and fatal dengue cases are consistently reported in several endemic areas, such as Southeast Asia, the Western Pacific and the Americas<sup>13-17</sup>.

It was also reported that deaths due to dengue shock syndrome were 50 times higher

than that of dengue fever<sup>4,18,19</sup>. If this virus is properly diagnosed and treated promptly, the death rate from dengue fever will fall from more than 20% to less than 1%<sup>4</sup>. Therefore, early prediction and case recognition are very important for controlling dengue fever. The number of dengue fever cases in Indonesia reached 143,000 by the end of 2022, with West Java, East Java and Central Java having the highest number of dengue fever cases. Nationally, the number of dengue cases is much lower than the estimated number of dengue cases in Indonesia<sup>20</sup>.

In humans, one dengue serotype confers lifelong immunity against reinfection but provides only temporary and partial immunity against other serotypes<sup>21</sup>. Enhancement of antibody-dependent immunity also plays an important role in the incidence of dengue fever<sup>22</sup>. The first dengue outbreaks were reported in 1779 in Jakarta, Indonesia and Cairo, Egypt.<sup>23,24</sup> However, the only confirmed outbreak in North America, by DENV, was the Philadelphia plague in 1780<sup>25</sup>. The largest outbreak of dengue fever was seen in 2016 in the Americas, with more than 2.38 million cases. In this outbreak, the highest contribution was in Brazil, with 1.5 million cases<sup>26</sup>. When dengue became a global concern, currently almost 75% of the global population is affected by dengue, the majority of which are in the Asia-Pacific region<sup>27</sup>. Apart from that, there has been an increase in the proportion of dengue fever cases, especially in Thailand, Indonesia and Myanmar<sup>28</sup>.

Because it is anthropophilic, the *Aedes aegypti* mosquito prefers human blood to animal blood<sup>29</sup>. Because many factors include amino acids, lactic acid, body heat, body odor, sweat, and other things that can attract mosquitoes, *Aedes aegypti* mosquitoes will land on old clothes hangers. Therefore, hanging clothes will increase the number of mosquitoes<sup>30</sup>. Suyasa's (2008) research findings show a correlation between the practice of hanging clothes and the prevalence of dengue fever vectors<sup>31</sup>. Similar findings were also reported by T. Widiyanto in his research in 2007 which found a relationship between the practice of hanging clothes and the incidence of dengue fever (OR=7.851) in Purwokerto respondents<sup>32</sup>. However, showering can stop the development of sweat odor. Bathing can reduce the smell of sweat, thereby reducing mosquito activity around humans. Human

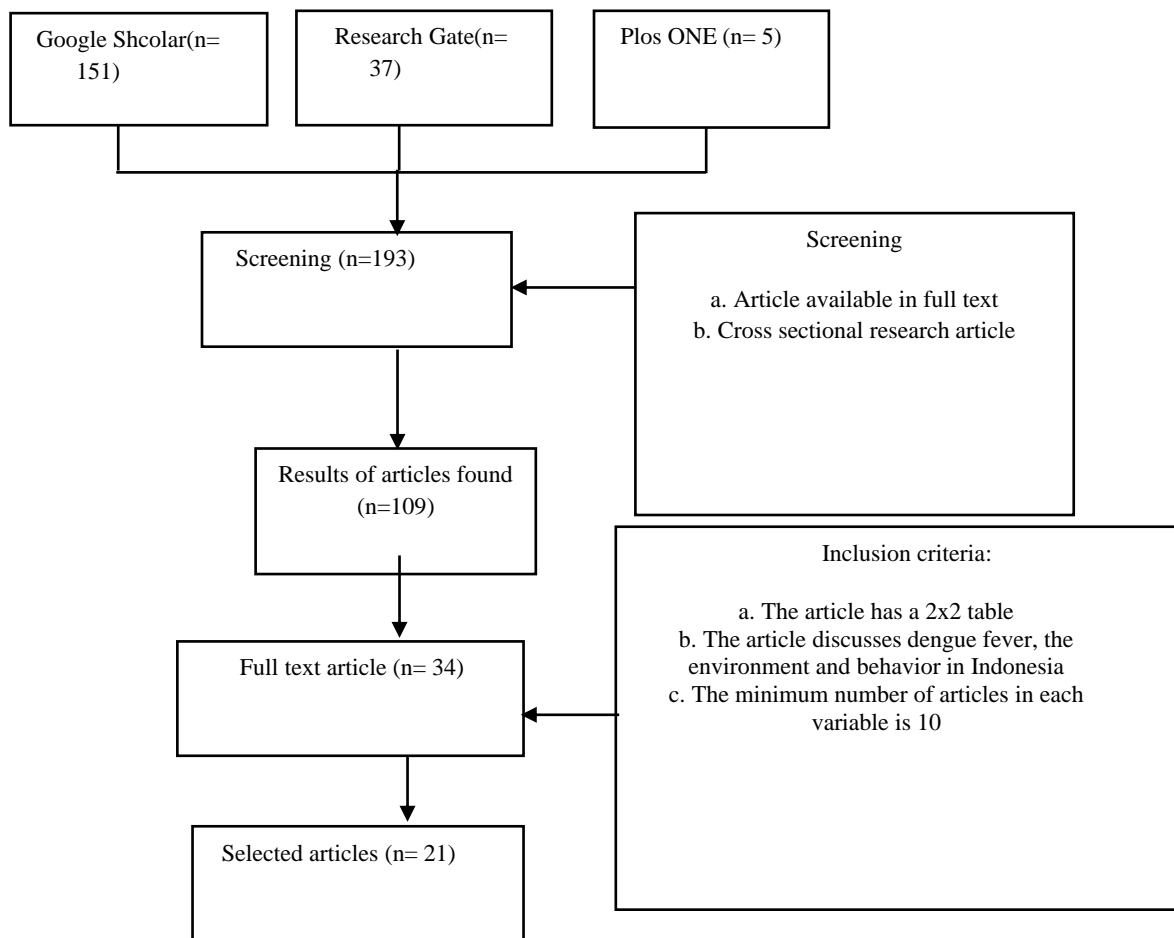
sweat is an important factor in the attraction of *A. aegypti*.

The aim of this research is to determine the risk variables that influence the incidence of dengue hemorrhagic fever in Indonesia, including the presence of larvae, the practice of hanging clothes, and the 3M movement. The uniqueness of this research is that researchers attempted to synthesize data from all research conducted between 2015 and 2023 to examine the relationship between variables that influence the incidence of dengue hemorrhagic fever.

## METHOD

Meta analysis was carried out on data that had been extracted and synthesized from 21 research articles collected. The pooled prevalence ratio estimate value was obtained from analysis of this data. If the model used is a fixed effect model then the Mantel-Haenszel method is used, and if the model is a random effect then the DerSimonian-Laird approach is used. PICOS methodology, which involves combining two or more similar research findings to produce a combination of quantitative data with the same hypothesis, was used in the meta-analysis of this study<sup>33,34</sup>.

Google Scholar, ResearchGate, and PlosONE were used as research data sources. "Environmental factors" and "behavior" are the main words of this research. The downloaded articles are articles that have abstracts and full text. The research articles found in this study were 193 journal articles. Then the articles were screened and sorted again using clear inclusion and exclusion criteria such as articles having 2x2 tables, articles discussing dengue fever, the environment and behavior in Indonesia, the number of articles in each variable was at least 10. The researcher used a cross sectional study design to screen at the next stage. Environmental and behavioral factors are selected variables that influence the incidence of dengue fever in Indonesia. Secondary data types from selected articles were used in this research. The incidence of dengue fever is the dependent variable, while environmental and behavioral factors are the independent variables of this research. The following is an image of the PRISMA flow diagram of this research.



**Figure 1. Prism Flow Diagram of the influence of environmental and behavioral factors on dengue fever cases**

Meta-analysis is often carried out in 5 steps, and the first involves the formulation of the study problem, followed by the collection of literature based on the expected objectives, as well as evaluation. The process then continues with analysis and interpretation of the literature obtained, followed by presentation in the form of articles <sup>35</sup>.

The JASP application is used to process the collected data and then analyze it using classic meta-analysis. Data analysis goes through the following stages:

### 1. Data Selection

The year of publication, variables, design, and results of each study are all included in state-of-the-art tables or the same tables as data collected from other papers. A 2x2 table is taken from this data to be entered into Excel and then converted into Comma Separated Values (CSV) in storage to be entered into the JASP application.

### 2. Data Analysis

To process meta analysis data using the JASP Version 0.16.3.0 application. fixed effect model or random effect is a type of analysis method. To determine the type of IUI method, it depends on the p value in the heterogeneity test table. The analysis results are displayed in the form of a forest plot graphic Egger Test /Bias Untuk melihat terdapat bias dalam penelitian ini digunakan Funnel plot dan uji Egger <sup>36</sup>.

### 3. Sensitivity Test

To find out whether the data is stable to change, this test examines the differences between the fixed effect model and the random effect model in terms of the pool prevalence ratio value and the difference in the Confident Internal (CI) range.



## RESULTS AND DISCUSSIONS

Based on Table 1. The one with the highest risk factor is the habit of hanging clothes with the pooled OR value as follows  $e^{0.87} = 2.387$  (CI 95% 0.17- 0.57) so it can be concluded that the possibility of contracting dengue fever is 2.387 times higher in people who hangs clothes. The possibility of contracting dengue fever is 2.075 times higher for people whose larvae are found around their house. Based on the findings of research conducted in the Semarang area, there is a large correlation between the prevalence of dengue fever and water reservoirs that accommodate mosquito larvae<sup>37</sup>. To implement the 3M plus movement, it is necessary to promote health about the importance of environmental cleanliness and change community behavior through eradicating mosquito larvae<sup>38</sup>. This

will stop the breeding cycle of *Aedes aegypti* mosquito larvae in the surrounding environment.

People's habit of hanging clothes is 6.29 times more likely to contract dengue fever compared to the habit of people who don't hang clothes<sup>39</sup>. When mosquitoes lay their eggs, they prefer wet and dark places. In rooms where more clothes are hung, there will be an increase in mosquito nests<sup>40</sup>. In this case, it is very important to know about preventing dengue fever, especially the habit of hanging clothes, in order to suppress the growth of the *Aedes aegypti* mosquito population and stop the spread of dengue fever in the surrounding environment, especially by eradicating mosquito nests. (PSN) in the home environment (inside and outside) using clothes that are no longer hanging.

**Table 1. Results of Meta Analysis of the Presence of Larvae, Habit of Hanging Clothes, and 3M Movement with Dengue Hemorrhagic Fever Cases.**

No	Research variable	N	Heterogeneity (pvalue)	Fixed/Random Effect Model	
				OR	95% CI
1	Presence of Larvae	10	< 0,001	2,075	0,12-1,33
2	the Habit of Hanging Clothes	10	< 0,001	2,387	0,17 – 0,57
3	the 3M Movement	10	< 0,001	0,406	(-1,66)- (-0,15)

The findings show that the Random Effect (RE) Model value represents the estimated Odd Ratio (OR) value showing a 95% CI of 0.73 with a value range of 0.12-1.33. The forest plot data shown in Figure 1 has a combined OR value of  $e^{0.73} = 2.075$ , which indicates that there is a 2.075 times higher risk of dengue hemorrhagic fever if larvae are present.

According to Nurrochmawati and Dharmawan stated that the presence of live mosquito larvae allows dengue fever to occur<sup>41</sup>. The presence of *A. aegypti* larvae is significantly correlated with pH, temperature and humidity of the surrounding water and air<sup>42</sup>. Although dissolved oxygen and pH appear to strongly influence the microfauna and associated flora at nest sites, mosquito larval development is directly influenced by parameters such as temperature and salinity<sup>43-47</sup>. Previous research shows that the quality of the water in the breeding area, seen from the physical and chemical properties of the water, can have an impact on the presence of larvae<sup>48</sup>. *Aedes aegypti* mosquito eggs will hatch if the water has the right pH, dissolved oxygen

salinity and temperature<sup>49</sup>. One of the main determinants of the existence of life in water is water quality, which is determined based on measurements of various characteristics, especially physical and chemical<sup>50-52</sup>. The water temperature in the brooding area is 27.6°C. The average maximum number of larvae detected in the breeding water at this temperature was still within the range where *Ae. aegypti* grows most effectively<sup>53</sup>. The water temperature where the *Aedes aegypti* mosquito breeds often ranges from 26.5°C to 29.3°C<sup>49</sup>. Salinity and dissolved oxygen, for example, have been shown to impact the development of *Aedes aegypti* larvae. It is known that the growth of *Aedes aegypti* larvae is strongly influenced by salinity (amount of dissolved salts in the environment) and DO (amount of dissolved oxygen)<sup>54</sup>.

The Random Effect (RE) Model value represents the estimated Odd Ratio (OR) value showing a 95% CI of 0.87 with a value range of 0.17-1.57. The forest plot results in Figure 1 are pooled OR  $e^{0.87} = 2,387$ , Therefore, it was determined that the danger of hanging clothes was 2,387 times higher than the number of

dengue hemorrhagic fever cases. This is in accordance with research <sup>55</sup> This shows that the incidence of dengue fever is correlated with hanging clothes, with a p value of 0.014 and an OR of 3. There are four types of surfaces that are breeding grounds for mosquitoes, such as metal, wood, clothes and cement <sup>56</sup>. Female mosquitoes are more often found on clothing, while male mosquitoes are more often seen landing on metal surfaces <sup>31</sup>. Hanging clothes also has an impact on the incidence of dengue fever <sup>57</sup>.

The estimated Odd Ratio (OR) value is

represented by the Random Effect (RE) Model value which has a CI 95% confidence interval of -0.90 and a range of -1.66 and -0.15. It can be concluded from the Forrest plot data in Figure 1 that the 3M movement has a protective factor of 0.406 against the incidence of Dengue Hemorrhagic Fever sufferers. The pooled OR value for the forest plot was  $e^{-0.90} = 0.406$ . Population density, screen ventilation, larvae, 3M behavior, hanging clothes, and use of mosquito repellent are additional factors that influence the occurrence of dengue fever <sup>57</sup>.

**Table 2. Heterogeneity test for careful variables**

<b>Meta-analysis heterogeneity test</b>		<b>Q</b>	<b>df</b>	<b>p</b>
the presence of larvae in cases of Dengue Hemorrhagic Fever	Omnibus test of Model Coefficients	5.577	1	0.018
	Test of Residual Heterogeneity	133.099	9	<001
the habit of hanging clothes in cases of Dengue Hemorrhagic Fever	Omnibus test of Model Coefficients	5.896	1	0.015
	Test of Residual Heterogeneity	124.323	9	< .001
the habit of hanging clothes in cases of Dengue Hemorrhagic Fever	Omnibus test of Model Coefficients	5.488	1	0.019
	Test of Residual Heterogeneity	194.019	9	< .001

Based on Table 2, it is known that the p-value of the heterogeneity test for each test variable is less than 0.05 or  $p = 0.001$ .

Therefore, we used the Random Effect Model in this analysis because there are variations between studies.

**Table 3. Egger's Test**

<b>Egger's Test</b>	<b>Z</b>	<b>P</b>
Risk Factors for the Presence of Larvae in Cases of Dengue Hemorrhagic Fever	-0.059	0.953
Risk Factors for the Habit of Hanging Clothes in Cases of Dengue Hemorrhagic Fever	1.337	0.181
Risk Factors for the 3M Movement in Dengue Hemorrhagic Fever Cases	2.647	0.008

The findings show that the Egger's Test p value is  $> \alpha$  (0.005), so the variable for the presence of larvae in Dengue Hemorrhagic Fever cases does not have publication bias. The findings also show that the Egger's Test p value is  $> \alpha$  (0.005), so the habit of hanging clothes variable in Dengue Hemorrhagic Fever cases does not have publication bias. It is known that the p value of Egger's Test is  $> \alpha$  (0.005), then the 3M Movement variable for Dengue Hemorrhagic Fever cases does not have publication bias.

## CONCLUSION

The findings show that the habit of hanging clothes has a 2.386 higher risk as a cause of dengue hemorrhagic fever, with the pooled OR value as follows  $e^{0.87} = 2.387$  (CI 95% 0.17-1.57). The presence of larvae has a risk of 2.075 for dengue fever with the following pooled value  $e^{0.73} = 2.075$  (CI 95% 0.12-1.33). Meanwhile, the 3 M movement has a risk of 0.406 for the incidence of dengue fever with the following pooled value  $e^{-0.90} = 0.406$  (CI 95% 1.66- 0.15). Based on these findings, it

was also concluded that there is an influence of the habit of hanging clothes, the presence of larvae and 3M movement on the incidence of dengue hemorrhagic fever. The habit of hanging clothes is the factor that has the highest risk value among the three research factors. With these findings, it can be recommended not to hang clothes and the alternative is to fold clothes and provide a place for dirty clothes that is disinfected so that it does not become a nest for mosquitoes. As for the presence of mosquito larvae, they can be eradicated by carrying out 3 M and routinely cleaning up puddles that may arise.

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## ***Domestic Environmental Factors Associated with Pediatric Snoring: A Scoping Review Protocol***

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### **ABSTRACT**

*Since one-third of children who snore consistently may have OSAS, understanding the causes is vital. Preventing snoring requires addressing obesity, allergies, and anatomical anomalies. Indoor allergens and enlarged tonsils and adenoids may also cause youngsters to snore. The review aims to identify and categorize key concepts, types of evidence, and research gaps in this area. The scoping review will follow the methodology and stages outlined by the Joanna Briggs Institute ((JBI). The final output will follow the PRISMA-Protocols (PRISMA-P) 2015 checklist. This review serves as a necessary step before conducting a systematic review and clinical studies. Childhood snoring is a common problem that can have adverse effects on a child's health and well-being. It is important for parents to understand the hazards of snoring and seek support if they suspect their child may have a sleep disorder. Treatment options vary depending on the cause and severity of snoring, and may include lifestyle changes, medication, or surgery. More research is needed to better understand the relationship between environmental factors and snoring children, including the impact of pollutant such as NO<sub>2</sub> and passive smoking. Early detection and treatment of snoring in children is crucial, as it can have long-term effects on their health and well-being. The conclusion is that knowledge empowers parents to take the necessary steps to ensure the well-being and healthy sleep of their children.*

**Keywords :** *Domestic Environmental, Children, Snoring, Scoping Review*

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### **INTRODUCTION**

Snoring is a common condition in children, with varying prevalence rates reported across different studies. Habitual snoring, which refers to regular snoring is estimated to occur in 3.2% to 11% of children, while infrequent snoring is present in 17% to 27% of

all children<sup>1,2</sup>. In a study of Indonesia children aged 5 to 13, the prevalence of snoring was found to be 31.6%, with 5.3% classified as habitual snorers and 26.4% as occasional snorers<sup>3</sup>.

It is important to note that approximately one-third of children who snore regularly may have obstructive sleep apnea

syndrome (OSAS), a condition characterized by interrupted breathing during sleep<sup>4</sup>. While most studies have focused on the impact of OSAS on children's health, some research suggests that snoring itself can have adverse effects on

neurocognitive function, behavior, and blood pressure, even in the absence of apnea<sup>6</sup>.

Given these concerns, both medical professionals and parents have become increasingly interested in understanding the causes of snoring in children and exploring prevention strategies. By addressing the underlying factors contributing to snoring, such as obesity, allergies, or anatomical abnormalities, it may be possible to alleviate the symptoms and improve children's overall well-being<sup>1,7</sup>.

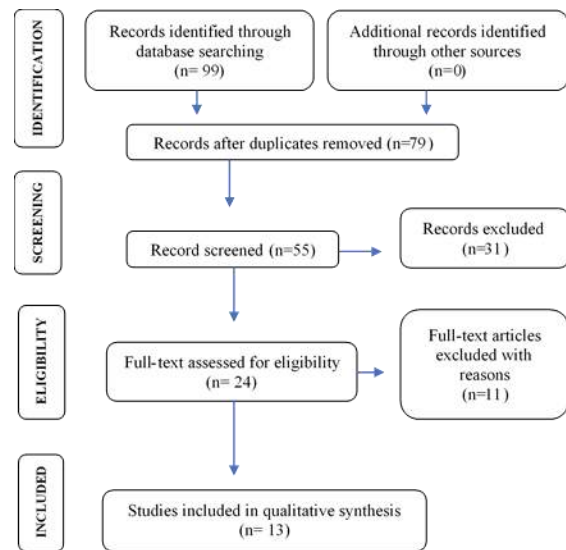
It is important to understand the environmental factors that contribute to snoring in children, as they can have a significant impact on their health and well-being. A scoping review was conducted to identify research on domestic environmental factors associated with snoring in children. The review found that exposure to indoor irritants such as volatile organic compounds, microbes, formaldehyde, and nitrogen dioxide may increase the risk of snoring. Other factors such as enlarged tonsils and adenoids, obesity, and allergies were also identified as contributing factors<sup>8,9</sup>. By addressing these factors, it may be possible to alleviate snoring symptoms and improve children's overall health<sup>10,11</sup>. Therefore, the purpose of this study is needed to understand the relationship between environmental factors and snoring in children.

## METHODS

### Study Design

A scoping review will be conducted to assess the range, scope, and types of studies related to the topic of interest. The scoping review will follow the methodology and stages outlined by the Joana Briggs Institute ((JBI)<sup>12</sup>. The final output will follow the PRISMA-Protocols (PRISMA-P) 2015 checklist (Figure 1)<sup>13</sup>.

**Figure 1. Prisma diagram for article selection process.**



### Search Strategies

A scoping review is a method of knowledge synthesis that investigates an exploratory research question with the goal of identifying and categorizing key concepts, types of evidence, and research gaps in a specific area or field. This is achieved through a systematic search, selection, and synthesis of existing knowledge. We will conduct a scoping review to explore broad questions and obtain an overview of a topic, rather than conducting a detailed synthesis of a specific question. This is particularly true for the specific topic of Domestic Environmental Factors Associated with Snoring in Children, as there is a lack of comprehensive and diverse literature on the subject. It aims to identify and analyze any gaps in knowledge that are significant for future research. This review serves as a necessary step before conducting a systematic review and clinical studies<sup>14,15</sup>.

