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RESEARCH **Open Access**

Perceived Stress During COVID-19 Pandemic: The Malaysian Nurses Experience

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Abstract

Research shows that nurses are one of the most vulnerable categories of professionals to develop stress and other problems due to the nature of their job. Thus the objective of this study is to describe the perceived stress experienced during the COVID-19 pandemic among Malaysian nurses. A cross-sectional study was conducted through an online form involving 319 randomly selected nurses from a teaching hospital on the east coast of Pahang, Malaysia, between January to December 2022. The perceived stress was measured using the Malay version 10-item Perceived Stress Scale, PSS-10 questionnaire. Descriptive and linear regression analysis was applied to measure the mean score of perceived stress and the association between perceived stress scores and other factors in this population. The study found that the total mean score of PSS-10 among the respondents was 19.1 ± 5.8. The three items with the highest mean scores were under the subscales "lack of self-efficiency" of the questionnaire (item-4, item-7, and item 5), while the item with the lowest mean scores belonged to subscales "perceived helplessness" (item-10). However, further analysis performed shows no significant association between perceived stress towards COVID-19 with sociodemographic and work-related factors among respondents. This study concluded that lack of self-efficiency was perceived as the main stress experienced by Malaysian nurses during the COVID-19 pandemic. Thus, it is pivotal that the nurse's manager and higher authority of the organization focus on improving the efficiency of these nurses through targeted programs focusing on problem-solving, emotional and on-the -job management plan, along with accessibility to resources, a positive work environment and support.

Keywords: Perceived Stress, Pandemic, Nurses.

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1. INTRODUCTION

Stress classically refers to "the bodily processes that result from circumstances that place physical or psychologic demands on an individual". Although a certain degree of stress can facilitate task performance, it becomes problematic when the demands outweigh the perceived resources to cope (Selye, 1973; Folkman & Lazarus, 1988). Similarly, World Health Organization, WHO defines stress as any type of change that causes physical, emotional, or psychological strain; or the reaction people may have when presented with demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope. Additionally, it may also cause negative and positive emotions and has both physical and mental effects (Ersöğütçü & Şener, 2019; WHO, 2023).

It is an undeniable fact that the COVID-19 pandemic has leave a massive impact on human populations globally. Focusing on Malaysia, even though the country is recognized as one of the countries that have successfully controlled the pandemic, thanks to the efficient public health system, it still experiences the same massive impacts of this pandemic. As a results, the number of job retractions and business losses keep on rising day by day. The situations were made worse by the second and third wave of this pandemic. The continuum of the scenario were the socioeconomic and health impacts of the population. Addressing on a healthcare, with the increase health and disease burden as a direct and indirect impact of the pandemic, the job expectations such as long hours of work, lesser day-off, shrinking staff numbers during each shift due to compulsory quarantine, especially when they are suspected to be in contact with a positive patient, unclear or administrative instructions which keep on changing, worrying about family members at home, aging parents etc, has made the impacts to be even more pronounced (Zhan, et al., 2020; Llop-Gironés et al., 2021; ASPE, 2022; Wanninayake, O'Donnell & Williamson, 2022).

Zeroing on nurses, they uninterruptedly continued to work in such a critical situation, taking the risk to be affected by COVID-19 makes them one of the most vulnerable categories of professionals to develop psychological stress and other mental health symptoms. Previous studies even shows that majority of the healthcare workers reported a perceived stress towards, and as a result of; working during the COVID-19 pandemic for a prolonged period of time. Thus, understanding the immediate mental health and psychological response of the healthcare providers after a public health emergency is important for implementing better prevention and response mechanisms to a disaster (Babore et al., 2020; Chekole, Yimer, Mekonnen, & Mekuriaw, 2020; King, Farrington, Donohue, & McCann, 2021; Aloweni, Ayre, Teo, Tan, & Lim, 2022).