### Eligibility criteria

#### Population/studies

Children aged between in kindergarten, pre-elementary school, junior high school and senior high school

Inclusion criteria include:

1. Prevalence rates of children with snoring condition measured objectively and subjective measures;



2. Intervention strategies and outcomes for reducing this condition.
3. Children in kindergarten, pre-elementary school, junior high school and senior high school, perspectives or outcomes of intervention strategies to reduce this condition (including mixed methods, qualitative and quantitative studies).

Exclusion criteria include:

All studies on snoring in children conducted in kinder garden, junior high school, senior high school without being limited to geographic region, ethnicity or gender, will be included.

Study types

The inclusion criteria for this scoping review will focus on published primary research studies that utilize mixed methods, quantitative, and qualitative methodologies. Specifically, studies that examine physical activity in children but also report data on snoring will be considered for inclusion, as long as they meet the remaining inclusion criteria.

On the other hand, certain exclusion criteria will be applied. These include studies that have limited availability of full-text articles, manuscripts written in languages other than English, and case reports criteria, the scoping review aims to ensure the inclusion of relevant and high-quality research studies<sup>14</sup>.

#### **Data Extraction from Included Studies**

S and NTW will conduct a thorough screening of electronic databases, following the eligibility criteria. The Endnote library will import every relevant article and eliminate any duplicates. Subsequently, the Endnote library will be shared with the review team for the subsequent stage of the study selection process. A screening tool will be created based on the eligibility criteria for both the abstract and full text screening stages. Two reviewers, identified

as SYW and HN will independently perform abstract and full text screening. The screened articles will be categorized as either included or excluded. There are discrepancies between the self-assessment (SYW) and (HN). The review team will engage in a discussion to reach a consensus on the abstract screening phase. During the full text phase, SA and S will address any discrepancies that may arise between SYW and HN, if an article is not available online, the library services of the institution will be consulted for assistance<sup>16</sup>.

The search strategy looks for to identify English-language studies published between January 2004 and July 2023. The user conducted a search on PubMed, Scopus, Cochran, and Embase. A comprehensive search, strategy will be developed using indexed descriptors and keywords. The selected keywords are “domestic environment”, “snoring children”, “bacterial contaminant”, “air pollute”, “environmental tobacco smoke”. The initial search will be performed in PubMed and subsequently translated into additional databases. The reference lists of the included studies and previously published reviews will be examined to identify additional relevant articles.

## **RESULTS**

The data charting form in table 1 has been specifically designed for this study. Two team members will independently chart the data, but charges may be made if valuable information is found to be missing. Table 1 includes study metrics, population characteristics, and study aims and outcomes. The restricted data from this chart will undergo thematic analysis, either quantitatively or qualitatively, to effectively address the research question. Two team members will be responsible for coding the data to minimize bias and errors.

**Table 1. Results of the article review**

Source	Country	Population	Aim	Study design	n	Key findings	Conclusion
Isaiah et al. (2021) <sup>4</sup>	United State of America	9–10-year-olds without major psychological or neurological issues	The study explores the influence of confounding factors on the cognitive outcomes of preadolescent children and their habitual snoring.	Cross-sectional	11873	The link between habitual snoring and cognitive performance was significantly reduced following demographic, anthropometric, and socioeconomic adjustments.	After controlling for baseline demographic, anthropometric, and socioeconomic factors, parent-reported frequent snoring had little effect on cognitive performance in 9–10-year-olds in this cross-sectional investigation.
Potasz et al. (2010) <sup>5</sup>	Sao Paulo	A study of 330 children in a clinical laboratory was conducted to assess sleep disorders.	The prevalence of sleep disturbances in children from a public hospital in São Paulo, Brazil.	Cross-sectional	330 children	Excessive environmental pollution in urban areas like São Paulo may contribute to children's increased allergies and respiratory disorders, favoring SDB.	Sleep problems, especially sleep disordered breathing and sleep hyperhidrosis, were common in boys in our study compared to international literature.
Tenero et al. (2017) <sup>6</sup>	Verona, Italy	We searched Medline, Scopus, and ISI Web of Science	Environmental air pollution can cause childhood sleep-disordered breathing.	Systematic review	8 articles	The findings indicate that ambient (not voluptuary) pollution worsens sleep-disordered breathing in children (grade C).	Studies Research indicates significant differences between polluted and unpolluted areas, and indoor pollution therapies can improve children's sleep-disordered breathing.
Sahin et al. (2009) <sup>10</sup>	Isparta, Turkey	1,605 7-13-year-olds (819 boys and 786 girls) from 9 randomly selected elementary schools in Isparta, Turkey.	-	Cross-sectional	1605 children	In multivariate analysis, poor school performance was independently associated with hyperactivity, nocturnal enuresis, teeth grinding, and low parental/maternal education.	Children with Habitual Snoring had increased daytime and night-time sleep issues. No correlation was found between HS and poor school performance.
Neroni et al. (2021) <sup>14</sup>	Rome, Italy	The study explored through PubMed/ME DLINE and ScienceDirect .	To analyse literature data to better understand the relationship between sleep disorders and gut microbiota composition.	Systematic review	13 articles	Children with sleep-related breathing difficulties, intestinal permeability is associated with greater plasmatic LPS levels and inflammatory mediators.	There is evidence that gut microbiota can affect mental states, sleep quality, and circadian rhythm, and psycho-physiological stress can affect microbiota composition.
Meng et al. (2021) <sup>15</sup>	Wuhan, China	Elementary school children in period 1 (N=2,517) and in period 2 (N=3,152) were recruited in Wuhan, China..	The study on the health effects of air pollution on Chinese children's respiratory health in four Chinese cities.	Cross-sectional	5669	Urban Wuhan children's respiratory health has improved since the 1990s, with urban children benefiting most. However, asthma and bronchitis prevalence remain unaffected.	Over 25 years, Wuhan children's respiratory health and indoor air quality have improved, with kitchen smoke influencing wheeze prevalence, and reducing tobacco smoke exposure may help prevent bronchitis.
Wang et al. (2023) <sup>17</sup>	Tianjin, China	Snoring index (SIS) data came from Google Trends and Baidu Index. 2011–2020	Research on seasonal changes and snoring worldwide has been searching using Google Trends and Baidu Index	Seasonal time series	Brazil, Japan, and Germany.	The 2020 time series decomposition revealed decreasing SIS values in the US, China, Japan, Russia, and Australia, possibly due to COVID-19 infections, consequences, and fear.	Snoring data Search Index exhibited cyclical fluctuations during the investigation. In the cold and heating seasons, the search index for snoring increased, suggesting seasonality.
Huang et al. (2022) <sup>18</sup>	China	A pediatric OSA was confirmed overnight by PSG, with adenoid and tonsillar hypertrophy diagnosed by an otolaryngologist	To examine the salivary microbiome of children with OSA and its longitudinal changes before and after adenotonsillectomy.	Cross-sectional study	36	The study's inability to link salivary microbiome to OSA suggests further research, with a small sample size and subjective symptoms making follow-up assessments challenging.	The study linked salivary microbiome to obstructive sleep apnea, but further research is needed due to follow-up challenges, small sample size, and subjective symptoms improvement in OSA children post-therapy.

Collado et al. (2019) <sup>19</sup>	Finland	The children's birth dates range from April 2011 to February 2013.	To characterize the connection between gut microbiota and child snoring.	Cohort study	43	Snorers have higher Proteobacteria, Enterobacteriaceae, and Erysipelotrichaceae levels, leading to a worse Firmicutes-Bacteroidetes ratio, potentially causing health disorders and contributing to snoring.	The gut microbiota, influenced by bacterial species and imbalances, can contribute to snoring's long-term effects, and treating the early microbiome can mitigate its effects.
Gozal et al. (2014) <sup>20</sup>	Teheran, Iran	6- to 12-year-old children attending public schools in five distinct neighbourhoods.	The study investigates the correlation between habitual snoring and air pollution levels in Tehran, Iran.	Cross-sectional studies	4322	Research indicates that poor air quality, particularly high nitrogen dioxide levels, can cause regular snoring in children, even after weight and allergies are considered. Improved air quality could potentially reduce snoring in children.	Poor air quality, especially high nitrogen dioxide levels, can cause regular snoring in children, even after considering weight and allergies, and improved air quality could potentially reduce snoring.
Sanchez et al. (2019) <sup>21</sup>	Chile	First grade children of elementary schools throughout Chile	To investigate links between air pollution and SDB symptoms in children.	Cross-sectional	564 children	Environmental pollution may disrupt children's sleep. Significant relationships were found between sleep respiratory symptoms and humidity, low temperatures, O <sub>3</sub> , and SO <sub>2</sub> .	Wheezing and snoring are strongly linked to O <sub>3</sub> and SO <sub>2</sub> air pollution. Weather variables like humidity and cold temperatures may also cause SDB symptoms.
Sun et al. (2018) <sup>22</sup>	Qingdao, China	A meta-analysis of 24 studies involving 87,829 individuals was conducted using PubMed, Embase, and Web of Science	A meta-analysis examined how family member environmental tobacco smoke and prenatal smoke exposure affect children's habitual snoring.	Systematic review Meta-analysis	24 articles	The meta-analysis, with a high sample size, adjusted odds ratios, dose-response analysis, steady association between household smoking and habitual snoring, and no publication bias.	This meta-analysis of observational research shows that ETS, particularly prenatal tobacco smoke and maternal smoking, increases HS risk.
Zhang et al. (2004) <sup>23</sup>	Perth, Australia	The Snoring stats Search Index cycled, with an increase in search indexes during cold and heating seasons,	To examine domestic environmental factors affecting kid snoring.	Cross-sectional	996 children	NO <sub>2</sub> increases lipid membrane fluidity, potentially affecting receptor-ligand interactions and increasing snoring prevalence and obstructive sleep apnea risk.	Primary schoolers often snore. Domestic surroundings may increase snoring. Child snoring is linked to home nitrogen dioxide.

The primary objective of this study is to identify evidence on the assessment approaches used in Domestic Environmental Factors Associated with Snoring in Children from the charted data so as to map the assessment practices across various kinder garden, junior high school, and senior high school. Data will be quantitatively represented using figures and tables and qualitatively described in relation to the research question, including themes such as assessment used, similarities as well as disparate approaches, and contextual nuances.

The critical appraisal of evidence sources, although not mandatory, will be an included step in this review to assess the methodological quality using methods appraisal tool (MMAT). This instrument has a prescribed set of questions that examine the appropriateness of the different sections reported in each of the evidence sources <sup>23</sup>.

## DISCUSSION

Understanding the causes of snoring in children is crucial for parents to ensure the well-being and healthy sleep of their children. Snoring in children can have various causes, ranging from temporary factors to long-lasting issues. While occasional snoring may not be a cause for concern, frequent or severe snoring can indicate a problem with breathing during sleep <sup>11,24</sup>.

There are different types of snoring in children, with varying frequency, severity, and impact. Primary snoring refers to habitual snoring without any noticeable symptoms or associated health issues. On the other hand, obstructive sleep apnea (OSA) is a more serious condition characterized by repeated pauses in breathing during the night due to airway blockage. OSA can lead to fragmented sleep and have negative impacts on physical health, mental health, learning, and behavior <sup>25,26</sup>.

To endure the well-being of children with snoring issues, it is important for parents to be aware of the potential consequences and seek appropriate treatment. Treatment options for snoring in children depend on the underlying cause and severity of the condition. It may involve lifestyle changes, such as weight management and sleep position adjustments, or medical interventions, such as the use of continuous positive airway pressure (CPAP) machines or surgical procedures <sup>17</sup>.

Further research is needed to explore the association between domestic environmental factors and snoring in children. This scoping review aims to fill this research gap by utilizing mixed methods, quantitative, and qualitative methodologies to review published primary research studies. By identifying key domains and research gaps, this review will contribute to a better understanding of the relationship between domestic environmental factors and snoring in children <sup>18,27</sup>.

The prevalence of habitual snoring varies across different studies and countries, ranging from 4.9% to 34.5% in primary school children. In Australia, a study reported a prevalence of habitual snoring among primary school children was found to be 15.2%, with 24.9% experiencing infrequent snoring. Interestingly, the prevalence of snoring was lower in older children compared to younger ones, and there was no significant difference between boys and girls <sup>28</sup>.

The adenoids, which are located in the upper airway, may play a role in various upper airway disorders in children. Adenoidectomy, the surgical removal of the adenoids is commonly performed to relieve recurrent ear infection in children. However, even after treatment with antibiotics and surgery, some children may still harbor pathologic bacteria in the nasopharynx <sup>29</sup>.

Minor, occasional snoring is believed to occur in up to 27% of children and is usually not a cause for concern. Primary snoring, without other symptoms is estimated to affect around 10-12% of children. Among children diagnosed with sleep-disordered breathing, approximately 70% receive a diagnosis of primary snoring. However, it can be challenging to determine the exact statistic for snoring and sleep apnea in children. Parents may not always observe their child's snoring or be aware of its frequency and severity. Additionally, detailed testing for sleep apnea, such as polysomnography may not be readily available, affordable, or practical in all cases <sup>30,31</sup>.

The findings of the scoping review indicate a strong association between snoring and respiratory symptoms, asthma, and other allergic conditions in children, consistent with previous studies. Passive smoking was identified as a major risk factor for habitual snoring <sup>32</sup>, while an interesting observation was the inverse relationship between snoring and pet

ownership, which may have a protective effect against allergic disease. Additionally, domestic exposure to NO<sub>2</sub> was significantly associated with snoring, with high levels of exposure increasing the risk by 4.5 times. This suggests that gas heating during winter, which contributes to NO<sub>2</sub> exposure, may be a contributing factor to snoring in children. Further research is needed to investigate the mechanisms behind these associations<sup>33,34</sup>.

The association between NO<sub>2</sub> exposure and snoring in children requires further investigation to determine the underlying mechanisms. While there is evidence linking NO<sub>2</sub> exposure to the development of allergic disease, the association between NO<sub>2</sub> and snoring appears to be independent of atopy<sup>35,36</sup>. Snoring is caused by upper airway obstruction during sleep, commonly at the nasal turbinate or nasopharynx. Exposure to NO<sub>2</sub> may increase lipid membrane fluidity, leading to altered receptor-ligand interactions and changes in cell-cell and cell-pathogen interactions in the upper airway. Further research is needed to understand the specific mechanisms linking NO<sub>2</sub> exposure and snoring in children<sup>37,38</sup>.

It is therefore crucial to identify and address snoring in children early on. Treatment options vary depending on the underlying cause and severity of the snoring<sup>39,40</sup>. Lifestyle modifications such as weight loss, proper sleep positioning, and avoiding allergens can be helpful. Medical interventions include continuous positive airway pressure (CPAP) machines, oral appliances, and in some cases, surgery<sup>19,20</sup>. However, more research is needed to understand the mechanisms behind the association between snoring and exposure to environmental pollutants such as NO<sub>2</sub><sup>21</sup>. Parents and caregivers should be aware of the potential risks associated with snoring in children and seek medical attention if they suspect their child may have sleep-disordered breathing<sup>22,41</sup>.

## CONCLUSION

The findings showed that domestic environmental factors have a relationship with snoring and this review will ensure that healthcare professionals, researchers, and parents have access to the latest information on the causes, consequences, and treatment option for snoring in children. Ultimately, this

knowledge will help parents in taking appropriate measures to ensure the well-being healthy sleep of their children.

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Article Review

***Telehealth Usage During The Coronavirus Disease 2019 Pandemic:  
A Meta-Analysis***

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**ABSTRACT**

*The recent pandemic has increased telemedicine use tremendously, but it has also pronounced access gaps to telemedicine. This study aimed to investigate factors affecting patient use of telehealth during the Coronavirus Disease 2019 Pandemic. This article was created using a systematic review and meta-analysis study that searched for articles in electronic databases such as Science Direct, PubMed, and Google Scholar. Observational studies are included in full papers with a publication year until 2022 were searched for this study. The Review Manager 5.3 (RevMan) software was used to analyze the articles in this study. We observed heterogeneity with a random-effect model to analyze the effect size from each primary study, and the results were reported as an adjusted odds ratio (aOR) and corresponding 95 percent confidence interval (CI). A total of 9 articles reviewed in the meta-analysis (consisting of 4 articles in each variable) showed that patients whose primary language is non-English (aOR= 0.72; 95% CI= 0.59 to 0.87; p= 0.0008) and have Medicaid insurance English (aOR= 0.86; 95% CI= 0.77 to 0.97; p= 0.02) were less likely to use telemedicine compared to patients who speak English and utilize private insurance. Medication insurance and non-English as a preferred language reduced the likelihood of patients using telemedicine.*

**Keywords:** Telemedicine, Telehealth, Patient Use, Determinants, Predictors, Coronavirus-2019

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## INTRODUCTION

The COVID-19 pandemic raised awareness of telemedicine among the general public to deliver safe, efficient medical care without the risks connected with in-person interaction<sup>1,2,3</sup>. The use of telemedicine is one of the technological breakthroughs in the field of medicine to improve quality health services. Telemedicine can be used to communicate patient needs regarding consultation on his condition to the doctor on conditions in which the patient cannot access health facilities. The use of telemedicine during the pandemic could increase investigations of epidemiology, disease control, and patient case management, asymptomatic or symptomatic. Through the use of telemedicine, patients with mild disease symptoms receive supportive care needed without needing to interact with other potential patients to exacerbate the condition. The provision of health care services through the interchange of trustworthy information for the diagnosis, treatment, and prevention of disease and injury is what the World Health Organization refers to as "telemedicine"<sup>4,5,6,7</sup>.

In the past ten years, telemedicine initiatives and digital health care visits have been investigated and adopted more frequently to increase patient access to care and lessen inequities in health care access<sup>8,9</sup>. Telemedicine as a form of digital health transformation is considered to be the answer to various problems faced in health services. The fear of transmitting the virus made online doctor appointments an option. This will continue to be the case post-pandemic, given the convenience and ability to serve patients even in remote locations. Digitalization will be a fine balancer in

healthcare. This will reduce doctors' hours of work, reduce the number of patients required to be hospitalized and provide access to essential health care information and diagnostic tools for rich and poor, urban and rural dwellers alike, in a safe, more affordable and sustainable manner<sup>10,11</sup>.

As outpatient telemedicine delivery became more common after May 2020, some research has looked into telemedicine utilization patterns. Existing research has also discovered associations between age in older, other races, and preference for a language other than English, together with lower telemedicine use<sup>12</sup>. Some have pointed out healthcare inequalities and rural populations' access to technology, which may put them at risk of lower telemedicine adoption<sup>13</sup>. Several studies have found that Black, Latinx, non-English speaking, older, and Medicare or Medicaid patients are less likely to use telemedicine<sup>14-16</sup>. The recent pandemic has increased telemedicine use tremendously<sup>17</sup>, but it has also pronounced access gaps to telemedicine more. This study aims to investigate more factors influencing telemedicine utilization concluded in a systematic review and further analysis.

## METHOD

### Data sources and search strategy

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed for this systematic review and meta-analysis<sup>18</sup>. From their inception to the 31st of July 2022, only English-language-based literature was used in the search term for an electronic search of Google Scholar, PubMed/Medline, and Science-Direct: "telemedicine OR telehealth AND patients use AND factors

OR determinants OR predictors AND COVID-19 OR coronavirus 2019". In addition, we manually searched the cited articles of prior meta-analyses and review articles for any pertinent studies.

### Study selection

The following eligibility requirements were satisfied by all studies to be included: (a) articles about the factors affecting patients use of telemedicine; (b) independent variables influencing patients use of telemedicine including having medicaid insurance and patients use non-English language as the preferred language; (c) associations measured by an adjusted odds ratio; and (d) respondents were general patients with variety of disease. Additionally, PECOS was used as the research strategy: 1) P (population): general patients; 2) E (exposure): medicaid/public insurance and patients use non-English language as the preferred language; 3) C (control): private insurance and patients use English

language as the preferred language; 4) O (outcome): telemedicine use (telephone only, video only, or both); 5) S (Studies): observational studies that were only released in English. Studies that did not fulfill the inclusion criteria were excluded, along with case reports, case series, literature reviews, editorials, human-based randomized controlled trials, and further studies.

### Data extraction and quality assessment of studies

The electronic databases were searched independently by two reviewers. After the studies were exported to Mendeley Desktop 1.19.8, duplicates were screened and removed. Two reviewers worked simultaneously and independently to extract data and assess the quality of included studies. The Critical Appraisal Skills Program (CASP) was used to assess the quality of the cohort. Score two means Yes; one is maybe, and 0 is no (Table 1 contains scoring information).

**Table 1. Quality Assessment by Critical Appraisal Skills Program (CASP)**

No	Assessment Indicator	Study (Author and year)								
		Chen et al., (2020)	Darrat et al., (2021)	Duan et al., (2022)	Eberly et al., (2020)	Eruchalu et al., (2022)	Haynes et al., (2021)	Javier-DesLoges et al., (2022)	Lattimore et al., (2021)	Xiong et al., (2021)
1.	Does this research address a clearly focused problem?	2	2	2	2	2	2	2	2	2
2.	Was the group recruited in an acceptable way?	2	2	2	2	2	2	2	2	2
3.	Is exposure accurately measured to minimize bias?	2	2	2	2	2	2	2	2	2
4.	Was the outcome	2	2	2	2	2	2	2	2	2

	accurately measured to minimize bias?									
5.	Did the author identify all the important confounding factors? Has the author taken into account confounding factors in the design and/or analysis?	2	2	2	2	2	2	2	2	2
6.	Was the follow-up subject complete enough? Was the follow-up of the subject long enough?	2	2	2	2	2	2	2	2	2
7.	Are the results of this study reported in aOR?	2	2	2	2	2	2	2	2	2
8.	is the result precise?	2	2	2	2	2	2	2	2	2
9.	Are the results reliable?									
10.	Can the results be applied to the local population?	2	2	2	2	2	2	2	2	2
11.	Are the results of this study consistent with other available evidence?	2	2	2	2	2	2	2	2	2
12.	Does the implications of this research for suitable for practice?	2	2	2	2	2	2	2	2	2
<b>Total Score</b>		<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>

### Statistical analysis

Review Manager (v. 5.3. The Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, 2014) was used for all statistical analyses. A

random-effects model was used to pool the data from the studies. The adjusted odds ratio (aOR) with respective 95% confidence intervals was used to analyze

the results (CI). According to Higgins et al., the heterogeneity scale was as follows:  $I^2 = 25-60\%$  - moderate,  $50-90\%$  - substantial,  $75-100\%$  - considerable, and  $p < 0.1$  – significant heterogeneity. For all analyses, a  $p < 0.05$  was considered significant.

initial search brought up 4051 possible research. The entire texts of 56 studies were evaluated for potential inclusion after exclusions based on titles and abstracts. There were still 9 studies<sup>19-28</sup> available for quantitative analysis. The findings of our literature search are summarized in Figure 1.

## RESULTS

### Literature search results

The three electronic databases'

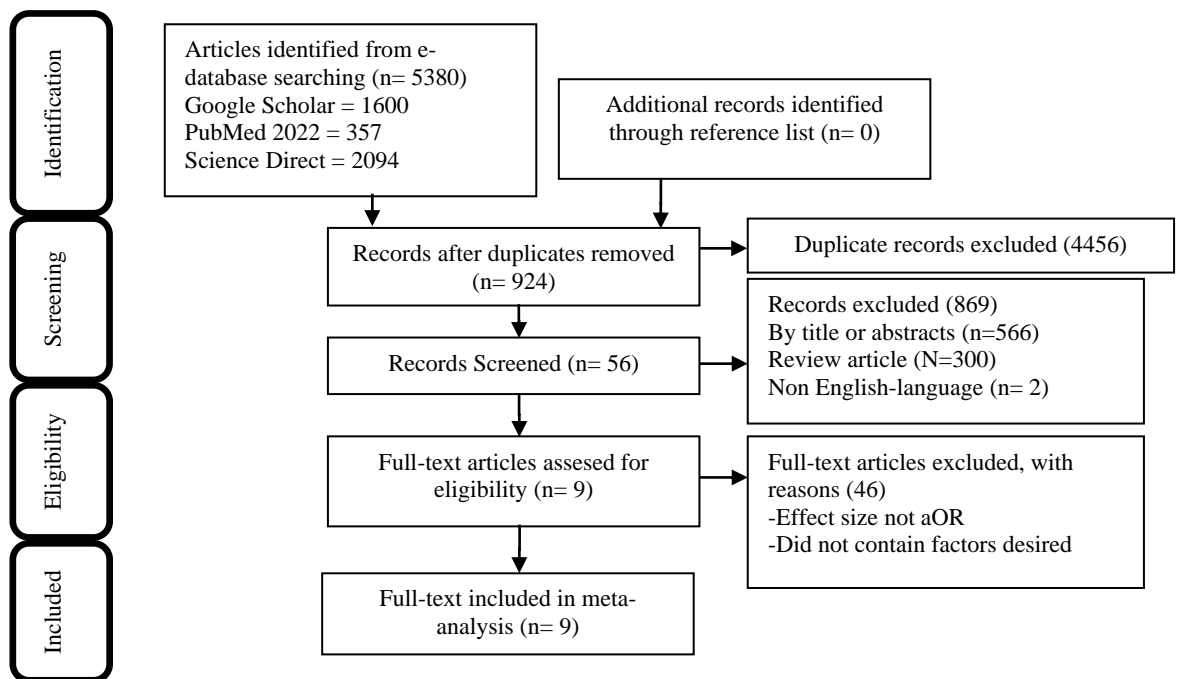


Figure 1. PRISMA flow diagram

### Study characteristics

The fundamental attributes of the included research are shown in Table 2. Ten published studies were considered in our analysis. Each one was a cohort study. 129,867 patients in all took part in this investigation. All studies were from

United States of America. Eight and nine studies examined the association between medicaid/ public insurance and patients using non-English as the preferred language and telemedicine-use, respectively.

**Table 2. Basic characteristics of selected studies**

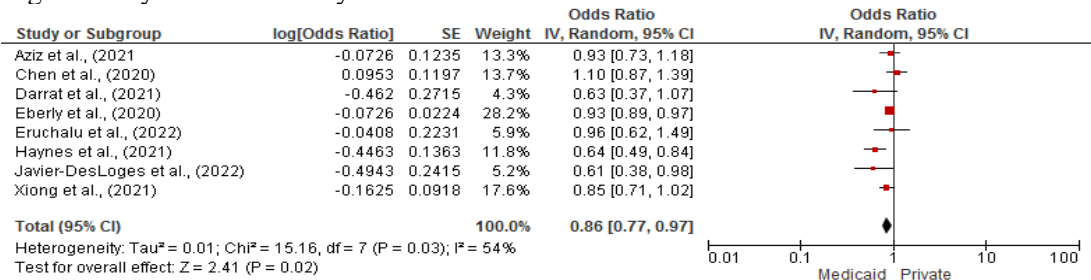
No	Author (year)	Country	Study Design	Duration of follow up	Sample	Intervention	Control	Factors affecting telemedicine (aOR (CI 95%))
1.	Chen et al., (2020)	USA	Cohort	March 1 to August 31, 2020	5023	Telemedicine visit	In-person visit	Non-English 0.71 (0.50-0.98) Medicaid insurance 1.10 (0.87-1.37)
2.	Darrat et al., (2021)	USA	Cohort	March 17 to May 1, 2020	1162	Telemedicine visit	In-person visit	Medicaid insurance 0.63 (0.37-1.07)
3.	Duan et al., (2022)	USA	Cohort	June 1, 2019 to January 22, 2021	1444	Telemedicine visit	In-person visit	Non-English 0.28 (0.08-0.95)
4.	Eberly et al., (2020)	USA	Cohort	March 16 to May 11, 2020	80,780	Telemedicine visit	In-person visit	Non-English 0.84 (0.78-0.90) Medicaid insurance 0.93 (0.89-0.97)
5.	Eruchalu et al., (2022)	USA	Cohort	March 24 to June 23, 2020	985	Telemedicine visit	In-person visit	Non-English 0.96 (0.62-1.48) Medicaid insurance 0.96 (0.71-1.28)
6.	Haynes et al., (2021)	USA	Cohort	March 19 to June 30, 2020	1292	Telemedicine visit	In-person visit	Non-English 0.53 (0.31-0.91) Public Insurance 0.64 (0.49-0.84)
7.	Javier-DesLoges et al., (2022)	USA	Cohort	March 15 to September 30, 2020	4234	Telemedicine visit	In-person visit	Non-English 0.92 (0.63-1.35) Medicaid insurance 0.61 (0.38-0.97)
8.	Lattimore et al.,	USA	Cohort	July 1, 2019 to	21,980	Telemedicine visit	In-person	Non-English 1.22 (0.48-862

	(2021)			May 31, 2020			visit	3.10)
9.	Xiong et al., (2021)	USA	Cohort	March 24 to May 18, 2020	11,056	Telemedicine visit	In-person visit	Non-English insurance 0.34 (0.18-0.65) Medicaid insurance 0.85 (0.71-1.02)

### Results of the meta-analysis

A detailed forest plot of eight studies were used to analyze the association between medicaid insurance and telemedicine use. The random analysis of pooled aOR suggests that patients with medicaid insurance were significantly less likely to use

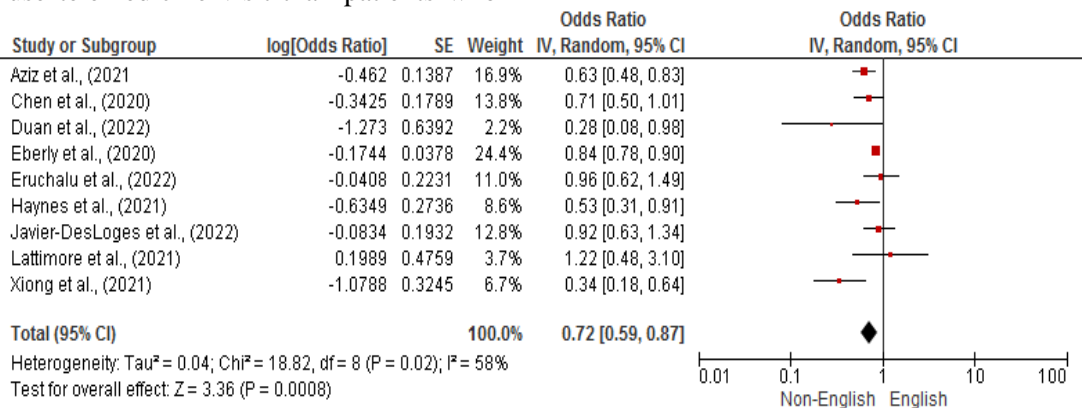
telemedicine visit than patients with private insurance (aOR= 0.86; 95% CI= 0.77 to 0.97; p= 0.02). The heterogeneity ( $I^2$ ) showed a moderate category with a value of 54% and it was significant p= 0.03 (Figure 2).



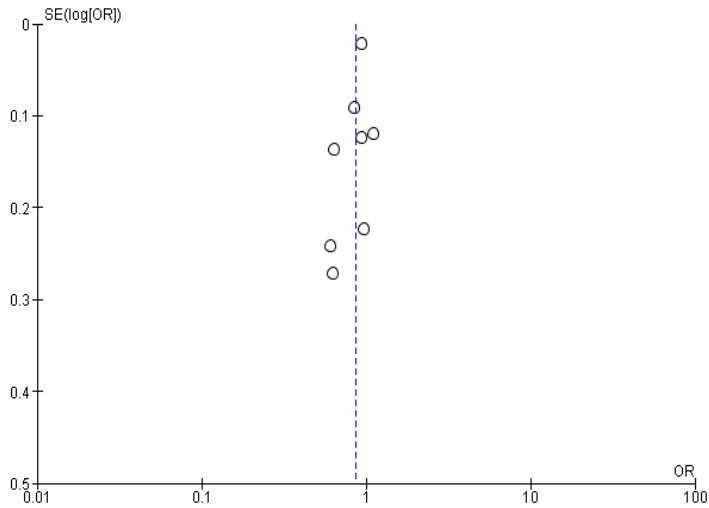
**Figure 2. Forest plot showing association between medicaid insurance and telemedicine use**

The random analysis of pooled aOR from 9 studies suggests patients with non-English as their preferred language were significantly less likely to use telemedicine visit than patients who

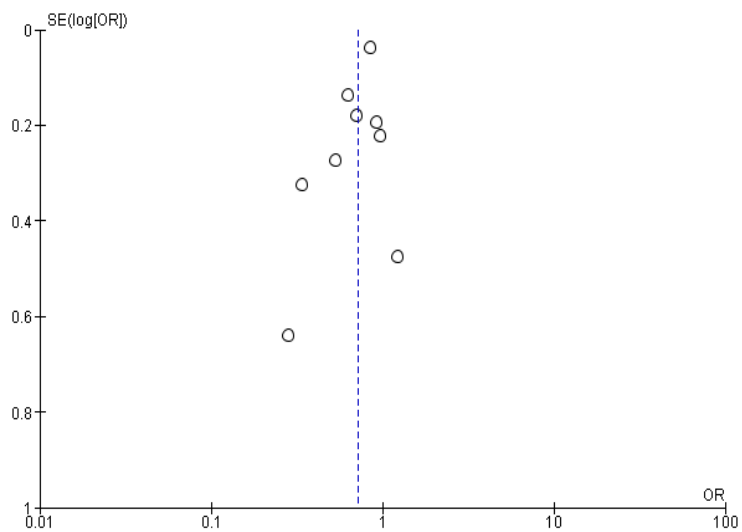
speaks English (aOR= 0.72; 95% CI= 0.59 to 0.87; p= 0.0008). The  $I^2$  showed a moderate category with a value of 58% and was significant (p= 0.02) (Figure 3).



**Figure 3. Forest plot showing association between non-English as patients' language and telemedicine use**



**Figure 4. Funnel plot showing the association between Medicaid insurance and telemedicine use**



**Figure 5. Funnel plot the association between non-English as patients' language and telemedicine use**

**Publication bias and quality assessment**

We use a funnel plot to assess publication bias. The bullets were representing each of the primary studies that are a part of the meta-analysis. Both

funnel plots showed no biased publication and underestimate effects based on a bullet leaning at the left side of the middle line. All the studies showed an excellent qualified article based on the total score described in Table 1.

## DISCUSSION

The COVID-19 pandemic has made it difficult for healthcare systems to provide adequate patient care<sup>29,30,31,32</sup>. To meet this demand, telemedicine practices have expanded across the country and around the world. Health providers must understand and identify gaps in this approach to reduce the risk and consequences of suboptimal care. Use of telemedicine can help the general public to accessing health services. Patient can consult a doctor related to the illness he experienced telemedicine without needing to go to the hospital, so that the patient can travel time to health services. Effectiveness telemedicine also impacts necessary medical financing in terms of transportation to patient visits, home visit practice by doctor or hospitalization which was not planned. Telemedicine can help solve the problem of medical practice on a regional scale area, where is the distance between the patient to impact health services health care costs and outcomes patient's illness. The impact of telemedicine will improve patient satisfaction for access health services and improve health conditions patient<sup>33,34</sup>. During the COVID-19 pandemic, telemedicine helps with patient care chronic as patients with immunocompromise, cancer, diabetes mellitus and hypertension. Use telemedicine in disease care chronic easy to control treatment of patients so that it is beneficial on the decline in the number of visits to hospital and arrival to the emergency department emergency. Telemedicine can support patient self-management start setting and the role of medication, lifestyle modification as well as the patient's emotional regulation effectively to improve quality patient outcomes. Through use the telemedicine,

the patient with chronic diseases can be avoided from infection COVID-19 and risk increasing patient's risk of death<sup>35,36</sup>.

In this review, we sought to identify the factors affecting patients' preference for telemedicine services compared to in-person visits. The results of our study disparities in insurance and non-English speaking in the utilization of telemedicine visits during the COVID-19 pandemic. Medicaid insurance is associated with lower utilization of telemedicine among patients in the general population. It was supported by Ruberto et al., (2022) based on multiple logistic regression mode analysis stated that non-commercial insurance were linked to lower telemedicine utilization (aOR 0.510 CI 95% (0.465-0.559)<sup>37</sup>. Government assistance is provided through Medicaid. It supports persons with low incomes of all ages. Most of the time, patients are not accountable for any costs connected with reimbursed services. Sometimes there is a small co-payment required. Federal and state governments collaborate on Medicaid. It differs from state to state. State and municipal governments manage it following federal regulations. To see if you qualify for your state's Medicaid (or Children's Health Insurance) program<sup>38</sup>. A study by Hsiao et al. (2021) also suggested that telemedicine visits were positively associated with getting older, having Medicaid or Medicare as a payer, and having the patient portal activated<sup>39</sup>.

Patients who do not speak English use telemedicine at a lower rate than patients who use English as a first language in the general population. This was similar to the results of the study by Reed et al., (2020) based on the effect size, patients with a known preference for a language other than English were noticeably less likely to select either type



of telemedicine than English speakers. The relative risk ratio (RRR) for English speakers on telemedicine visits is 1.18 and 1.15 compared to in-person clinic visits, respectively <sup>40</sup>.

## CONCLUSION

This is the first review paper, as far as we are aware that looked into the factors that influence patients' telemedicine visits versus in-person visits. The meta-analysis found that having Medicaid insurance and not speaking English decreased the likelihood of patients using telemedicine. Using predetermined criteria, the two researchers separately determined whether the identified studies were eligible and thoroughly evaluated the caliber of those studies. The factors that must be considered when developing health promotion activities were highlighted in this study. Health literacy, counseling, and education programs are also required in clinical and community settings. Future research should concentrate on refining the analysis by subspecialty services and delving deeper into utilization patterns. More research is needed to quantify the effects on health outcomes and costs.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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## ***Exploring Media-Based Interventions for Adolescent Mental Health: Literature Review***

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### **ABSTRACT**

*Media-based interventions show promise in addressing the rising mental health concerns among adolescents, surpassing challenges associated with traditional care. This review critically assesses the effectiveness of media-based interventions in promoting adolescent mental health, with a specific focus on social media, digital applications, and film. The methodology employs a comprehensive approach, utilizing Google Scholar, Scopus, and PubMed databases (2012-2022) with keywords such as "mental health," "media," and "adolescents." The methodology is refined for enhanced clarity, explicitly detailing the search strategy, inclusion and exclusion criteria, and selection process. Findings from the analysis of 13 selected articles highlight promising outcomes of digital interventions in screening and treating mental disorders in adolescents. Emphasizing scalability, accessibility, and personalization benefits, the review recognizes the importance of addressing privacy concerns and the potential drawbacks of relying solely on digital platforms. Additionally, it emphasizes the impact of using booklets for mental health self-management in schools. The review improves organization and flow, eliminating repetition for a clearer presentation of information, providing a detailed evaluation of their strengths and limitations, enhancing the overall credibility of the review. The abstract explicitly discusses limitations related to inclusion criteria, such as language restrictions and the exclusion of specific study designs. This comprehensive approach contributes to a more robust understanding of the literature, providing valuable insights for researchers, practitioners, and policymakers involved in developing effective interventions for adolescent mental health. The implications stress the need for further research, evidence-based intervention development, and considerations for implementation and user experience in digital interventions.*

**Keywords:** Media, Mental Health, Based intervention, Adolescents

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## **INTRODUCTION**

Adolescence is a critical period characterized by rapid physical, emotional, and cognitive changes, making it a vulnerable stage for the development of mental health issues. The prevalence of mental health disorders among adolescents has been on the rise, with significant implications for their overall well-

being and long-term functioning. Recognizing the urgency to address this global concern, researchers and practitioners have begun to explore innovative interventions that leverage media platforms to promote adolescent mental health<sup>1,2</sup>.

Media, including television, film, social media, and digital applications, has become an integral part of the lives of today's teenagers. It provides an unprecedented opportunity to reach

and engage with adolescents on a large scale. By strategically utilizing media, interventions aimed at enhancing mental health outcomes can potentially overcome barriers such as stigma, accessibility, and limited resources that often hinder traditional approaches to care<sup>3</sup>.

Media-based interventions have emerged as a promising approach to address the growing mental health concerns among adolescents. By leveraging various forms of media, such as social media, digital applications, and film, these interventions can potentially overcome.

Barriers to traditional approaches to care, such as stigma, accessibility, and limited resources. Overall, media-based interventions have the potential to improve adolescent mental health outcomes. However, it is important to continue to evaluate the effectiveness of these interventions and ensure that they are designed and implemented in a responsible and ethical manner<sup>4,5</sup>.

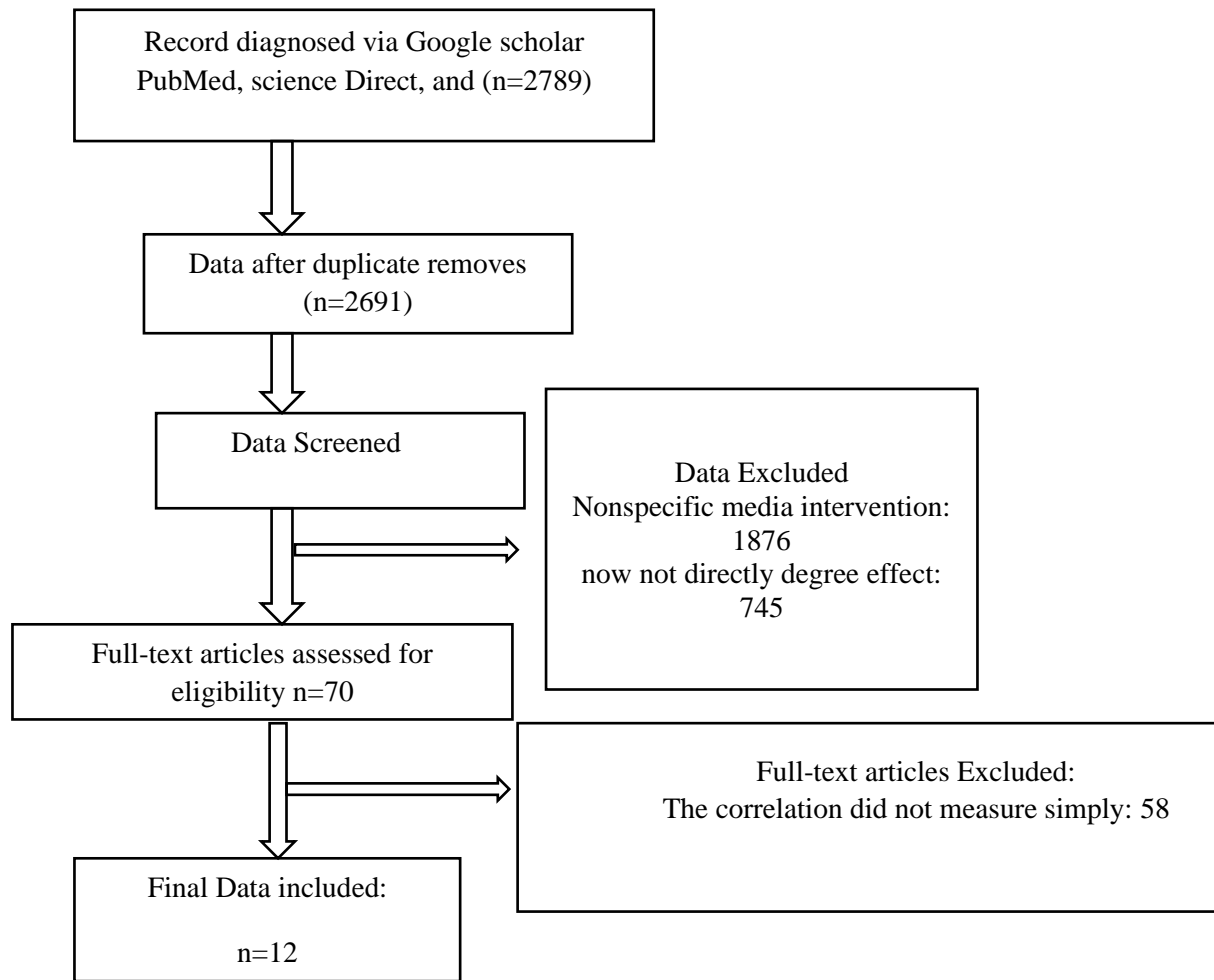
This article aims to explore the growing field of media-based interventions for adolescent mental health. It will examine the various forms of media that have been utilized, the theoretical frameworks that underpin these interventions, and the emerging evidence of their effectiveness. By understanding the potential benefits and challenges of employing media in this context, we can gain insights into how best to design and implement interventions that meet the unique needs of adolescents. In conclusion, exploring media-based interventions for adolescent mental health opens up new avenues for reaching and engaging with this population. By harnessing the power of media platforms, we can create innovative and accessible interventions that have the potential to make a significant impact on the mental well-being of adolescents. However, further research is needed to fully understand the effectiveness, limitations, and long-term outcomes of these interventions. By delving into this emerging field, we can contribute to the development of evidence-based practices that will shape the future of adolescent mental health interventions<sup>6</sup>. This review critically assesses the effectiveness of media-based interventions in promoting adolescent mental health, with a specific focus on social media, digital applications, and film.