In term of measurement, the current study is using the Perceived Stress Scale (PSS), one of the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. The PSS was designed for use in community samples with at least a junior high school education. The items are easy to understand, and the response alternatives are simple to grasp. Moreover, the questions are of a general nature and hence are relatively free of content specific to any subpopulation group. In interest of using the most adaptable version of the questionnaire, the Malay version of PSS-10 will be used for this study. These versions of questionnaire have also been reliably used among a varied of populations including patients and other specific populations (Al-Dubai, Barua, Ganasegeran, Ali Jadoo, & Rampal, 2014; Sandhu, Ismail & Rampal, 2015; Siang, et al., 2016; Ibrahim, Cham, Chu, Kalaman, & Siau, 2023). Therefore, this study aims to describe the perceived stress experience by the nurses during the pandemic COVID-19 among the Malaysian nurses.

2. RESEARCH METHOD

The study was conducted as an online cross-sectional study whereby data collections were elicited using self-filled online questionnaire between January to December 2022. A list of all registered nurses obtained from the hospitals administration office was used as the sampling frame. Respondents were then randomly selected from this sampling frame using Excel randomly generated numbers.

All selected nurses who were a registered employee of IIUM Sultan Ahmad Shah Medical Centre@IIUM (SASMEC@IIUM), Pahang, Malaysia either on permanent or contract basis, or nurses who were an employee of other organization (eg ministry of health) but currently doing nursing work as part of his or her post basic or post graduate clinical attachment were recruited as the participants of this study. Meanwhile, undergraduate nursing students and those who were a known case of or been diagnosed and treated as having mental related problems, including depression, stress or anxiety, were excluded from the study

The sociodemographic data collected were explained in detail in a previous paper which was conducted to study the perceived threat and coping mechanism adopted among this population (Pasi, Kamaruzaman, & Basri, 2022). In a nutshell, the data encompassed the information on social and demographic characteristics, work related information and on history of contact with positive COVID-19 patient while on duty.

On the measurement of respondents' perceived stress, the Perceived Stress Scale, PSS developed by Cohen, Kamarck and Mermelstein (1983) is a widely used self-report measure assessing "the degree to which situations in one's life are appraised as stressful". The scale measures, over the past month, the degree to which life has been experienced as unpredictable, uncontrollable, and overloaded. Due to the low factor loadings on four items, the scale's original 14 items were subsequently reduced to 10 by Cohen and Williamson (1988), which slightly increased the scale's reliability as measured by Cronbach's alpha (ranging from 0.67 to 0.91). For telephone interviews or other time-constrained circumstances, a further 4-item version was created; however, it has not performed as well as the full 14- and 10-item versions (Cohen & Williamson, 1988).

The PSS-10's Malay version was the same validated version that was used in previous research among Malaysian medical students (Al-Dubai et. al. 2014). The PSS-10 measures the degree to which one perceives aspects of one's life as stressful. It has a 5-point Likert scale and response ranged from 0 (never) to 4 (very often), indicating how often they have felt within the past month. Total scores range from 0 to 40, with higher scores indicating greater perceived stress. Six out of 10 items of the PSS-10 were considered negative (1, 2, 3, 6, 9 and 10) and the remaining four as positive (4, 5, 7 and 8), representing "perceived distress" and "perceived coping," respectively. The Cronbach's alpha values for Malay versions of the scale were reported to be between 0.70 to 0.85.

The study was approved by the university's research ethical committee and SASMEC@IIUM research committee. A general description, including an informed consent form, was posted through email and WhatsApp messaging. Respondents had been assured that all the information would be kept confidential. Additionally, the grant to finance the conduct of this study was awarded by the Sultan Ahmad Shah Medical Centre@IIUM, SASMEC Research Grant 2021 (Project ID: SRG21-004-0004).

Regarding analysis, data collected was analyzed using the IBM SPSS Statistics for Windows, Version 26.0. All continuous variables were described using mean (SD) and / or median (IQR) whereas for categorical data as frequency (%). Univariate and multiple linear regression were applied to assess the association between perceived stress scores towards COVID-19 with other factors in this populations.

3. RESULTS AND DISCUSSION

This study was conducted to explore the perceived stress experienced by nurses during the COVID-19 pandemic among Malaysian nurses.