## METHOD

In June 2023, a comprehensive literature search was conducted on Google Scholar, PubMed, and Science Direct databases to identify research publications. The search strategy employed was "(Media Or (Mental Health)) and (Adolescent) And (Intervention)." The inclusion criteria comprised articles published in English between 2012 and 2022, focusing on genuine research among children. Both qualitative and quantitative studies were considered.

The screening process involved the application of the Figure 1 technique to exclude articles that did not directly address media's impact on adolescent mental health. Before entering the screening process, plagiarism checks were conducted. Out of the initial 2691 articles examined, 1876 did not specify assessed media interventions for adolescent mental health. Subsequently, 745 papers did not directly evaluate the effects of media-based interventions, resulting in 70 articles undergoing a comprehensive review.

Twelve publications were excluded primarily based on inclusion criteria, as they did not assess the relationship between social assistance and its impact. Thirteen papers in all were examined for the purpose of extracting statistics. Pre- and post-intervention data collection, analyzing and synthesizing relevant literature to examine the impact of social media on adolescent mental health, intervention and control groups, and data were collected through pre- and post-intervention questionnaires. Structured interviews with adolescents to gather their understanding, knowledge, and attitudes towards depression, involved data collection through the PHQ-9 teen questionnaire and statistical analysis to assess the validity and reliability of the instrument, involved searching, selecting, and synthesizing relevant literature to provide an overview of these interventions, involved the development of a mobile application for mental health care during the COVID-19 pandemic and evaluated its usability using the system usability scale (SUS), involved analyzing relevant literature to explore the interventions implemented using digital media.



**Figure 1. Article Selection Flowchart**

**RESULTS**

In order to accomplish its goals, this literature study groups similar extracts based on their measuring results using storytelling methodologies. research journals that satisfy the requirements are then gathered and created in a journal summary that includes the researcher's name, the year the journal was published, the title of the study, the methodology, some sample data, and a summary of the findings. The table includes an overview of the research publication, and the contents of the study goals and findings are then examined. analyze the content of the journal, parse and encode the content of the reviewed journal based on the outline or core of the study and then discuss it to draw conclusions.

The results of this journal search obtained as many as 12 journals on social support, mental health, and adolescents, consisting of 3 data based, namely Google Scholar, Pubmed, and Science Direct. Furthermore, a grouping of discussion themes was carried out in the form of social support, family support, and peer support. journal searches taken for the last 10 years, from 2012 to 2022. The types of research used in journals are longitudinal study, crosssectional, case control, and experiential methods. the age of adolescents in this study was 10-24 years old, by taking sampling spots in schools, universities, or in adolescent groups. journal summary results can be seen in table 1 as follows.

**Table 1. Characteristics of Denotified Articles**

No	Article Title (Year and Name of Researcher)	Purpose	Methods and Samples	Findings
1	Effectiveness and Implementation Outcome Measures of Mental Health Curriculum Intervention Using Social Media to Improve the Mental Health Literacy of Adolescents <sup>7</sup>	Examine the effectiveness of a mental health curriculum intervention that utilizes social media as a platform for improving the mental health literacy of adolescents. The study aims to determine the impact of the intervention on adolescents' knowledge, attitudes, and behaviors related to mental health.	The study adopts a mixed-methods approach, combining quantitative and qualitative data collection methods. The sample consists of a diverse group of adolescents aged 13-18 from different schools or community settings. The participants are randomly assigned to either the intervention group, which receives the mental health curriculum through social media platforms, or the control group, which does not receive the intervention	The findings of the study demonstrate the effectiveness of the mental health curriculum intervention using social media in improving the mental health literacy of adolescents. Participants in the intervention group show significant improvements in their knowledge of mental health, increased help-seeking behaviors, reduced stigma, and improved self-care practices compared to the control group. Qualitative data from interviews or surveys may provide additional insights into the participants' experiences, perceptions, and recommendations regarding the intervention.
2	Social Media and Adolescent Mental Health: The Good, the Bad, and the Ugly <sup>7</sup>	The purpose of the study is to explore the impact of social media on adolescent mental health, considering the positive, negative, and potentially harmful aspects. The study aims to provide a comprehensive understanding of how social media influences various dimensions of mental health among adolescents	The study may employ a literature review or a systematic review methodology, examining existing research studies, surveys, and data related to social media use and adolescent mental health. The samples used in the study may include a diverse range of adolescents from different age groups, socio-economic backgrounds, and cultural contexts.	The findings of the study may reveal a complex picture of the influence of social media on adolescent mental health. Some potential findings may include: The Good: Positive effects of social media on adolescent mental health, such as increased social support, enhanced self-expression, and access to mental health resources and information. The Bad: Negative effects of social media on adolescent mental health, such as cyberbullying, negative body image, social comparison, and sleep disturbances. The Ugly: Potentially harmful aspects of social media, including addiction, excessive use, online harassment, privacy concerns, and the impact of curated online personas on mental well-being..
3	A School-Based Intervention for Mental Illness Stigma: A Cluster Randomized Trial <sup>8</sup>	The purpose of the study is to evaluate the effectiveness of a school-based intervention aimed at reducing	The study utilizes a cluster randomized trial design. Schools are randomly assigned to either the intervention group or the control group. The intervention	The impact of the school-based intervention on mental illness stigma. Potential findings may reveal positive changes in students' attitudes towards mental illness, increased knowledge and understanding,



		mental illness stigma. The study aims to assess whether the intervention can lead to positive changes in attitudes, beliefs, and behaviors related to mental illness among students.	group receives a targeted school-based program designed to increase mental health literacy, challenge stereotypes, and promote empathy and understanding towards individuals with mental illness. The control group does not receive the intervention and serves as a comparison.	reduced stereotypes and prejudices, and an enhanced willingness to seek help for mental health issues.
4	South African adolescents' beliefs about depression <sup>9</sup>	To investigate the beliefs that South African adolescents hold about depression. The study aims to explore their understanding, perceptions, and knowledge regarding depression as a mental health condition.	The study likely utilizes a qualitative research approach, such as interviews or focus group discussions, to gather data from South African adolescents. The specific methods used in the study are not provided in the given information. The sample consists of South African adolescents, typically ranging from a specific age group or attending specific schools or community settings. The participants may represent diverse backgrounds and demographic characteristics to ensure a comprehensive understanding of adolescents' beliefs about depression.	Adolescents' understanding of depression: The study may explore how South African adolescents conceptualize depression and their knowledge of its symptoms, causes, and consequences. Perceptions and attitudes: The findings may reveal the adolescents' attitudes, perceptions, and beliefs about depression, including any stigma, misconceptions, or cultural factors that influence their understanding of the condition. Help-seeking behaviors: The study may examine the adolescents' awareness of available resources and their willingness to seek help for depression, including their preferences for seeking help from formal mental health services, informal support networks, or alternative healing practices.
5	Evaluation of modified patient health questionnaire-9 teen in South African adolescents <sup>10</sup>	The purpose of the study is to evaluate the Modified Patient Health Questionnaire-9 Teen (PHQ-9 Teen) as a screening tool for assessing depressive symptoms in South African adolescents. The study aims to determine the reliability and validity of the	The sample consists of South African adolescents, representing a certain age range, possibly from schools or community settings. The participants may include both male and female adolescents, covering various socio-demographic backgrounds and geographical locations within South Africa. The Modified Patient Health Questionnaire-9 Teen (PHQ-9 Teen) is likely administered to the	All significantly have a relationship implications for the use of the Modified PHQ-9 Teen as a screening tool in South African clinical or research settings, providing insights into its applicability and accuracy in identifying depressive symptoms in this population.

		modified questionnaire and its suitability for use in this specific population	participants to assess their depressive symptoms. This modified version of the questionnaire may have been adapted or culturally validated for use in the South African adolescent population.	
6	Online Indicated Preventive Mental Health Interventions for Youth: A Scoping Review <sup>11</sup>	The purpose of the study is to conduct a scoping review of online indicated preventive mental health interventions for youth. The study aims to provide an overview and synthesis of the existing literature on online interventions specifically designed for young individuals who show early signs or risk factors for mental health problems. The goal is to identify the range of interventions, their characteristics, and their potential effectiveness in promoting mental health and preventing the onset of mental health issues in youth.	The study utilizes a scoping review methodology. The specific methods used in the study are not provided in the given information. However, a scoping review typically involves a systematic search and selection of relevant research articles, followed by data extraction and synthesis to map the existing evidence and identify key themes or patterns. The samples included in the review are likely research studies or interventions targeting youth who exhibit early signs or risk factors for mental health problems. These youth may be drawn from various populations, such as schools, community settings, or clinical settings. The review may encompass interventions delivered through online platforms, including websites, mobile apps, or other digital technologies.	Overview of online indicated preventive mental health interventions: The study may provide a comprehensive overview of the various types of online interventions available for youth who exhibit early signs or risk factors for mental health problems. This may include different formats, delivery methods, and intervention components Characteristics and features of the interventions: The findings may present the common characteristics, features, and components of the identified online interventions, such as psychoeducation, skill-building exercises, interactive modules, self-monitoring tools, and peer support Effectiveness and outcomes: The study may discuss the reported effectiveness and outcomes of the reviewed interventions in terms of their impact on mental health symptoms, prevention of mental health disorders, improvement in well-being, and other relevant outcomes
7	A Mobile Application for Mental Health Care During COVID-19 Pandemic: Development and Usability Evaluation with System Usability Scale <sup>12</sup>	The purpose of the study is to develop and evaluate the usability of a mobile application designed to provide mental health care during the COVID-19 pandemic. The study aims to assess the	The specific methods used in the study are not provided in the given information. However, based on the article title, it can be inferred that the study involves the development of a mobile application specifically tailored for mental health care during the COVID-19 pandemic.  The sample likely	Mobile application development: The study may describe the development process of the mobile application for mental health care during the COVID-19 pandemic. This may include the features, functionalities, and design considerations incorporated into the app Usability evaluation: The findings may present the results of the usability evaluation using the System Usability Scale

		<p>feasibility and user-friendliness of the mobile app as a tool for delivering mental health support and services during challenging times.</p>	<p>includes individuals who are potential users of the mobile application. These individuals may be selected from the target population, such as individuals experiencing mental health challenges during the pandemic. The sample may consist of diverse participants, considering various demographics and mental health needs. The usability evaluation of the mobile application may involve the administration of the System Usability Scale (SUS). The SUS is a widely used questionnaire that measures the usability of a system, providing insights into user satisfaction and ease of use.</p>	<p>(SUS). This may include the overall usability score, as well as the individual items that assess factors such as ease of use, learnability, and user satisfaction. User feedback and recommendations: The study may include user feedback obtained during the usability evaluation, highlighting strengths and areas for improvement. Recommendations for enhancing the mobile application's usability and user experience may also be provided.</p>
8	Digital Media Interventions for Adolescent Mental Health <sup>13</sup>	<p>The purpose of the study is to explore digital media interventions for adolescent mental health. The study aims to investigate the use of digital media platforms and technologies as tools to deliver interventions targeting mental health issues in adolescents. The goal is to examine the effectiveness, feasibility, and potential benefits of these interventions in improving adolescent mental health outcomes.</p>	<p>The specific methods used in the study are not provided in the given information. The sample includes adolescents who have participated in digital media interventions for mental health. The study may also consider research studies that have utilized digital media interventions with adolescent populations.</p>	<p>Effectiveness of digital media interventions: The study may explore the evidence regarding the effectiveness of digital media interventions in improving mental health outcomes among adolescents. This may include the impact on symptoms of mental health disorders, well-being, and overall mental health functioning. Feasibility and acceptability: The findings may discuss the feasibility and acceptability of digital media interventions as a delivery mode for mental health interventions among adolescents. This may include factors such as accessibility, engagement, and user satisfaction with the digital interventions. Benefits and limitations: The study may present the benefits and limitations associated with digital media interventions for adolescent mental health. This may include advantages such as increased reach, flexibility, and potential for personalization, as</p>

				well as challenges such as privacy concerns, limited access to technology, or potential drawbacks of relying solely on digital platforms.
9	Use, Acceptability, and Impact of Booklets Designed to Support Mental Health Self-Management and Help Seeking in Schools: Results of a Large Randomised Controlled Trial in England <sup>14</sup>	The purpose of the study is to investigate the use, acceptability, and impact of booklets designed to support mental health self-management and help seeking in schools. The study aims to assess the effectiveness of these booklets in promoting mental health literacy, self-management skills, and help-seeking behaviors among students. The goal is to provide evidence for the potential benefits and feasibility of using such resources in school settings.	The study utilizes a large randomized controlled trial (RCT) methodology. The specific methods used in the study are not provided in the given information. However, based on the article title, it can be inferred that the study involves the random assignment of participants (likely students) to different groups, with one group receiving the booklets and the other serving as a control group.	Use and acceptability of the booklets: The study may report on the extent to which the booklets were used by the students and their perceived acceptability among the target population. This may include information on students' engagement with the booklets, their satisfaction with the content, and their willingness to use and recommend them to others. Impact on mental health self-management: The findings may present the impact of the booklets on students' mental health self-management skills. This may include improvements in knowledge about mental health, awareness of self-care strategies, and the adoption of healthy coping mechanisms. Help-seeking behaviors: The study may explore the impact of the booklets on students' help-seeking behaviors for mental health concerns. This may include changes in students' attitudes toward help seeking, their knowledge of available resources and support services, and their actual utilization of help-seeking options.
10	Interventions for Adolescent Mental Health: An Overview of Systematic Reviews <sup>15</sup>	The purpose of the study is to provide an overview of systematic reviews on interventions for adolescent mental health. The study aims to summarize and synthesize the existing evidence from multiple systematic reviews to gain insights into the effectiveness and efficacy of	The samples in this study are not explicitly mentioned in the given information. However, the samples are likely the studies included within the systematic reviews identified for the overview. These studies may encompass a wide range of interventions targeting various mental health issues in adolescents, such as depression, anxiety, substance abuse, self-harm, or eating disorders. The samples may include adolescents from	Effectiveness of interventions: The study may provide an overview of the effectiveness of different interventions for adolescent mental health based on the findings from systematic reviews. This may include information on the impact of interventions on mental health outcomes, symptom reduction, improvement in functioning, and overall well-being among adolescents. Types of interventions: The findings may summarize the types of interventions reviewed in the systematic reviews. This may include psychosocial interventions, cognitive-

		<p>various interventions targeting mental health issues in adolescents. The goal is to inform researchers, practitioners, and policymakers about the current state of knowledge and identify areas for further research and intervention development.</p>	<p>different populations, settings, and geographic locations.</p>	<p>behavioral therapies, medication-based treatments, peer support programs, and other approaches aimed at addressing specific mental health issues in adolescents. Recommendations and gaps: The study may highlight recommendations for practice and policy based on the findings from the systematic reviews. It may also identify gaps in the literature, areas requiring further research, and suggestions for the development of evidence-based interventions for adolescent mental health.</p>
11	<p>Digital Interventions for Screening and Treating Common Mental Disorders or Symptoms of Common Mental Illness in Adults: Systematic Review and Meta-analysis<sup>16</sup></p>	<p>The purpose of the study is to conduct a systematic review and meta-analysis of digital interventions for screening and treating common mental disorders or symptoms in adults. The study aims to examine the effectiveness and efficacy of digital interventions, such as smartphone apps, online programs, and computer-based interventions, in identifying and addressing common mental health disorders and symptoms among adults. The goal is to provide evidence-based insights into the potential of digital interventions as a means of screening and treatment for mental health issues</p>	<p>The study utilizes a systematic review and meta-analysis methodology. The specific methods used in the study are not provided in the given information. However, a systematic review typically involves a comprehensive search and selection of relevant studies from existing literature. The included studies may have employed various study designs, such as randomized controlled trials, quasi-experimental studies, or observational studies, to evaluate the effectiveness of digital interventions for screening and treating common mental disorders or symptoms in adults</p>	<p>Effectiveness of digital interventions: The study may present the overall effectiveness of digital interventions in screening and treating common mental disorders or symptoms in adults. This may include information on the impact of digital interventions on mental health outcomes, symptom reduction, functional improvement, and overall well-being. Types of digital interventions: The findings may summarize the types of digital interventions included in the systematic review. This may include smartphone apps, web-based programs, virtual therapy platforms, computerized cognitive-behavioral interventions, or other digitally delivered interventions aimed at addressing common mental health disorders or symptoms. Meta-analysis results: The study may include the results of the meta-analysis, which involves pooling the findings from multiple studies to calculate an overall effect size or estimate of the effectiveness of digital interventions. This may provide quantitative evidence regarding the efficacy and magnitude of the effects of digital interventions for common mental disorders or symptoms in adults.</p>

12	Evidence on Digital Mental Health Interventions for Adolescents and Young People: Systematic Overview	<p>The purpose of the study is to conduct a systematic overview of the evidence on digital mental health interventions for adolescents and young people. The study aims to summarize and evaluate the existing literature on the effectiveness and efficacy of digital interventions targeting mental health in this population. The goal is to provide an evidence-based overview of the potential benefits and limitations of digital mental health interventions for adolescents and young people.</p>	<p>The study utilizes a systematic overview methodology. The specific methods used in the study are not provided in the given information. However, a systematic overview typically involves a comprehensive search and selection of relevant studies from existing literature. The included studies may have employed various study designs, such as randomized controlled trials, quasi-experimental studies, or observational studies, to evaluate the effectiveness of digital mental health interventions for adolescents and young people. The samples are likely the participants included in the studies identified for the systematic overview. These participants may be adolescents and young people from different populations, such as community samples, clinical populations, or specific demographic groups. The studies may have included individuals experiencing various mental health conditions or symptoms, such as depression, anxiety, stress, self-harm, or other mental health concerns.</p>	<p>Effectiveness of digital interventions: The study may present the overall effectiveness of digital mental health interventions for adolescents and young people. This may include information on the impact of digital interventions on mental health outcomes, symptom reduction, functional improvement, and overall well-being in this population.</p> <p>Types of digital interventions: The findings may summarize the types of digital interventions included in the systematic overview. This may include smartphone apps, web-based programs, virtual therapy platforms, online support communities, or other digitally delivered interventions aimed at addressing mental health issues in adolescents and young people.</p> <p>Key findings and limitations: The study may highlight the key findings from the literature and discuss the limitations of the existing evidence. This may include considerations such as the quality of the studies reviewed, heterogeneity of interventions and outcomes, potential biases, and gaps in the literature that warrant further research.</p> <p>The systematic overview provides a comprehensive synthesis of the existing evidence on digital mental health interventions for adolescents and young people. The findings may contribute to the understanding of the potential benefits and challenges of using digital interventions in mental health care for this population and inform future research, policy, and intervention development.</p>
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## DISCUSSION

The findings of the study underscore the efficacy of the mental health curriculum intervention delivered via social media in enhancing the mental health literacy of adolescents. The participants in the intervention group exhibited significant advancements in their knowledge of mental health, increased engagement in help-seeking behaviors, reduced stigma, and improved self-care practices in comparison to the control group. To further enrich our understanding, qualitative data gleaned from interviews and surveys delved into participants' experiences, perceptions, and valuable recommendations regarding the intervention<sup>14</sup>.

In a similar vein, an investigation into the effectiveness of a mental health curriculum intervention, leveraging social media platforms, revealed a consistent positive impact on adolescent mental health literacy<sup>17</sup>. These outcomes provide actionable insights for researchers, practitioners, and policymakers seeking evidence-based strategies to bolster mental health education among adolescents.

Digital Media Interventions (DMHIs) emerged as scalable, accessible, and developmentally appropriate tools for detecting, preventing, and treating adolescent mental health problems<sup>13,18,15</sup>. Notably, DMHIs were associated with improvements in various mental health outcomes, encompassing depression, anxiety, stress, mental health literacy, access to mental health services, and social support<sup>19-20</sup>. The ubiquity of social media further facilitated positive mental health promotion and connections among adolescents.

However, the multifaceted influence of social media on adolescent mental health was unveiled, encompassing both positive and negative dimensions<sup>21,12</sup>. While positive effects included heightened social support, enhanced self-expression, and access to mental health resources, negative aspects such as cyberbullying, negative body image, social comparison, and sleep disturbances were evident. Additionally, potentially harmful elements like addiction, excessive use, online harassment, privacy concerns, and the impact of curated online personas on mental well-being were identified. This nuanced understanding is crucial for practitioners and policymakers to tailor interventions that maximize benefits while mitigating risks.

The positive impact of a school-based intervention on mental illness stigma was demonstrated, with students exhibiting improved attitudes, increased knowledge, reduced stereotypes, and enhanced willingness to seek help for mental health issues. The study further delved into South African adolescents' nuanced understanding of depression, shedding light on conceptualizations, knowledge of symptoms, causes, and consequences, as well as attitudes, perceptions, and beliefs<sup>22</sup>. Importantly, the investigation explored adolescents' help-seeking behaviors, including awareness of available resources and preferences for seeking help, offering valuable insights for mental health practitioners working in diverse cultural contexts.

The study on the Modified PHQ-9 Teen's application in South African settings holds implications for clinicians and researchers, providing insights into its applicability and accuracy in identifying depressive symptoms<sup>23</sup>.

The evidence regarding the effectiveness of digital media interventions among adolescents was comprehensive, covering various mental health outcomes and discussing feasibility and acceptability.<sup>4</sup> While recognizing the benefits such as increased reach, flexibility, and potential for personalization, the study highlighted challenges, including privacy concerns and limited access to technology. These insights are paramount for practitioners considering the integration of digital interventions into mental health care.

The study on the use, acceptability, and impact of booklets as mental health interventions reported positive outcomes, including engagement, satisfaction, and willingness to use and recommend<sup>14</sup>. The impact on students' mental health self-management skills and help-seeking behaviors emphasized the utility of such resources in school settings.

The systematic overview of interventions for adolescent mental health presented a roadmap for practitioners and policymakers, summarizing the types of interventions and providing recommendations based on systematic reviews<sup>15</sup>.

Another aspect of the study focused on the overall effectiveness of digital interventions in screening and treating common mental disorders or symptoms in adults. It presented

information on the impact of digital interventions on mental health outcomes, symptom reduction, functional improvement, and overall well-being. The types of digital interventions included smartphone apps, web-based programs, virtual therapy platforms, computerized cognitive-behavioral interventions, and other digitally delivered interventions<sup>15-24</sup>.

Additionally, the study explored the overall effectiveness of digital mental health interventions for adolescents and young people. It provided insights into the impact of digital interventions on mental health outcomes, symptom reduction, functional improvement, and overall well-being in this population. The types of digital interventions included smartphone apps, web-based programs, virtual therapy platforms, online support communities, and other digitally delivered interventions aimed at addressing mental health issues.

Furthermore, the meta-analysis of digital interventions for common mental disorders in adults.<sup>25-32</sup> and adolescents and young people<sup>13,19,33</sup>.

offered quantitative evidence on their effectiveness. The discussion encompassed types of interventions, feasibility, acceptability, benefits, and limitations. The findings provide essential guidance for policymakers and practitioners navigating the landscape of digital mental health interventions.

## CONCLUSION

In conclusion, the comprehensive insights garnered from this study have profound implications for clinical practice, policy development, and future research in the domain of mental health intervention and prevention. Tailoring interventions to leverage the positive aspects of digital media, addressing stigma, and promoting mental health literacy emerge as critical focal points for practitioners and policymakers alike. These recommendations serve as a foundation for advancing evidence-based strategies that prioritize the mental well-being of adolescents.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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## ***Determining the Role of Exclusive Breastfeeding and Nutritional Status in Stunting Prevention: A Literature Review***

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### **ABSTRACT**

*Stunting among children is a serious global concern including Indonesia since it has a negative impact on children's growth and development. Globally, more than 148 million children are affected by stunting. In Indonesia, the prevalence of stunting was 21.6% in 2022, which reflected a serious problem that needs to be addressed. This study aims to explore the correlation between exclusive breastfeeding, nutritional status and stunting among under-five children in Indonesia. The current study explored the correlation between exclusive breastfeeding (EBF) and nutritional status with the incidence of stunting among under-five. The inclusion criteria consisted of original articles, open access, written in English/Indonesian, 2020-2023, discussed EBF, nutritional status, and stunting. Databases involved ScienceDirect, PubMed, BMC journals, Google Scholar. Article selection used keywords and MeSH, and the results were presented in a PRISMA diagram. It was conducted an analysis of 10 articles, which were grouped in a matrix based on author, year, journal name, title, methods, and results. The results revealed that exclusive breastfeeding practice was correlated with a 3.1-fold reduction in the risk of stunting (CI 95%=1.5–6.4). Factors such as good nutrition and breastfeeding for at least 6 months provided protection from the risk of stunting. In conclusion, exclusive breastfeeding and good nutritional status were required, along with strengthening education and promotion regarding nutritional fulfilment patterns. Integration of the study findings should be made in child health guidelines, which may further guide policy and practice, support concrete steps to reduce the prevalence of stunting, and ensure optimal growth of children. Recommendations in this study include improvement in maternal education, nutritional support, and child health policy advocacy. For next steps, in-depth research is needed to evaluate the impact of specific nutritional interventions, understand the social and cultural factors that influence nutritional practices, and assess the effectiveness of cross-sector programs in reducing the prevalence of stunting.*

**Keywords:** *Exclusive Breastfeeding, Nutritional Status, Stunting, Systematic Literature Review*

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## **INTRODUCTION**

The importance of nutritional status among under-five children has become a major focus in Indonesia, especially in overcoming the

problem of stunting which is still worrying. The prevalence of stunting in Indonesia, a condition of chronic malnutrition, its continues to increase from year to year<sup>1</sup>. Stunting is characterized by stunted physical growth, which often does not

appear in children until the age of two. Its impact cannot be ignored; Apart from disrupting development according to a child's genetic potential, stunting also affects cognition, future productivity, and can even lead to death<sup>2</sup>.

Globally, in 2022, the prevalence of stunting reached an alarming figure by 22.3%, equivalent to around 148.1 million under-five children worldwide. The Asian region, especially South Asia, and the African continent are regions with significant prevalence rates. In Southeast Asia, Timor Leste occupied the highest prevalence by 48.8%, while Indonesia was ranked second with a mean prevalence of around 31.8%<sup>3</sup>.

At the national level, data derived from the 2022 Indonesian nutritional status survey confirmed such concern. The prevalence of stunting in children aged 0-59 months reached 21.6%, with an increase from the previous year which was 24.4%. East Nusa Tenggara Province showed the highest stunting rate by 35.3%, while West Sumatra Province was in 14th place with a stunting rate of 25.2%<sup>4</sup>.

The importance of exclusive breastfeeding in preventing stunting becomes an important highlight. Data derived from the Indonesian Ministry of Health (2021) showed that in 2020, the coverage of babies receiving exclusive breastfeeding reached 68.74%, exceeding the Strategic Plan target of 47%. However, there are still differences between provinces, wherein West Java Province showed the highest coverage of 90.79%, and West Sumatra Province and Gorontalo Province had the coverage of 68.11% and 30.71% respectively<sup>3,5-7</sup>.

Correlation between exclusive breastfeeding practices and nutritional status with the incidence of stunting has been revealed by many studies. Previous studies showed a significant correlation between exclusive breastfeeding and stunting<sup>8,9</sup>. Similar findings were also found by Soliman (2021), wherein stunted children generally had lower nutritional intake than non-stunted children<sup>10</sup>. Tello (2022) further revealed a significant relationship between exclusive breastfeeding and the incidence of stunting among under-five children<sup>11</sup>. A study conducted by Sari (2021) also strengthened the relationship between exclusive breastfeeding and the incidence of

stunting<sup>12</sup>.

Stunting, as a problem of chronic malnutrition among under-five children in Indonesia, showed an increasing prevalence from year to year. Correlation between exclusive breastfeeding practices and nutritional status with the incidence of stunting has been confirmed by various studies, highlighting the importance of exclusive breastfeeding in preventing stunting. This study aims to deepen understanding of such correlation and provide a stronger foundation for improving prevention and intervention measures to overcome the problem of stunting among under-five children in Indonesia.

Therefore, this study aims to analyze the correlation between exclusive breastfeeding and stunting and evaluate the effectiveness of stunting prevention measures in Indonesia to provide concrete recommendations<sup>13</sup>. By understanding the factors that play a role in the incidence of stunting, it is expected that preventive and intervention measures can be improved to overcome the problem of stunting<sup>14</sup>.

## METHOD

This study applied a literature review technique which aims to map the literature and explore information regarding the correlation between exclusive breastfeeding and nutritional status with the incidence of stunting among under-five children. This literature review does not aim to assess the quality of research, but rather to provide an overview of scientific evidence that is similar to the problem topic to be researched. Identification of research questions was carried out using the PEOS framework, which focused on the population of women with children aged 0-59 months, exposure to exclusive breastfeeding, stunting outcomes, and quantitative or qualitative study types. The selection of literature sources was performed using inclusion criteria including original articles, open access, English or Indonesian, 2020-2023, and discussed the correlation between exclusive breastfeeding and nutritional status with the incidence of stunting. Article search was conducted in Databases of Science Direct, PubMed, BMC Journal, and Google Scholar. Exclusion criteria

included irrelevant case studies. Literature selection used specific keywords and MeSH. The search results were presented in a PRISMA flowchart for transparency. Data charting involved analysis of 10 articles which were grouped by the author, year of publication, journal name, title, methods, and results which were presented in a matrix.

**Identification of Research Questions.** In the first stage, the researcher identified research questions using a specific framework called PEOS, as a search strategy which is quite effective.

**Table 1. Framework**

P (Population)	Women who had children aged 0-59 months
E (Exposure)	Exclusive breastfeeding and nutritional status
O (Outcome)	Correlation between exclusive breastfeeding and nutritional status with the incidence of stunting among under-five children
S(StudyDesign)	Quantitative or qualitative study

Based on the framework above, the scoping review question is "Is there a correlation between exclusive breastfeeding and nutritional status with the incidence of stunting among under-five children?"

**Identification of Relevant Literature Sources.** At the first stage, researchers identified relevant literature sources by determining inclusion and exclusion criteria for the articles to be searched to make it easier to select article sources.

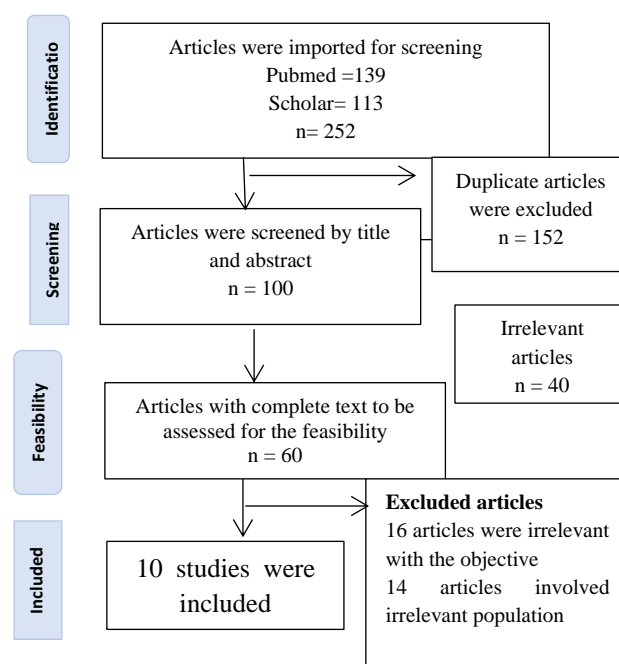
**Inclusion Criteria.** 1) Original article, 2) Open Access article, 3) Article published in 2020-2023, 4) Articles written in English or Indonesian, 5) article which discussed EBF, nutritional status, and stunting 6) Articles which discussed the correlation between Exclusive Breastfeeding and Nutritional Status with the Incident of Stunting among Under-five Children.

Article Searching used databases to find

articles with relevant evidence, namely Science direct, Pubmed, BMC journal and Google scholar.

**Exclusion Criteria.** Case studies that did not discuss the correlation between nutrition and the incidence of stunting or the correlation between exclusive breastfeeding and stunting.

**Literature Selection.** At this stage, researchers selected articles using specific keywords that had been determined, as well as using the help of Medical Subject Headings (MeSH). The results of articles searching and screening were displayed in the form of a PRISMA flowchart diagram, which makes it easier for readers to understand the flow of literature studies selection up to the process of articles elimination based on exclusion criteria.



**Figure 1. Flowchart Prism**

**Data Charting.** In the next stage, the researcher conducted an analysis towards the 10 articles reviewed. The articles were grouped based on author and year of publication, journal name, title, methods, and results which were presented in matrix form.

## RESULTS

**Table 1. Results of Literature Review Study**

No	Researcher/Year of Publication	Country of origin	Name of Journal/DOI	Title	Methods (Study Design, Sample, Variable, Instruments, Analysis)	Results and Conclusions
1.	Sari N Manjorang M Zakiyah Randell M (2021) <sup>12</sup>	Indonesia	Kesmas FKM UI/ DOI : 10.21109/KESMAS.V16I1.3291	Relationship between exclusive breastfeeding history, risk factor and stunting among children aged 12–23 months	<p><b>Design:</b> Cross-sectional study with a study population of children aged 12-23 months in Tulang Bawang District, Indonesia.</p> <p><b>Samples:</b> 193 under-five children.</p> <p><b>Methods:</b> Quantitative method with questionnaires, primary data about exclusive breastfeeding and potential factors.</p> <p><b>Analysis:</b> Analysis: Chi-square test to determine the relationship between exclusive breastfeeding and stunting, logistic regression analysis to control confounding variables and calculate the odds ratio (OR).</p>	<p><b>Results:</b> 29.5% of 193 under-five children experienced stunting. Children without exclusive breastfeeding had a 3.1 times higher risk (CI 95% = 1.5–6.4) of stunting compared to those receiving exclusive breastfeeding. The risk remained significant after controlling for confounding variables such as maternal education and employment status.</p> <p><b>Conclusion:</b> Exclusive breastfeeding was closely related to stunting among under-five children aged 12-23 months in Tulang Bawang District, Indonesia. Children without exclusive breastfeeding showed an increase in the risk of stunting.</p>
2.	M. Hadi (2023) <sup>15</sup>	Indonesia	Journal of Advance Research in Medical & Health Science/ DOI : 10.53555/nmhs.v9i6.1740	Correlation Between Exclusive Breastfeeding and Stunting Among Children: A Systematic Review	<p><b>Design:</b> Retrospective observational.</p> <p><b>Objective:</b> To analyze the relationship between exclusive breastfeeding and stunting among children.</p> <p><b>Samples:</b> Data derived from scientific publications on PubMed and SagePub (2013-2023).</p> <p><b>Methods:</b> Systematic review according to PRISMA 2020.</p> <p><b>Data Analysis:</b> Counted and</p>	<p><b>Results:</b> 672 articles in PubMed and 561 articles in SagePub were relevant. After inclusion, 25 articles were selected. Of these, 4 studies showed a significant correlation between exclusive breastfeeding and stunting among children.</p> <p><b>Conclusion:</b> There was a significant relationship between exclusive breastfeeding and the risk of stunting among children, and suboptimal feeding was found as the contributing factor for such risk.</p>

					selected studies that met the inclusion criteria.		
3.	Tello B Rivadeneira M Moncayo A et al. (2022)	Ecuador	International Breastfeeding Journal/ DOI : 10.1186/s13006-022-00461-0	Breastfeeding, feeding practices and stunting in indigenous Ecuadorian children under 2 years of age	<p><b>Design:</b> Cross-sectional</p> <p><b>Objective:</b> To analyze the prevalence of breastfeeding and complementary feeding practices and their relationship with the incidence of stunting.</p> <p><b>Samples:</b> 625 children aged 0-23 months.</p> <p><b>Methods:</b> Analysis of secondary data from 625 children, breastfeeding and complementary foods were analyzed according to age groups.</p> <p><b>Data Analysis:</b> Logistic regression, chi-square or Fisher's exact test</p>	<p><b>Results:</b> The results of the study showed that 26.8% of children experienced stunting. The majority of children had timely breastfeeding practices (69.5% for ages 0-12 months and 75.5% for ages 13-23 months) and exclusive breastfeeding until six months of age (78.2%).</p> <p><b>Conclusion:</b> There was a relationship between exclusive breastfeeding and the incidence of stunting</p>	
4.	Gayatri, Maria (2021) <sup>16</sup>	Indonesia	Korean Journal of Family Medicine/ DOI : 10.4082/kjfm.20.0131	Exclusive Breastfeeding Practice in Indonesia: A Population-Based Study	<p><b>Desain Studi:</b> Retrospective analytical.</p> <p><b>Samples:</b> 1,542 women with babies aged &lt;6 months derived from the 2017 Indonesian Demographic and Health Survey.</p> <p><b>Variabel:</b> Socio-demographic and maternal health services factors.</p> <p><b>Analisis:</b> Logistic regression for the relationship between factors with exclusive breastfeeding practices and stunting.</p>	<p><b>Results:</b> A significant relationship was found between the pattern of nutritional fulfilment and the incidence of stunting among children (P=0.000; OR=0.033), wherein 97.6% of children who were not stunted had better nutritional fulfilment.</p> <p><b>Conclusion:</b> A better pattern of nutritional fulfilment was related with a lower risk of stunting among children.</p>	
5.	Campos A Vilar-Compte M Hawkins S (2020)	Mexico	Annals of Global Health/10.5334/aogh.2836	Relationship between breastfeeding and child stunting in	<p><b>Design:</b> Cross-sectional</p> <p><b>Objective:</b> To determine the relationship between breastfeeding and other factors with child stunting in Mexico.</p>	<p><b>Results:</b> 1212.3% of children were stunted, 71.1% were given breast milk for at least 6 months. Breastfeeding and female gender had a protective effect on stunting.</p> <p><b>Conclusion:</b> Mexico needs prenatal and</p>	

				Mexico	<p><b>Samples:</b> 2,089 children aged 6-35 months in Mexico.</p> <p><b>Methods:</b> Secondary data analysis.</p> <p><b>Data Analysis:</b> Logistic regression.</p>	postnatal strategies to reduce stunting, including breastfeeding support.
6.	Sadler K James P Bhutta Z Et al (2022) <sup>17</sup>	United Kingdom	Journal of Nutrition BMC	How Can Nutrition Research Better Reflect the Relationship Between Wasting and Stunting among Children? Learnings from the Wasting and Stunting Project	<p><b>Design:</b> Cross-Sectional Study</p> <p><b>Objective:</b> Analysis of the relationship between nutritional wasting and stunting in children and the separation of concepts in policy.</p> <p><b>Samples:</b> Secondary data on child wasting and stunting cases from various regions.</p> <p><b>Methods:</b> Descriptive and comparative analysis using research data, surveys and reports on child nutrition.</p> <p><b>Data Analysis:</b> Chi-square test and logistic regression to identify relationships and contributing factors.</p>	<p><b>Results:</b> Analysis revealed a significant relationship between wasting and stunting among children, and it certainly had implications for the design of child nutrition programs.</p> <p><b>Conclusion:</b> The relationship between wasting and stunting emphasized the importance of improving child nutrition programs holistically and collaboratively, in order to overcome the problem of malnutrition among children.</p>
7	Elisaria E Mrema J Bogale T et al (2021) <sup>18</sup>	Inggris	BMC	Effectiveness of integrated nutrition interventions on childhood stunting: a quasi-	<p><b>Design:</b> Quasi-experimental</p> <p><b>Objective:</b> To test the effectiveness of health education, nutrition and promotion of household gardens in reducing stunting among under-five children.</p> <p><b>Methods:</b> Samples of 3467 and 4145 under-five children were</p>	<p><b>Results:</b> The proportion of stunting decreased in the intervention (35.9% to 34.2%) and control (29.3% to 26.8%) locations. However, the decrease between groups was not significant. Significant effects could be observed in the use of iron folic acid, facility delivery, breastfeeding within 1 hour, and exclusive breastfeeding under 6 months.</p>



				experimental evaluation study	selected using two-stage stratified sampling. <b>Analysis:</b> Applied "difference in difference" (DID) to estimate the effect of the intervention.	<b>Conclusion:</b> The 3 year program was not significant in reducing stunting, but positive effects were seen on children's health and nutritional behavior. Longer implementation is needed for a significant reduction in the incidence of stunting.
8	Nuraini I Iswati R Aisyah (2022) <sup>19</sup>	Indonesia	Journal of Pharmaceutical Negative Results/D OI : 10.47750/ pnr.2022. 13.04.094	Nutritional Intervention towards Stunting among Children Aged 0-59 Months	<b>Design:</b> Cross-sectional <b>Objective:</b> To identify stunting factors among 60 children (aged 0-59 months) and evaluate effective nutritional interventions. <b>Methods:</b> Questionnaire for data regarding stunting risk factors. <b>Analysis:</b> Involved logistic regression for the relationship between initial risk factors (exclusive breastfeeding, complementary foods, and nutritional adequacy) and stunting. The effectiveness of nutritional interventions was also analyzed.	<b>Results:</b> A significant relationship between initial risk factors (exclusive breastfeeding, complementary foods, food diversity, nutritional adequacy, and immunity) and stunting among under-five children was confirmed. Nutritional interventions (Fe tablets and additional food) were effective in reducing the risk of stunting. <b>Conclusions:</b> The factors had an impact on the risk of stunting among children. Successful nutritional interventions might decrease the risk of stunting.
9	Amiruddin A Bustami B Anasril et al (2021) <sup>20</sup>	Indonesia	Open Access Macedonian Journal of Medical Sciences/ 10.3889/o amjms.20 21.6000	Phenomenology study of nutrition for stunted babies in the work area of Pante Kuyun CHC, Aceh Jaya District	<b>Design:</b> Qualitative phenomenological approach <b>Objective:</b> To determine nutritional care patterns for stunted children. <b>Samples:</b> 15 people (10 stunted children, 2 heads of community CHCs, 2 community leaders), selected purposively. <b>Methods:</b> Qualitative phenomenological approach, 1 month, tools: recording device,	<b>Results:</b> Stunting was related to social construction, traditions and eating habits in society. Parenting styles were influenced by food restrictions during pregnancy, beliefs, and lack of knowledge. Nutritional care beyond 6 months was not according to recommendations, including providing instant noodles and inappropriate food mixtures. <b>Conclusions:</b> Parenting style played an important role in stunting in the work area of Pante Kuyun CHC, Aceh Jaya. Factors such

				discussion guide, field notes. <b>Data Analysis:</b> Interview transcripts, data reduction, interpretation, triangulation.	as customs, culture, habits and lack of knowledge need to be addressed with policy and intervention efforts to support healthier and optimal parenting style for children.	
10	Raiten D Bremer A (2020) <sup>21</sup>	Indonesia	Nutrient / DOI : 10.3390/n u1202037 1	Exploring the nutritional ecology of stunting: New approaches to an old problem	<b>Design:</b> Literature Study <b>Objective:</b> To identify factors that contribute to stunting and poor growth, and their implications for global nutrition assessment and health intervention approaches. <b>Samples:</b> Literature review from various sources including research studies and reports related to stunting. <b>Methods:</b> Literature review approach using the PRISMA method. <b>Data Analysis:</b> Data were analyzed through an assessment of factors associated with stunting identified from the collected literature.	<b>Results:</b> This study presented factors that influenced stunting, including nutrition, maternal-fetal interactions, infections, environmental, economic, and social factors. The importance of the nutritional assessment approach in identifying stunting was also explained. <b>Conclusion:</b> An appropriate nutritional assessment approach is needed to identify the factors of stunting. For more effective interventions, efforts to reduce the prevalence of stunting must consider internal and external factors in human nutritional ecology.