Table 1. Respondents sociodemographic and work characteristic (N=319).

Sociodemographic characteristic	n	Mean (Standard deviation)	Percentage
Age (years)	319	28.8 (5.1) (minimum= 22, maximum= 63)	
Ethnic group			
Malay	309		96.9
Indian	2		0.6
Bumiputera Sabah	7		2.2
Other (Eurasian)	1		0.3
Marital status			
Single	136		42.6
Married	182		57.1
Divorcee	1		0.3
No of living child		1(1) (minimum=0, maximum= 5)	
Highest formal education			
Attained			
Diploma	303		95.0
Degree	15		4.7
Master	1		0.3
Household income/ month (RM)			
Median		RM 3,100	
Interquartile range			
25%		RM 2,500	
50%		RM 3,100	
75%		RM 5,000	
Total no of household		4 (2) (minimum= 1, maximum= 12)	
Total no of years' services as nurse (years)		3.0 (2.4) (minimum= 1, maximum= 17)	
Total no of years working in the current ward/ unit (years)		2.5 (1.9) (minimum= 1, maximum= 14)	
No of days on night duty in this past 1 week (days)		1(1) (minimum=0, maximum= 3)	
No of days-off in this past week (days)		2 (1) (minimum=0, maximum= 3)	

History of contact with positive COVID-19 patient while on duty?		
Yes	192	60.2
No	127	39.8

Table 1 present the sociodemographic and work characteristic of the respondents. The response rate for this study was found to be 91.1% (319 out of the 350 calculated sample size) with all being Muslim and more than ninety percent were Malay female (96.9%, 94.6%). Married and single respondents were equally represented with mean number of households of four and one for child. The median household income was reported at equivalent to about USD 700.00 per month with 90.0% attained highest education at the diploma level. In term of work, their mean year of service as nurse was three years and being at their current ward or unit for about more than two years. Additionally, more than sixty percent reported history of contact with positive COVID-19 patents while on duty.

Table 2. Perceived Stress Scale, PSS-10 Mean Scores among respondents (N=319).

PSS-10 Items (In the last month, how often)	**Mean ± Standard deviation**
PSS-10: Item 1 …have you been upset because of something that happened unexpectedly?	1.89 ± 0.97
PSS-10: Item 2 …have you felt that you were unable to control the important things in your life?	1.61 ± 0.95
PSS-10: Item 3 ... have you felt nervous and stressed?	1.86 ± 0.96
PSS-10: Item 4 …have you felt confident about your ability to handle your personal problems?	2.29 ± 0.90
PSS-10: Item 5 …have you felt that things were going your way?	2.10 ± 0.84
PSS-10: Item 6 …have you found that you could not cope with all the things that you had to do?	1.66 ± 0.86
PSS-10: Item 7 …have you been able to control irritations in your life?	2.27 ± 0.87
PSS-10: Item 8 …have you felt that you were on top of things?	2.06 ± 0.78
PSS-10: Item 9 …have you been angered because of things that happened that were outside of your control?	1.76 ± 0.95
PSS-10: Item 10 …have you felt difficulties were piling up so high that you could not overcome them?	1.59 ± 0.95
Total mean PSS-10 scores	19.08 ± 5.77

Table 2 describes the perceived stress related to COVID-19 among respondents. The total mean score of PSS-10 among the respondents was 19.1 ± 5.8. The item with the highest mean score was item- 4 (… [in the last month] how often have you felt confident about your ability to handle your personal problems?) with mean score of 2.29 ± 0.90 followed by item- 7 (… [in

the last month] how often have you been able to control irritations in your life?) and item-5 (… [in the last month] how often have you felt that things were going your way?...) with mean score of 2.27 ± 0.87 and 2.10 ± 0.84 respectively. The lowest mean perceived threat was item-10 with mean score of 1.59 ± 0.95 (… [in the last month] how often have you felt difficulties were piling up so high that you could not overcome them?...).

A further analysis was performed to investigate if there are any association between perceived stress towards COVID-19 with sociodemographic and work-related factors among respondents of this study. Lamentably, results revealed that there were no significant association between perceived stress towards COVID-19 with any of these variables (results were not shared here). Thus, no further analyses were performed.