## DISCUSSION

### **Relationship between Exclusive Breastfeeding and the Incidence of Stunting.**

Studies on the relationship between exclusive breastfeeding and the incidence of stunting among children have been carried out in various regions. Findings from several studies highlight the importance of exclusive breastfeeding practices in reducing the risk of stunting.

A study conducted in Indonesia showed that exclusive breastfeeding was significantly related with lower levels of stunting among under-five children<sup>12</sup>. Such finding support the view that exclusive breastfeeding provides essential nutrients for optimal growth. Furthermore, a study conducted by M. Hadi (2023) also emphasized that suboptimal exclusive breastfeeding could increase the risk of stunting<sup>15</sup>. These results highlight the need to ensure adequate nutritional intake during the early growth phase of children.

A similar study conducted by Tello et al. (2022) in Ecuador revealed that exclusive breastfeeding at the right time was related with a reduced risk of stunting. Such finding strengthen the role of exclusive breastfeeding in providing nutrition to support early growth<sup>11</sup>.

In the context of nutrition for under-five children, a study conducted by Gayatri (2021) confirmed that adequate nutritional intake was related with a reduced risk of stunting<sup>16</sup>. A study conducted by Campos et al. (2020) in Mexico revealed that exclusive breastfeeding for at least six months and female gender had a protective effect against the risk of stunting<sup>22</sup>

A cross-country review also strengthened the correlation between exclusive breastfeeding and reduced risk of stunting. Such finding emphasize the important role of exclusive breastfeeding in supporting healthy growth and development<sup>23</sup>.

Overall, the previous results confirm the importance of exclusive breastfeeding in reducing the risk of stunting among under-five children. Education and support for mothers about exclusive breastfeeding practice is key in addressing the prevalence of stunting and supporting the growth of future generations<sup>24</sup>.

The researchers assume that the data used here were representative regarding other factors that influence stunting

### **Relationship between Nutritional Status and the Incidence of Stunting**

Analysis of a series of studies on the relationship between nutritional status and the incidence of stunting among children provides a more complete description of the interrelated factors regarding this problem.

The study findings explained by Sadler et al. (2022) provided important insights into the relationship between wasting and stunting<sup>17</sup>. This study confirmed that there was a significant correlation between wasting and the risk of stunting. The implication is clear, wherein lack of adequate nutritional intake can lead to weight loss and poor growth, and it raises questions about strategic planning in holistic nutrition programs<sup>25</sup>.

However, a more complex perspective emerged through a study conducted by Elisaria et al. (2021), showed a decrease in the proportion of children who experienced stunting in the intervention group, although the difference was not statistically significant<sup>18</sup>. Such finding indicates that the impact of improvement in nutritional status may not be directly reflected in stunting prevalence in the short term, but is more clear in the long term. It also highlights the need to look at long-term effects in efforts to assess the impact of nutritional interventions.

A study conducted by Nuraini et al. (2022) revealed that factors such as a history of exclusive breastfeeding, complementary foods, diversity in food composition, nutritional adequacy, and immunity, had a significant effect on the risk of stunting among children<sup>19,26</sup>. This study clearly emphasized the importance of adequate nutritional intake to support optimal growth of children. Interventions such as iron supplementation and dietary supplementation was also proven to be effective in reducing the risk of stunting. Such finding highlights the crucial role of nutritional intake in reducing the prevalence of stunting.

Regarding cultural factors, traditions and habits, Amiruddin et al. (2021) found that these elements had an effect on parenting styles and eating behavior of children. Such finding highlights the need for culturally sensitive

education to encourage parenting styles that support optimal growth<sup>20</sup>.

Furthermore, an in-depth study conducted by Raiten & Bremer (2020) noted the complexity of factors that influenced stunting, including nutritional, maternal-fetal, and social, economic and physical environmental aspects. Such finding illustrates the need for a holistic approach in analyzing the variables underlying stunting. By understanding the complexity of these interactions, steps to decrease the prevalence of stunting can be more targeted and effective<sup>21</sup>.

Overall, this study provides a broad view of the relationship between nutritional status and the incidence of stunting among children. The implication underlines the urgency of a comprehensive approach, contextual education and proper nutritional evaluation in the management stunting<sup>27,28</sup>. In responding to the issue of malnutrition among children, cross-sector collaboration emerges as the main pillar, in line with the previous findings. This emphasizes the importance of working together in overcoming the challenges of malnutrition and stunting among children.

Overall, this study underlined the urgency of a comprehensive approach, contextual education on exclusive breastfeeding, and in-depth nutritional evaluation in dealing with the problem of stunting.

The implications of these findings for health policy and clinical practice require serious consideration. There is a need of concrete steps such as culturally sensitive education, increase in nutritional intake, and a holistic approach in dealing with the problem of stunting among children. Future research needs to explore more deeply the complex interactions of factors influencing stunting and evaluate the effectiveness of nutritional intervention programs.

## CONCLUSION

This study consistently showed a positive correlation between exclusive breastfeeding practice and adequate nutritional intake with a reduced risk of stunting among children. Exclusive breastfeeding practice was identified as the main contributor to essential

nutrition that supports optimal growth, while adequate nutritional intake in the early stages of a child's life had a significant impact in reducing the prevalence of stunting. Such findings encourage the need to strengthen education for mothers and emphasize the importance of exclusive breastfeeding practice as well as proper nutrition early since the early childhood life. Nutritional support and interventions also played an important role, especially through iron supplementation programs and complementary breastfeeding. In addition, cross-sector collaboration and a sustainable approach were identified as keys to success in overcoming the stunting challenge. Recommendations for further development include implementation of support programs, in-depth research for a more holistic understanding, and on-going evaluation of the effectiveness of implemented interventions. In conclusion, this study provided a strong basis for guiding health policy and clinical practice to reduce the prevalence of stunting among children.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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## **Risk Factor Analysis of the Incidence of Hepatitis A in Indonesia: A Meta-Analysis**

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### **ABSTRACT**

*Hepatitis transmission is still a global public health issue, including in Indonesia. Low personal hygiene and environmental sanitation are the contributing factors to hepatitis A. This study aimed to analyze the impact of hand-washing habits, cutlery exchange, food and snack hygiene, and latrine use on the incidence of Hepatitis A. The study used meta-analysis with the PICOS technique. The data from Google Scholar, Mendeley, and Research Gate by looking at keywords such as "risk factors" and "hepatitis A", which were then sorted according to the inclusion-exclusion criteria and obtained 16 full-text case-control articles. Data analysis used a fixed effect model through JASP software version 0.9.2. The meta-analysis found that hand-washing behavior had a risk of 1.131; food and snack hygiene had a risk of 6.233; the habit of exchanging cutlery had a risk of 10.17; and latrine utilization had the highest risk of 12.935 for the incidence of hepatitis A. The study found that the use of latrines is the most significant factor in the occurrence of hepatitis A due to open defecation. Furthermore, exchanging cutlery is rated as the second factor triggering hepatitis A transmission, followed by the consumption of snacks or other foods. The study also found that hand-washing behavior has the lowest risk of hepatitis A incidence. The study concludes that hand-washing behavior, latrine utilization, food and snack hygiene, and exchanges of cutlery increase the risk of hepatitis A at different levels. It is suggested that behavioral factors such as hand washing, the use of closed latrines, and the consumption of healthy snacks or foods are essential measures to educate the community about hepatitis A and reduce its transmission within the population.*

**Keywords:** Hepatitis A, Hand-washing, Food Hygiene, Exchanging Cutlery, Latrine Utilization

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## **INTRODUCTION**

Hepatitis is a public health problem worldwide, including in Indonesia. Five hepatitis viruses contribute to hepatitis cases, including Hepatitis A virus (HAV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Hepatitis D virus (HDV), and Hepatitis E virus (HEV). All hepatitis viruses can cause acute hepatitis. Among the several types of hepatitis diseases, Hepatitis A often appears as an extraordinary event. This disease is closely related to environmental sanitation conditions,

food hygiene and sanitation, and clean and healthy living behaviors that are not optimal, so Indonesians are at risk for contracting Hepatitis A and Hepatitis E<sup>1,2,3</sup>.

World Health Organization (WHO) reported that 7.134 people died from Hepatitis A worldwide (accounting for 0.5% of deaths from viral hepatitis) in 2016<sup>1</sup>. Basic Health Research (Riset Kesehatan Dasar/Riskesdas) data in 2018 showed that 0.39% of the Indonesian population had hepatitis. The figure is a three-fold decrease compared to 2013 (1.2%)<sup>4</sup>. Despite the national decline, Hepatitis

A outbreaks occur in several regions. Ministry of Health of the Republic of Indonesia stated that Hepatitis A outbreaks had occurred throughout 2013 in East Java Province, in 6 districts, including Jombang, Lamongan, Pacitan, Sidoarjo, Ponorogo, and Pasuruan, with a total of 462 cases<sup>3</sup>. In 2014, it occurred in three districts, including Sidoarjo, Kediri, and Surabaya, with 59 cases<sup>3</sup>. The Hepatitis A outbreak in 2015 happened again in 3 districts, including Probolinggo, Lamongan, and Jember, with a total of 78 cases<sup>5</sup>. In 2019, Ministry of Health of the Republic of Indonesia reported a Hepatitis A outbreak in Pacitan District with a total of 957 cases<sup>6</sup>.

Previous studies identified several things related to the incidence of hepatitis, especially extraordinary events (outbreaks) in specific communities and community groups, including boarding schools, dormitories, schools, and company employees, with a typical source pattern. Hepatitis A outbreaks often have an epidemic cycle of 5-10 years which usually occurs during the rainy season with an outbreak period lasting about 1-2 months<sup>3</sup>. The virus can be spread through food or drink contaminated with faecal-oral human faeces. One of the factors causing Hepatitis A is contaminated water sources, as happened in Pacitan in 2019. The outbreak occurred due to Hepatitis A virus contamination that may have originated from domestic waste in the Kaligoro River water in Sukorejo village. The river is the primary source of spring water for residents. The other contributing factors are poor environmental sanitation, including eating in unclean public spaces, sharing food on one plate, a cutlery exchange, and handling foods without washing hands<sup>6-8</sup>.

When an HAV infection occurs, the patient will experience an incubation period of 18-50 days, with an average of 28 days. Symptoms include nausea, vomiting, decreased appetite, fever (temperature more than 390 Celsius), and discoloration of the skin; nails; and eyes to yellow, and yellow-brown urine due to bilirubin precipitation. Laboratory results show elevated Serum Glutamic Oxaloacetic Transaminase (SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT). Most acute hepatitis infections cause mild illness and even go undetected. However, in some cases, they can lead to complications and fatalities known as fulminant hepatitis A<sup>6,8,9</sup>.

The first global health sector strategy in

May 2016, the World Health Assembly (WHA) endorsed the Global Health Sector Strategy (GHSS) for viral hepatitis 2016-2021. The strategy proposes the elimination of viral hepatitis as a public health threat by 2030 through a 90% reduction in new chronic infections and a 65% reduction in deaths, compared to the 2015 baseline. WHO also sets out a roadmap towards elimination by implementing key prevention, diagnosis, treatment, and community intervention strategies. WHO supports its members to achieve global hepatitis goals through awareness raising, partnership promotion, resource mobilization, policy formulation, evidence-based data for action, improved health equity in hepatitis response, prevention of transmission, improved screening services, and care and treatment<sup>1</sup>. The Government of Indonesia through the Regulation of the Ministry of Health of the Republic of Indonesia No. 1501/ Menkes/Per/X/2010 on Certain Types of Infectious Diseases that Can Lead to Outbreaks and Their Management Efforts, and the Regulation of Ministry of Health of the Republic of Indonesia No. 53/2015 on Hepatitis Management. Those regulations stated that Hepatitis A outbreak/outbreak management can be carried out in five ways, namely 1) epidemiological investigation and surveillance, 2) management of patients in health facilities (case finding, examination, treatment, and care), 3) prevention and immunity (through vaccination), 4) destruction of the cause of the disease (through the provision of chlorine for clean water management; hand washing using soap; proper food processing; storing food at safe and appropriate temperatures; and using clean water), and 5) public education through health promotion<sup>10,11</sup>.

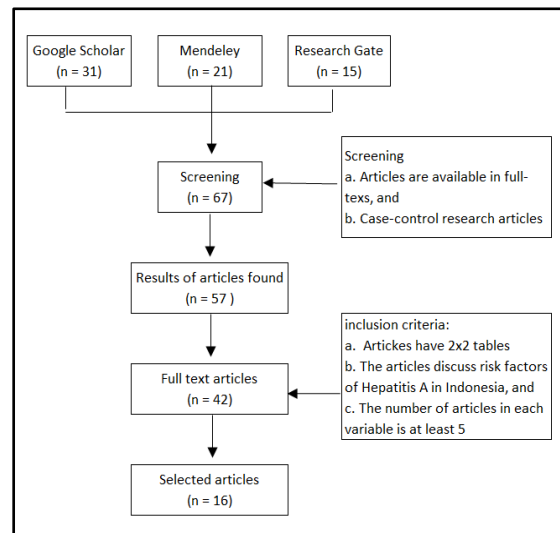
This study aims to analyse the risk factors of handwashing habits, cutlery exchange, food and snack hygiene, and latrine utilization on the incidence of Hepatitis A in Indonesian communities.

## METHODS

The study used meta-analysis with the PICOS technique, which combines several similar research results to obtain a blend of quantitative data with the same hypothesis to conclude by finding the effect size or summary value.<sup>12</sup> This research uses secondary data from



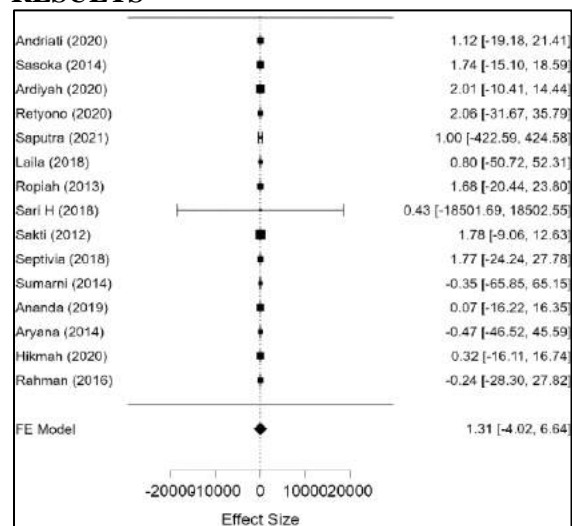
several electronic databases. The databases used are Google Scholar, Mendeley, and Research Gate (2012-2022). The keywords used in the search were "risk factors", and "Hepatitis A". The population of this study is sixty-seven international and national research articles with topics that match the research objectives. Fifty-seven articles was screening based on abstract review, then the full article was selected, and the exclusion of articles without full text. The next stage of the article was filtered again based on case-control research study designs. Forty-two journal articles were selected that examined the risk factors of hand washing habits, cutlery exchange, food and snack hygiene, latrine utilization, personal hygiene, and sanitation on the incidence of Hepatitis A in the Indonesian community. Finally, sixteen studies were selected that obtained a 2 x 2 table between exposure and outcome, discussed risk factor of Hepatitis A in Indonesia, and the number of articles in each variables was at least 6. The following is a PRISMA flowchart from this study.



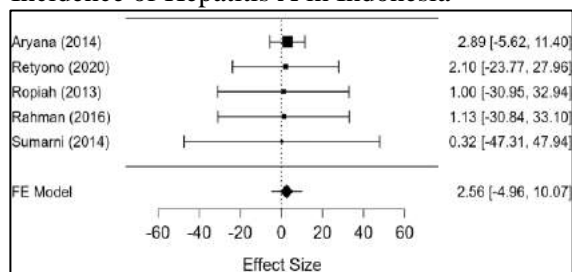
**Figure 1. PRISMA Flowchart of Risk Factors of Hand-washing Habits, Cutlery Exchange, Food and Snack Hygiene, and Latrine Utilization on the Incidence of Hepatitis A in Indonesian communities.**

The dependent variable was the incidence of Hepatitis A in Indonesia, while four risk factor includes handwashing habits; food and snack hygiene; cutlery exchange; and latrine utilization were independent variables. The process of doing a meta-analysis typically contains some parts, the first of which is formulating the study topic. The analysis was conducted to obtain the pooled odds ratio estimate value using the Mentel - Haenszel method for the fixed effect model analysis and the DerSimonian-Laind method for the random effect model analysis. If the variation between variables is homogeneous or the heterogeneity p-value is greater than 0.05, the analysis model used is the fixed effect model. Meanwhile, the random effect model analysis model is used if the variation between variables is heterogeneous or the heterogeneous p-value is smaller than 0.05. If the OR estimate value > 1 and the confidence interval range does not exceed 1, so the risk factors were hand washing habits, exchanging cutlery, food or snack hygiene, and latrine utilization on the incidence of Hepatitis A in Indonesian people. The following steps were literature gathering based on the planned objectives and evaluation.

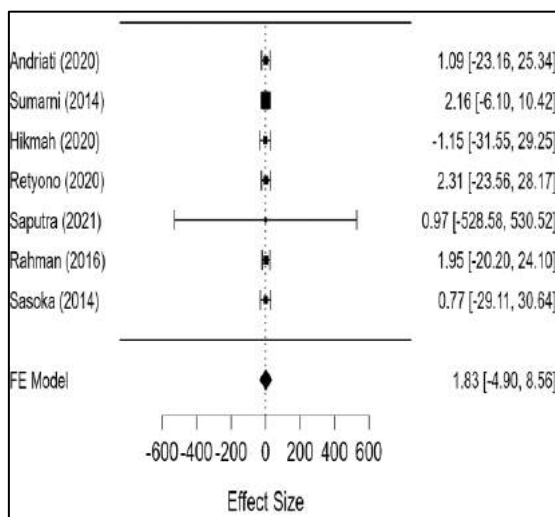
## RESULTS



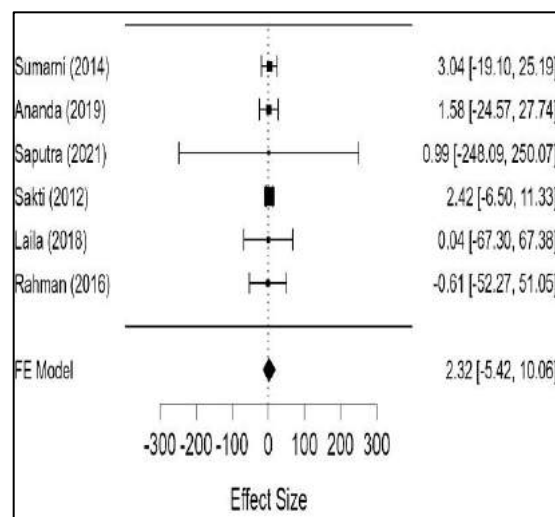
### Risk Factors for Hand-washing Behavior on the Incidence of Hepatitis A in Indonesia



### Risk Factors of Latrine Utilisation on the Incidence of Hepatitis A



Risk Factors for Food and Snack Hygiene on the Incidence of Hepatitis A in Indonesia



Risk Factors for the Habit of Exchanging Cutlery for the Incidence of Hepatitis A in Indonesia

**Figure 2. Forrest Plot of Risk Factors of Hand-washing Habits, Food and Snack Hygiene, Cutlery Exchange, and Latrine Utilization on the Incidence of Hepatitis A in Indonesian communities**

The Fixed Effect (FE) Model value of the Forrest plot on the hand-washing behavior represents the Odds Ratio (OR) estimate value showing a 95% CI of 1.31 with a range value of -4.02 - 6.64. The results of the forest plot in Figure 2 show that the pooled OR =  $e^{1.31} = 3.706$ . So it can be concluded that personal hand-washing behavior has a 3.706 times greater risk of making Hepatitis A incident.

The Fixed Effect (FE) Model value of the Forrest plot on food and snack hygiene shows the estimated Odds Ratio (OR) with a 95% CI of 1.83. From the forest plot Figure 4. pooled OR value =  $e^{1.83} = 6.233$  (95% CI -4.90 - 8.56). It concludes that the food and snack hygiene variable has a 6.233 times greater risk of causing Hepatitis A incidents.

The Fixed Effect (FE) Model value of

the Forrest plot on exchanging cutlery has an OR estimate with a 95% CI value of 2.32. Forest plot Figure 5. has a pooled OR value =  $e^{2.32} = 10.175$ . The Habit of exchanging cutlery variable has a 10.175 times greater risk of experiencing the incidence of Hepatitis A. The confidence level of FE is 95% and has an interval range of -5.42 - 10.06.

The Fixed Effect (FE) Model value of the Forrest plot on use of latrines has an estimated OR 95% CI value of 2.56 with an interval range of -4.96 - 10.07. The results of the Forest Plot Figure 5. obtained a pooled OR value =  $e^{2.56} = 12.935$ . It concludes that the use of latrines has a 12.935 times greater risk of experiencing Hepatitis A. This factor is most affected for Hepatitis A incidence in Indonesia.

**Table 1. Heterogeneity Test of Meta-Analysis of Individual Hand-washing Behaviour, Food and Snack Hygiene, Exchanging Cutlery, and Latrine Utilisation on Hepatitis A Incidence**

Varibales Independent	Hand-washing Behaviour			Food and Snack Hygiene			Exchanging Cutlery			Latrine Utilisation		
	Q	df	p	Q	df	p	Q	df	p	Q	df	p
Fixed and Random Effects												
Omnibus test of Model Coefficients	0.232	1	0.630	0.285	1	0.593	0.345	1	0.557	0.445	1	0.505
Test of Residual Heterogeneity	0.084	14	1.000	0.053	6	1.000	0.024	5	1.000	0.032	4	1.000

Table 1 shows that the p-value in the

heterogeneity test of all factors (includes hand-

washing behaviour, food and snack hygiene, exchanging cutlery, and latrine utilisation) are greater than  $\alpha$  (0.05), namely  $p = 1.000$ , which

means that the variation between studies is homogeneous, so in this analysis, all variables are using the fixed effect method.

**Table 2. Egger's Test of Risk Factors for Individual Hand-washing Behaviour Food and Snack Hygiene, Cutlery Exchange, and Latrine Utilization on the Incidence of Hepatitis A in Indonesian communities**

Regression test for Funnel plot asymmetry ("Egger's test")								
	Hand-washing Behaviour		Food and Snack Hygiene		Cutlery Exchange		Latrine Utilisation	
	z	p	z	p	z	p	z	p
sei	-0.088	0.930	-0.128	0.898	-0.095	0.924	-0.176	0.860

Based on Table 2, it is known that the p-value of Egger's Test of all variables  $> \alpha$  (0.05). The variable hand-washing behaviour, food and

snack hygiene, exchanging cutlery, and latrine utilisation on the incidence of Hepatitis A did not have publication bias.

**Table 3. Results of Meta-Analysis of Individual Hand-washing Behaviour, Food and Snack Hygiene, Cutlery Exchange, and Latrine Utilization on the Incidence of Hepatitis A**

No	Variables	N	Fixed/Random effect Models	
			OR	95% CI
1.	Hand-washing behavior	15	1,131	-4,02 – 6,64
2.	Food and Snack Hygiene	7	6,233	-4,90 – 8,56
3.	Cutlery Exchange	6	10,175	-5,42 – 10,06
4.	Latrine Utilisation	5	12,935	4,96 - 10,07

Based on the results of Table 6. which has the highest risk factor is the latrine utilization variable with a pooled OR value =  $e^{2.56} = 12.935$  (95% CI 4.96 - 10.07), so it can be concluded that latrine utilization has a 12.935 times greater risk of experiencing Hepatitis A. Furthermore, the habit of exchanging cutlery variable with a risk of

10.175 times, and the food/snack hygiene variable with a risk of 6.233 times. The lowest risk factor was found in the individual handwashing/hygiene behavior variable, with a pooled OR =  $e^{1.31} = 1.131$  (95% CI -4.02 - 6.64), so that poor individual handwashing/hygiene behavior has a 1.131 times greater risk of experiencing hepatitis A.

**Table 4. Sensitivity Test Comparison of Pooled Odds Ratio Fixed Model and Random Model**

Variables	N	Hetero entity (p-value)	Fixed effect Models		Random Effect Model	
			OR	95% CI	OR	95% CI
Risk Factors of Hand-washing Behaviour	15	1.000	1,131	-4,02 – 6,64	1,131	-4,02 – 6,64
Risk Factors of Food and Snack Hygiene	7	1.000	6,233	-4,90 – 8,56	6,233	-4,90 – 8,56
Risk Factors of Cutlery Exchange	6	1.000	10,175	-5,42 – 10,06	10,175	-5,42 – 10,06
Risk Factors of Latrine Utilisation	5	1.000	12,935	4,96 - 10,07	12,935	4,96 - 10,07

The four independent variables, there is no variation between studies, with no visible increase in the pooled OR value from the fixed effect model to the random effect model.

## DISCUSSION

The results of the meta-analysis showed that the Hand-washing Behaviour variable had

a 3.706 times greater risk of experiencing the incidence of Hepatitis A in Indonesian society. Previous study claimed the risk ratio of Hepatitis A due to the habit of not washing hands before eating properly (using soap) is 2.19 (95%CI=1.32-3.65;  $p = 0.000$ ), meaning that exposure to improper hand washing before eating will increase the risk of hepatitis incidence ( $p < 0.05$ )<sup>13</sup>.

Proper handwashing before eating has a significant correlation with the incidence of hepatitis. A history of close contact with HAV-infected people allows for the transmission of Hepatitis A because the Hepatitis A virus can survive for several hours on fingertips and hands for up to two months on dry surfaces<sup>8</sup>. As a result, if a person has been in close contact with an infected person, transmission can occur directly through handshakes or indirectly through contaminated objects that are touched or shared. The unclean and unhealthy living behavior, before and after eating or defecating without washing hands with soap. The habit of washing hands with soap, especially before eating, and in several other conditions such as after defecating, after using the toilet, after touching garbage, and others, must become an internalized behavior in each individual as an effort to prevent disease, especially the category of fecal-oral infectious diseases<sup>3,14</sup>.

Currently, the Indonesian government is intensively socializing Community-Based Total Sanitation (Sanitasi Total Berbasis Masyarakat/STBM), an approach to change hygiene and sanitation behavior through community empowerment with triggering methods. Hand-washing with soap is one of the STBM programs at the community level to promote hygiene (Cuci Tangan Pakai Sabun/CTPS)<sup>3,15</sup>. This program is expected to increase the achievement of CPTS, which is currently still low. The results of a survey of CTPS behavior in Indonesia on five critical CTPS times showed very low results, namely 12% after going to the toilet, 9% after washing children, 14% before eating, 7% before feeding children, and only 6% before preparing food<sup>15</sup>.

The results showed that the incidence of Hepatitis A due to non-fulfillment of food hygiene or snacks consumed was 6.233 times greater. Previous research also concluded the same thing, namely, the serving of food in school canteens that did not meet the hygiene and sanitation of food/snacks triggered the outbreak of hepatitis in the school<sup>16</sup>.

The results of a study of Food Service Companies in Central Kalimantan in 2016 showed that the level of fulfillment of sanitary hygiene principles in food management in the A2, A3, and B food service industries falls in the sufficient category. The food storage stage in the A2 food service industry and the food processing stage in the A2, A3, and B food service industries had a level of fulfillment of sanitary hygiene principles that was still lacking, so it needed to be further improved<sup>17</sup>. These conditions will contribute to states that do not maintain the cleanliness of food or beverages from possible biological, chemical, and other objects that can interfere with, harm, and endanger human health.<sup>18</sup> Other risk factors include the low quality of environmental sanitation, especially in the dining area. Hence, the risk of transmission of Hepatitis A and other diseases, such as E.Coli which causes diarrhea, is also higher<sup>2,6,8</sup>.

Food sanitation efforts are needed to create and maintain healthy and hygienic food conditions free from the dangers of biological, chemical, and other objects as stipulated in Indonesian Law No. 18/2012.<sup>18</sup> These efforts must be carried out in a series of stages, starting from the selection and storage of food ingredients, food processing, cooking food, and transporting food to the final stage, namely serving food<sup>19</sup>.

The meta-analyzes also show the risk of hepatitis A transmission through cutlery exchange. This habit has a 6.233 times greater risk of experiencing Hepatitis A in Indonesian people. Previous studies claimed that exchanging or using cutlery together has a 2.09 times increased risk of Hepatitis A transmission in Indonesian society (CI = 1.26-3.48;  $p = 0.00$ )<sup>13</sup>.

Hepatitis transmission is very likely to occur indirectly through HAV-contaminated cutlery used together (exchanging cutlery). The Hepatitis A virus is relatively stable and can survive for up to two months on dry surfaces<sup>20</sup>. Eating and drinking utensils contaminated with the Hepatitis A virus, from the virus attached to the hands and fingers of sufferers and then shared with others, can be a medium for the transmission of Hepatitis A disease.

Education to the public regarding personal eating utensils needs to be carried out continuously, including introducing the habit of bringing eating utensils (spoons-forks) when traveling or consuming food outside the

home/public eating places/stalls. In this risk factor, it is also necessary to pay attention to the personal hygiene of food handlers in restaurants/stalls/restaurants, school canteens/offices, and food/snack sellers when working/touching the tools used when making / processing and serving food. The survey of handwashing with soap behavior (CTPS) in Indonesia on the five important times of CTPS showed the lowest result, only 6% before preparing food<sup>15</sup>. The importance of maintaining personal hygiene and environmental sanitation in food processing-storage and serving/consumption areas is the responsibility of all individuals in the area, especially catering workers (food handlers).

Using latrines that are not following sanitation standards also has a 12.935 times greater risk for the incidence of Hepatitis A transmission. Previous study found that an epidemiological investigation (case-control study) on a hepatitis A outbreak that occurred in one of the high schools in Jember Regency, East Java, showed that the behavior of students at risk included defecation, not in latrines<sup>21</sup>. Environmental conditions can affect the incidence of Hepatitis A, such as lack of clean water supply, unsanitary wastewater and garbage disposal, and personal hygiene. The incidence of Hepatitis A is influenced by a person's behavior, such as people living in areas with poor environmental conditions and people with low personal hygiene, such as lack of implementation of clean and healthy lifestyle (Perilaku Hidup Bersih dan Sehat/PHBS). Hepatitis A outbreaks due to HAV-contaminated water sources also occurred in Pacitan in 2019. The Hepatitis A virus contamination most likely came from domestic waste in the Kaligoro river water in Sukorejo Village, a spring water source for residents<sup>6</sup>.

Efforts to continue to make people aware of Stop Open Defecation (Stop Buang Air Besar Sembarangan/Stop BABS) include the declaration of "Stop Open Defecation" in various regions in Indonesia, both in urban and rural areas. Stop Open Defecation behavioral efforts are part of Community-Based Total Sanitation (STBM), which requires commitment from all levels of society, the private sector, and the government. In addition to efforts to improve clean and healthy lifestyle (PHBS) through health education, other efforts are needed to overcome the physical constraints of the availability of latrine facilities.

Triggering system of STBM through community empowerment (gotong royong system) is a solution to build latrines for people with limited funding. The provision/assistance of costs for the procurement of physical facilities for residents who cannot afford to provide latrine facilities that meet environmental health standards as has been implemented in various regions in Indonesia<sup>22</sup>.

## CONCLUSIONS

The meta-analysis results show that behavioral factors such as hand washing, unhygienic foods or snacks, the use of open latrines, and cutlery exchange may risk people to the exposure of hepatitis A transmission. However, there are variation on the level of risk among the behavioral factors where the use open latrine is the most significant contributor of the hepatitis A transmission. The study recommends that community empowerment through health education about hepatitis A transmission and contribution factors of the transmission is a crucial element to reduce the risk of transmission of the disease. The healthy life-styles need to be maintained by promoting community empowerment and the spirit of mutual cooperation by the community, the private sector, and the government in reducing/eliminating the incidence of Hepatitis A in Indonesia.

The study has some limitation includes only used quantitative articles, just three data source, and the population of hepatitis A cases does not represent most of Indonesia. Further research is recommended to use qualitative data to look deeper into the intermediary factors that cause Hepatitis A, and look for articles from more data sources, and consider the population distribution that can represent all clusters/regions in Indonesia.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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Article Review

## ***The Implications of Utilizing Artificial Intelligence-Based Parenting Technology on Children's Mental Health: A Literature Review***

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### **ABSTRACT**

*The study aims to look at the development of artificial intelligence to support positive parenting and help improve children's mental health. This research method uses the PRISMA approach through a search process using the keywords "Parenting, Child Mental Health, Artificial Intelligence, Communication, and Discipline Enforcement on the Scopus, Google Scholar, Science Direct, and Pubmed databases in the period 2018 to 2023 with a five-step process to obtain data. After elimination, 1,223 journal articles were obtained that met the inclusion and exclusion criteria of 11 journal articles. Based on the results of the literature review, information was identified regarding the history of the development of artificial intelligence technology, artificial intelligence significantly has a positive impact on children's mental health, through the use of artificial intelligence parents gain meaningful literacy in providing positive care for children. However, the use of artificial intelligence can lead to parents' dependence on artificial intelligence, which is feared to replace human figures. In conclusion, studying the development and adequate use of artificial intelligence technology is urgently needed to improve the ability and quality of parenting to support the optimization of children's mental health.*

**Keywords:** Parenting, Children's Mental Health, Artificial Intelligence, Communication, Enforcement of Discipline

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## **INTRODUCTION**

Mental health problems among children and adolescents are increasing (Entenberg et al., 2023), and this trend has increased in recent years due to the impact of COVID-19, such as social isolation and stress<sup>1,2,3</sup>. Problem behavior is one of the most common disorders in children and adolescents<sup>4,5</sup>, and childcare programs effectively reduce disruptive behavior<sup>4,6</sup>.

The psychological formation of children depends on the care of both parents<sup>7</sup>. Children will grow into a generation with good morals if they receive good parenting, whereas children will grow into an era with bad morals if they receive lousy parenting<sup>8</sup>. Therefore, the

family environment is much associated with children's behavior because parenting is fully responsible for forming children's attitudes and behavior<sup>9</sup>. In addition to the school environment and community environment, parents are one of the keys to success in shaping children's behavior in all matters, both in speech and formal education. Parents need to create intense parenting with their children through communication and enforcement of discipline<sup>10</sup>.

The massive development of information technology has brought changes and significantly impacted the child-rearing process. Parents must try to find appropriate and appropriate parenting patterns for the millennial generation or digital native generation<sup>11</sup>. The



most effective plan of action in supporting long-term outcomes for children is to focus parents on implementing parenting styles throughout childhood<sup>12,13</sup> fostering parents in childcare, of course there are many interventions that can be carried out, one of which is with the support of technology as a means of implementation that can be applied<sup>13</sup>. Artificial intelligence has demonstrated its ability to change early childhood education, focusing on building a solid foundation for a child's learning journey that will last a lifetime. Educational tools and systems that use Artificial Intelligence (AI) are created to meet young learners' specific needs, improving their learning experience and helping them develop<sup>14,15</sup>.

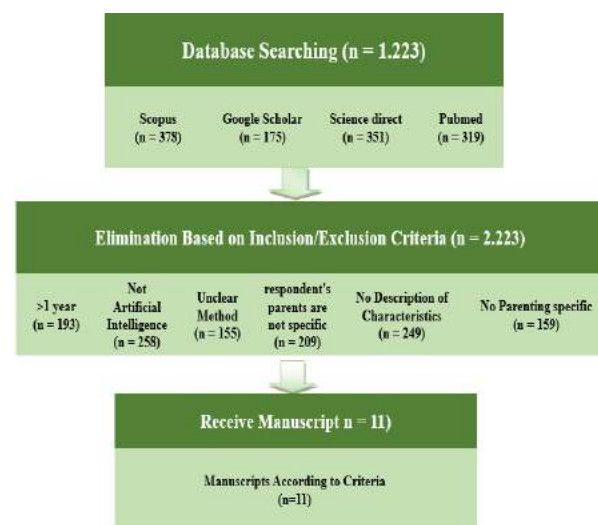
In dealing with behavioral problems in children and adolescents effectively, a solution has been found that by implementing digital parenting applications, promising results have been obtained<sup>16</sup>. Digital care shows a higher potential for consistency and regulatory compliance than face-to-face therapy, although digital use has challenges in user retention<sup>11</sup>. Interactive digital parent training apps had a higher impact size than non-interactive programs, as users were more likely to report that they praised the inclusion of a sales feature provided<sup>11</sup>. Thus, it becomes essential to explore references regarding the critical role of artificial intelligence in supporting the parenting of children.

Currently, there are not many literature reviews that explore the influence of the use of artificial intelligence on children's mental health through the role of mothers in parenting. For this reason, this literature review was conducted to answer the question of how the use of artificial intelligence affects the mother's ability to provide care for children, in addition to the risks that can be caused by excessive use of artificial intelligence. The purpose of this study is to determine the development of artificial intelligence in improving the ability of parents to provide positive parenting, the impact on children's mental health and the risks posed by excessive use of artificial intelligence.

## METHOD

This research is a literature review based on the PRISMA guidelines. The process carried out is to search for several research journal articles published through online databases, an integrated analysis process is implemented.

Several electronic databases used in this research are Scopus, Google Scholar, Science Direct and Pubmed with a time span of 2018 to 2023 with the keywords "Parenting, Children's Mental Health, Artificial Intelligence, Communication, Enforcement of Discipline. The criteria used in this literature review were that the literature reviewed was original research, utilization of artificial intelligence, and mental health. The study selection process consists of 5 steps shown in the diagram. The process can be seen in the diagram below:



**Chart 1. Processing of Elimination of Article Journals**

Data from selected articles is extracted in a table, including: length of research in years, title of artificial intelligence article, clarity of research methods, specific parent respondents, clarity of respondent characteristics, results of research on child care. This literature review used guidelines to analyze reporting quality among the selected studies. The guidelines used are Critical Appraisal Skill Program Tools (CASP) and Quality Assessment to assess the risk of bias from selected studies.

## RESULTS

The results of the study found that from 11 articles it was found that there was a relationship between artificial intelligence (AI) and parenting styles for their children. The 11 articles used have relevance and pay attention to the research objectives. The following table reviews the results of the analysis in this article:

**Article Reviews “Artificial Intelligence-Based Parenting Training for Children's Mental Health”**

<b>Research (Year)</b>	<b>Article Title</b>	<b>Source</b>	<b>Method</b>	<b>Characteristics</b>	<b>Results</b>	<b>Conclusion</b>
(Entenberg et al., 2023) <sup>11</sup>	AI-based chatbot micro-intervention for parents: Meaningful engagement, learning, and efficacy	Google Scholar	This research use A randomized control trial and the participants in the experimental group accessed a 15-min intervention that taught how to utilize positive attention and praise to promote positive behaviors in their children, while the control group remained on a waiting list	170 parents with at least one child between 2–11 years old.	- The result is participants engaged with a brief AI-based chatbot intervention and were able to learn effective praising skills. Although scores moved in the expected direction, there were no significant differences by condition in the praising knowledge reported by parents, perceived changes in disruptive behaviors, or parenting self-efficacy, from pre-intervention to 24-hour follow-up.	The results provided insight to understand how parents engaged with the chatbot and suggests that, in general, brief, self-guided, digital interventions can promote learning in parents. It is possible that a higher dose of intervention may be needed to obtain a therapeutic change in parents. Further research implications on chatbots for parenting skills are discussed.
(Cecula et al., 2021) <sup>17</sup>	Applications of artificial intelligence to improve patient flow on mental health inpatient units - Narrative literature review	Science Direct	- This research was conducted by identifying patterns in literary works, analyzing them and reflecting on them in the form of themes. - The OVID database is still used to access the Embase and Medline databases. - Major journals (JAMA, Nature, The Lancet) are checked against the most important studies.	- 323 papers were selected and 83 papers were analyzed - Then divided into three main themes: diagnosis (33%), prognosis (39%) and treatment (28%). The main themes that emerged from AI in patient flow studies were: readability (41%), resource	- A review of the AI mental health literature shows that AI can be used to improve diagnostic accuracy, personalize treatment, and predict clinical outcomes to ensure timely intervention. - A review of the literature on the use of artificial intelligence in patient flow with regard to predicting avoidable readmission, increasing treatment efficiency, optimizing resource allocation, reducing length of stay, and validating existing algorithms for more general purposes.	There is extensive research on the potential use of AI in mental health, and some studies focus on its application in inpatient psychiatric care, but research rarely addresses improving patient flow.  Further research should explore patient perspectives regarding the integration of AI into healthcare, as patient experience is a key factor in healthcare, especially in patient access. Addressing patient concerns is critical in

				allocation (44%) and limitations (91%).	- The potential for this application of AI to have both positive and negative impacts on the patient experience.	the broader implementation of AI so that patients can maintain autonomy over their sensitive information, particularly in the field of psychiatry..
(Siddiqua et al., 2023) <sup>18</sup>	AIDA: Artificial intelligence based depression assessment applied to Bangladeshi students	Science Direct	<ul style="list-style-type: none"> <li>- Study of the assessment and observation of depression, including the development of an integrated questionnaire</li> <li>- Then measure the hybrid depression rating scale by analyzing and assessing the collected data.</li> </ul>	- The questionnaire was distributed among Bangladeshi students and a total of 684 responses (aged between 19 and 35) were obtained.	<ul style="list-style-type: none"> <li>- The results of this study show a new depression measurement scale with three different levels, namely. normal, moderate and extreme, using voting techniques on the results of eight known scales.</li> <li>- Nine characteristic selection methods are used to find important and important characteristics that influence depression. Additionally, 12 machine learning, ensemble, and deep learning algorithms are used to automatically predict depression. Random Forest, Gradient Boosting Algorithm, and CNN were found to be better models for depression assessment. Finally, hyperparameter optimization and feature selection are used to improve the performance of prediction results</li> </ul>	<ul style="list-style-type: none"> <li>- This research examines various personal and social factors that negatively impact the mental health of young people.</li> <li>- Metaheuristic optimization methods can be widely applied to find the best patient biometric markers and features. A possible extension of this work is to harness the power of advanced AI frameworks such as adversarial and sequential learning, domain conditions, etc.</li> </ul>
(Alrusaini & Beyari, 2022) <sup>19</sup>	The Sustainable Effect of Artificial Intelligence and Parental Control	Science Direct	The technique of research that was applied in the study was a quantitative approach. The primary questionnaire focused on	sample in this study are 415 parents who had given their children at least one smart device	The findings presented in this paper show that the moderating effect of artificial intelligence control was more statistically significant than parental controls in influencing the sustainability of child behavior.	the study concluded that using artificial intelligence control is more effective than relying on parental controls to enhance the behavioral sustainability of

<p>on Children's Behavior While Using Smart Devices' Apps: The Case of Saudi Arabia</p>	<p>game apps, social media apps, video-streaming apps, artificial intelligence control, parental control, and the sustainability of child behavior. On the other hand, a separate questionnaire designed specifically to capture demographic information was also drafted. The structural equation model (SEM) was preferred, as it depicted the moderating roles of artificial intelligence control and parental control by using SPSS AMOS software. Findings established that games, social media, and video-streaming applications negatively affected the sustainability of child behavior</p>	<p>Moreover, the results show that the greatest effect on children's behavior were social media, video-streaming, and games apps. respectively. Nevertheless, both approaches resulted in positive child behavior</p>	<p>children with smart device applications in Saudi Arabia.</p>			
<p>(Entenberg et al., 2023)<sup>11</sup></p>	<p>AI-based chatbot micro-intervention for parents: Meaningful engagement, learning, and</p>	<p>Scopus</p>	<p>The exploration system with a randomized control trial was carried out. Actors in the experimental group penetrated a 15-nanosecond intervention that tutored how to use</p>	<p>The parties sign through Facebook postings and shipping list ads. An total of 170 parents who had at least one child progressed between 2 – 11</p>	<p>- The results of this study were that participants engaged with a brief AI-based chatbot intervention and were able to learn effective praise skills. Although the scores moved in the expected direction, there were no significant differences by condition in terms of parent-</p>	<p>Parents can admit psychoeducation and learn from chatbot micro interventions. parents can engage meaningfully with chatbots when communicating about their gests with their children.</p>

	efficacy		positive attention and praise to promote positive get in their children, while the control group remained on a waiting list.	times living in Argentina	reported praise knowledge, perceived change in disruptive behavior, or parental self-efficacy, from pre-intervention to 24-hour follow-up.	Chatbots area unique and innovative way to increase availability, training parents and druggies to engage meaningfully with them. With advances in AI, chatbots for internal health are a promising intervention format for parents of busy children and adolescents.
(Lin et al., 2021) <sup>20</sup>	Parental Acceptance Of Children's Storytelling Robots : A Prejection Of The Uncanny Valley Of AI	Scopus	- This exploration uses a qualitative study using design fiction, which is a form of academic design that opens up conversations about the use of new technology and its ethical and social counterclaims.	- People receive invitations through posts, forums, the original Reddit community, or word of mouth. - Additional criteria are adult parents who have at least one child, aged 2 to 5 years (preschool age).	- Exploration has shown that robots in the home are further than just a new technology for children. They give a sophisticated experimental platform for shaping cognitive perception, family dynamics, and mortal-robot relations. - Exploration shows that parents have an equivocal but generally positive station towards chatbots and are ready to drink them at home. Parents appreciate puck tales for perfecting children's reading chops, forming habits and family connections	Parents find it delicate to produce a internal model of how socially able robots operate, which creates cognitive conflict and passions of ignorance. This feeling can be reduced by making the AI more transparent and easy to understand. Experimenters explore the counteraccusations of using robots for children's story time, including their implicit effect on maternal well-being, and suggest directions for unborn exploration.

(Glassman et al., 2021) <sup>13</sup>	Parents' Perspectives on Using Artificial Intelligence to Reduce Technology Interference During Early Childhood: Cross-sectional Online Survey	Scopus	<ul style="list-style-type: none"> <li>- This exploratory study was conducted using a cross-sectional experimental study using a population-based examination of websites where US parents had a 5-year-old child.</li> <li>- This examination was developed for the Amazon TurkPrime platform (now called CloudResearch) for recruitment and administration via the Prime Panels service.</li> </ul>	<ul style="list-style-type: none"> <li>- Adults aged &gt; 18 years, with primary care responsibility for at least one child aged &lt; 5 years in the household.</li> <li>- Exclusion criteria included inability to read English or Spanish or completion of checks outside the United States.</li> </ul>	<ul style="list-style-type: none"> <li>- From this study parents inform digital devices can affect the concentration of parent-child relationships with an average of 3.03 devices (SD 2.07).</li> <li>- Youth, Hispanic race, and Spanish spoken at home are associated with increased awareness of technological significance. Compared to parents' perceptions of technology and sociodemographic factors, parents' perceptions of their problematic technology use were most strongly associated with acceptance of AI tools.</li> </ul>	<p>AI grounded tools may be used as training aids to help parents of colorful sociodemographics increase their attention when minding for their youthful children, particularly in managing with technology from using their own mobile bias.</p> <p>Unborn examinations should validate whether there's sufficient focus on AI grounded parenthood support to combat parents' inordinate use of digital technology-convicted technoference versus their particular problems with technoference and to identify other factors impacting the adequacy and utility of this support.</p>
(Ghaznavi et al., 2020) <sup>21</sup>	Photorealistic avatars to enhance the efficacy of Self-latachment psychotherapy	Scopus	<p>This exploration system was carried out with a validity study in which the actors were asked to flash back their nonage moments by first using their filmland and also by using customized photorealistic incorporations using Mobilevr and Oculus</p>	<ul style="list-style-type: none"> <li>- Low end interpretation</li> </ul> <p>A aggregate of 15 actors were signed via social media platforms; the maturity of actors were in their twenties( 11 males and 1 lady). For each party, a special Android</p>	<ul style="list-style-type: none"> <li>- Experimenters created a new psychotherapy that uses customizable photorealistic incorporations to increase the effectiveness of tone-protestation psychotherapy.</li> <li>- The platform also offers facial and body robustness for some introductory moods similar as happy, sad, spooked and agitated, and allows you to</li> </ul>	<p>Sophisticated virtual reality systems are transforming sectors such as the military, education and healthcare. Advances in virtual reality technology, particularly the availability of photorealistic human-like avatars, have made virtual reality experiences more personalized and</p>

			Quest.	VR operation, containing their custom icon, is created and participated.	- High end interpretation Six actors from the low end trial, who have access to the Oculus Quest	change the body( height/ range) and apparel color of the icon . - icon( VR) grounded approaches when combined with traditional print grounded approaches show promising results. Nearly 85 of actors reported that their child's photorealistic icon in VR was more seductive than a print of their child. - Both low- position and high- position VR- grounded approaches were unanimously reported to be more effective than traditional high- imagination approaches. Actors reported that the high- end VR interpretation of the platform was more realistic and immersive than the low- end mobile VR interpretation.	realistic.  Researchers who implement both high-end and low-end versions can help other researchers create better, more interactive, and highly realistic virtual reality experiences in the future.
(Roslan et al., 2023) <sup>22</sup>	Parent Assistance Training on Children's Intelligence in the Modernization Era in Wawatu Village, North Moramo District, South Konawe Regency	Google Scholar	- The method of this research is lectures and discussions explaining the role of parents, especially mothers in today's children's education, the positive and negative impacts of media technology.	20 people consisting of mothers who have teenage children in Wawatu Village, North Moramo District, South Konawe Regency	- participants have been able to understand the role of parents, especially mothers in educating children in this modern era, especially in using communication technology. - They are also able to understand how to provide assistance to children so that they grow up as intelligent generations who can maximize the use of communication technology by avoiding the negative effects of communication technology.	With the knowledge that they've attained from this comforting, it's clearly hoped that it'll be useful in the sweats of parents, especially maters, in furnishing backing and knowledge to children at home related to the use of communication technology. The donation of this training is to raise mindfulness for parents about the significance of educating and educating	

children using information technology in the modernization period.

(Pervanidou et al., 2023) <sup>23</sup>	The Impact of the ENDORSE Digital Weight Management Program on the Metabolic Profile of Children and Adolescents with Overweight and Obesity and on Food Parenting Practices	Scopus	<ul style="list-style-type: none"> <li>- This study explores the impact of the ENDORSE platform on metabolic parameters associated with childhood obesity and the dietary care practices of participating mothers.</li> <li>- The Comprehensive Feeding Practice Questionnaire was used for the assessment of feeding practices. Next, regression analysis was used to investigate possible associations between changes in BMI z-scores and changes in metabolic parameters and dietary care practices.</li> </ul>	<ul style="list-style-type: none"> <li>- Children aged 6-14 years with a BMI &gt; 85th percentile, which is the cutoff value for the definition of overweight according to the International Obesity Task Force (IOTF).</li> <li>- Exclusion criteria for participating in this study were secondary causes of obesity, such as endocrine diseases, genetic syndromes known to be associated with obesity.</li> </ul>	<ul style="list-style-type: none"> <li>- Glycated hemoglobin (mean change = -0.10, p = 0.013), SGOT (mean change = -1.84, p = 0.011) and SGPT (mean change = -1.84, p = 0.011) decreased statistically and SGPT (mean change = - 2.095, p = 0.022). Emotional feeding/food as a reward decreased (mean change -0.21, p = 0.007) and healthy eating guidelines increased (mean change = 0.11, p = 0.051). Linear regression analysis showed that changes in BMI z-score had a strong and significant correlation with important metabolic parameters: changes in HOMA-IR (beta coefficient = 3.60, p value = 0.046), changes in SGPT (beta coefficient = 11.90), P). -value = 0.037) and changes in cortisol (beta coefficient = 9.96, p-value = 0.008). Additionally, changes in healthy eating guidelines had a strong negative association with changes in BMI z-score (beta coefficient = -0.29, p value = 0.007).</li> <li>- Implementation of the ENDORSE digital weight monitoring program improves</li> </ul>	The use of this new digital-based ENDORSE platform in weight management and the promotion of parental healthy eating practices adds new data about the importance of digital-based interventions to combat childhood obesity. Certainly, future large-scale cohorts combined with a control group representing standard care of overweight and obese children and adolescents are needed to better support the findings of this study.
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					several important metabolic parameters and eating habits.	
(Ali et al., 2022) <sup>24</sup>	Artificial Intelligence-Based Mobile Application for Children Emotion Through Drawings	Scopus	This study included Primary (local) and Secondary (online) data sources for child art drawings. Our primary source was data collected from a local school based in Doha. We collected 102 drawings to test the effectiveness of art therapy-based emotion-sensing. Our secondary data source was searching online where we collected a total of 521 drawings through Google and Instagram.	Thus, the 521 drawings were labeled by the art therapist into two different groups: positive emotions (n=365) and negative emotions (n=258). Drawings collected from the school were also labeled into positive emotions (n=52) and negative emotions (n=50).	The model accuracy ranged from 55% to 79% in the four experiments. This study showed that ESRA has the potential in identifying the emotions of children. However, the underlying algorithm needs to be trained and evaluated using more drawings to improve its current accuracy and to be able to identify more specific emotions.	ESRA can help parents and teachers understand the emotions of children through analyzing their drawings using AI. However, the underlying algorithm proposed in this work needs to be trained and evaluated using more drawings to improve its current accuracy. Further research is needed to improve ESRA in identifying more emotions and considering cultural nuances in the representation of the drawings.

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## DISCUSSION

Technological developments that entered the era of the Industrial Revolution 4.0 are considered to have influenced various fields of science, one of the focuses being the ways and patterns of child development<sup>25</sup>. The era of the Industrial Revolution 4.0 can also be said to be the era of Artificial Intelligence (AI) and machine learning, also often referred to as artificial intelligence<sup>26</sup>. Technological developments challenge mentors and the next generation of children<sup>27</sup>.

Child psychiatry is a branch that is oriented and explores the stages of growth and development of children's emotions and behavior<sup>28</sup>. This is intended to provide promotive, preventive, curative, and rehabilitative efforts with an eclectic-holistic approach to achieve optimal mental health for children and their families. The biggest challenge facing the Industrial Revolution 4.0 was meeting the stimulation needs to support children's emotional growth and development to have healthy minds to deal with rapid and drastic changes. The World Health Organization (WHO) concept is that a mentally healthy child is a child who can feel that he is healthy and happy<sup>29</sup>. Child psychiatry tries to address the challenges of development in the current 4.0 industrial revolution era and achieve Indonesia's Sustainable Development Goals (SDGs) goals<sup>30</sup>.

The influence of AI on child development In the rapid and drastic development of technology, AI technology, also known as machine learning or super-computer, can change human interactions<sup>31,32</sup>. Such as communication interaction patterns between friends, neighbors, teachers, and students, to communication patterns between parents and their children. No artificial intelligence in this AI era can replace someone's job in doing something, especially medical elements<sup>33</sup>.

These efforts are also expected to face challenges in children's lives. Able to accept other people and their environment as they are and have positive perceptions and attitudes towards themselves and others. This period is significant because it is the main foundation for brain growth and developing individual character and personality in the future.

### **The benefits of AI in the context of child mental health**

Artificial intelligence (AI) can now be applied in almost all fields, including parenting. The use of AI by parents to help raise their toddlers for a full day has already been done<sup>34,35</sup>. Waugh uses the cutting-edge AI program ChatGPT and Google Bard to help raise his 18-month-old son, William. They were serving food created by AI and participating in suggested activities before relaxing with some AI-produced television scripts and reading books to children written by technology.

Based on research by Guido A. Entenberg, Sophie Mizrahi, Hilary Walke, et al. (2023), chatbots are computer-based programs that utilize artificial intelligence (AI) to communicate with people via text or voice and have the potential to provide mental health interventions to a large number of populations (i.e., adolescents and adults)<sup>11</sup>. The chatbot is designed to guide parents of newborns and premature babies about stress, sleep, and nutrition<sup>36</sup>. The chatbot reproduces human-like conversations and captures open dialogue about parenting experiences. Overall, participants found it helpful and reported having a positive experience. The parenting chatbot also offers tools for depression screening and relaxation exercises<sup>37</sup>. One-session interventions for parents have shown promising results in treating children's and adolescents' mental health problems, including anxiety, depression, and behavior problems<sup>11</sup>.

In the future, artificial intelligence (AI) could mimic human behavior, including the complex task of raising children<sup>13</sup>. Microsoft researchers report that GPT-4 is starting to exhibit near-human intelligence. However, this can lead to potential pitfalls. AI can offer children what humans, TV, or smartphones cannot providesmartphone<sup>38,39</sup>. AI will be able to determine a child's needs and tailor interactions to offer the best parent-child and educational experience. If a child has difficulty learning a specific concept, AI can adjust its instructions, trying to change to meet the child's learning needs excitingly<sup>40</sup>. AI can act as a nanny, tutor, or playmate; its primary selling point is unprecedented personalization to suit every child's needs<sup>41</sup>. This condition sounds too exaggerated to be accurate, even though it happened. Children must deepen and inculcate moral values into their souls, as parents must educate and have a pure spirit and noble

character, and be far from despicable and vile<sup>41</sup>. They must also instill these noble values into children's souls and purify their hearts from dirt. The communication patterns used by families, in this case, parents, in shaping children's character are more dominant using open models or democratic communication models compared to closed or authoritarian communication models<sup>42</sup>.

AI can recognize the most straightforward child's learning method, like what is based on the child's algorithm. AI can help analyze and detect dangerous behavior and inappropriate content for children so that we can protect children from bad risks online. Irresponsible people can use the innocence of children to use personal identity data without the owner's knowledge. Therefore, digital literacy is essential so that people are more aware and careful about potential crimes involving AI.

### **The advantages of AI in improving children's mental health**

AI can behave similarly to a human with one exception: it never gets tired. This technology will continue providing undivided attention to parents in raising children in a way humans cannot. One of the significant advantages of AI is its ability to automate repetitive tasks, freeing human resources to focus on more complex and creative endeavors<sup>41</sup>. By simplifying processes, AI can significantly increase efficiency and productivity in various areas, especially for repetitive work, including parenting<sup>34,35</sup>.

Unlike humans, machines do not require rest to recover from fatigue and increase productivity. The AI-based engine helps perform repetitive tasks for a long time without slowdowns. AI enables operating machines unlimitedly without reducing productivity<sup>43,44</sup>. This is one of the main advantages of AI that has led to its acceptance in every sector. Manufacturers use Artificial Intelligence to continue to produce according to consumer demand and get high profits<sup>45</sup>. In parenting, artificial intelligence can assist in diagnosing parenting patterns, predicting parenting outcomes, and identifying ways in parenting data, which ultimately improves child care and parenting effectiveness<sup>40</sup>.

### **The risks of using AI on children's mental health**

AI cannot replace some things and must be anticipated to be a harmful effect from AI, which is that it has not been able to replace the role of emotional relations (bonding) and mother-child attachment, which are essential and are said only to be found in humans<sup>30</sup>. Therefore, integrating the perinatal psychiatric health service system and child psychiatry in primary care is an essential thing to do at this time in mental health services. This is done from the time the mother is pregnant until the child is born to support the formation of a safe mother-child bonding and attachment.

Technology leaders, including the heads of OpenAI and Google's DeepMind, have issued dire warnings about the potential risks AI poses to society and urged caution. The ban on using technology in biometric monitoring and specific clauses to protect children is being carried out more intensively. The first AI law by a significant regulator could be a model for planning similar parenting patterns<sup>46</sup>. Personalization not only widens the gap that separates those who don't share someone's beliefs, values, or interests but can also make people in the same group increasingly polarized in their views and beliefs.

AI relies heavily on data, and the collection and utilization of personal information raises concerns about security and privacy<sup>47</sup>. AI systems must be designed with robust security measures to protect sensitive data from unauthorized access and breaches. In addition, AI also increases the potential for abuse<sup>48</sup>. For example, deepfake videos. Deepfakes can spread false information and manipulate public opinion<sup>49</sup>. Someone could take a video of a person and edit it to make him say things he never actually said.

In utilizing AI, it is necessary to focus on the effects of technology-based personalization on today's culture and society<sup>50</sup>. Algorithms that operate behind the scenes study people's interests to compose and show more about what they might want to see, hear, and experience on this platform. They are designed to make someone hooked so that they continue to use them again<sup>51</sup>.

The same can be said about beliefs, political views, values, etc. If someone consumes content with a certain tendency,

online platforms will continue to provide more content with a similar trend<sup>52</sup>. Personalization wraps in a bubble of ignorance, reinforcing the inaccurate perception that everyone has the same beliefs or values as himself<sup>52</sup>.

Personalized online platform experiences create many parallel worlds that divide human communicative cultures. This problem gradually goes unnoticed, and these conditions separate, making it increasingly difficult to respect speaking and working with others<sup>52</sup>.

Its own culture and communicative practices will influence each circumstance. The more time spent online, the more immersing oneself with like-minded people in the group to learn and internalize language and communicative norms. It's hard to tell if something needs to be fixed if most of one's social circle communicates similarly. If we encounter someone who gives abusive parenting, the last thought that comes to our mind is the possibility that the person comes from a different communicative culture<sup>52</sup>.

The exact words and gestures that seem polite to the communicative culture of one area can appear rude to people from other regions, making it very easy for misunderstandings and misjudgments to one another. The concern is that this problem will worsen with children raised in AI-based parenting. Children in parental care for their children must understand how to struggle to understand and cooperate with others. If we are not careful, we risk raising a generation of children with a skewed perception of the world due to the formation of personal groups created by AI<sup>52</sup>.

In addition, the depersonalized level of interaction with parenting AI will create tiny groups, making it more difficult for children to try to relate to and understand others, leading to more conflict, misunderstanding, and mistrust<sup>52</sup>. Loneliness will be experienced by children when parents do not fully assist when implementing parenting<sup>53</sup>. In the future, the next generation of children may experience increased loneliness and alienation and be less able to communicate or collaborate<sup>52</sup>.

## CONCLUSION

The rapid development of artificial intelligence sometimes makes it difficult for people to distinguish between reality and digital products. Often someone is not aware that

digital activities that seem ordinary, can have a bad impact if the use of technology is not equipped with digital skills. Parents can use artificial intelligence in providing care to improve children's mental health. Digital health technologies that ask about moods and thoughts seem to "listen" to people's feelings, learn about their owners, and offer cognitive behavioral therapy tools. Interactions with AI can mimic real-life face-to-face encounters adapted to individual situations. Caution must be exercised in anticipation that AI cannot replace human connection. If more digitally savvy, AI could benefit much better children's mental health. This is because of the existence of AI for parents to make it easier for them to learn something. AI can recognize the easiest parenting methods, based on the child's algorithm. Researchers are further advised to explore the use of artificial intelligence related to coordination between parents and school teachers to improve the quality of children's mental health development.

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The authors declare no conflict of interest.

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