As explained above, the analysis revealed that the total mean score of PSS-10 among the respondents was 19.08 ± 5.77. Out of the 10 items listed in the scale, item number four which asked "(… [in the last month] have you felt confident about your ability to handle your personal problems?" scored the highest mean of 2.29 ± 0.09. This item focuses on personal problem as the highest perceived stress among nurses in this study. Despite its significant role, not many researchers were interested on highlighting the negative effect of personal problems on the workplace. However, it is important to note that without proper intervention, the personal problem has the potential to spill over into the workplace, which resulted in not only magnifying the existing other stressor among this healthcare workers, but also may even cause adverse effect in patient care (Bhui, Dinos, Galant-Miecznikowska, de Jongh, & Stansfeld, 2016; Khamisa, Peltzer, Ilic, & Oldenburg, 2017; Yu, Raphael, Mackay, Smith, & King, 2019).

The second highest mean score of PSS-10 item recorded among the respondents was the item number seven which asked "(… [in the last month] how often have you been able to control irritations in your life?)?" with the score of 2.27 ± 0.87. This item focuses on the ability of respondents to control irritations, which he or she perceived as one of the main contributors of stress in their life. Irritations which is a state of feeling annoyed or angry, could arise or experienced by nurses when they perceived that they were subjected to a discriminatory situation, either in a form of treatment by patients, colleagues, or superiors. Often nurses must suppress or avoid expressing their irritations, a situation known as emotional dissonance, whereby there is a difference between the emotions they experience and those they need to express. This in turn causes them to feel stress, helpless, frustrated or even resentment (Han, Won, Kim, & Lee, 2015; Yun & Yoo, 2021, Cybulska et al., 2022).

The third highest mean score of the PSS-10 item among these respondents was item number five which asked (… [in the last month] how often have you felt that things were going your way?) with the score of 2.10 ± 0.84. This item highlighting the nurses concern on how their performance and their ability to follow through and proceed according to theirs or their manager has planned can itself become a stressor for them. The nature of their work with complex job demands and needs, high expectations, excessive responsibility, and minimal authority will easily be causing what was carefully planned to be going in the opposite directions. Eventually the magnitude of the problem causes them to end up feeling overwhelmed, and it is significant enough to be one of the high-perceived stressors for their works environment (Jacobs and Lourens 2016; Jäppinen, Roos, Slater, & Suominen, 2021; Babapour, Gahassab-Mozaffari, & Fathnezhad-Kazemi, 2022).

It is interesting to note that the three items with the highest mean score of the PSS-10 among this population, which is items four, five and seven were all fall under the same subscales of the questionnaire. And even more interesting is that even though it was not discussed above, the fourth highest item's mean score was coincidently item number eight, which is the last four item within the mentioned subscale. These four items (items four, five, seven and eight) were known as the subscales for "lack of self-efficiency" which measuring an individual's perceived inability to handle problems. As a comparison, the other six items of the

scales (items one, two, three, six, nine and ten) belongs to the subscales of "perceived helplessness" that measuring an individual's feelings of a lack of control over their circumstances or their own emotions or reactions. All these items have much lower mean scores (range from 1.89 to 1.61) as compared to the four items under the initial subscale. Thus, it can be concluded that nurses in this study have a strong control over the situation, and able to adapt their work and emotions accordingly during the pandemic. However, when it comes to perceiving their efficiency in handling the repetitive and multiple problems related to the pandemic which include but not limited to both personal and job-related problem, it causes significant stress to them (Roberts & Grubb, 2014; Soudagar, Rambod, & Beheshtipour, 2015; Khomami and Rustomfram, 2019).

It is substantial to mention a few of the limitations faced by this study. Firstly, it will not be possible to accurately determine any causal relationships among variables, owing to the design of this study which is a cross sectional. Secondly, data collection was carried out through a self-filled online questionnaire. Thus, make it prone to information bias. Thirdly, the current study was conducted when the country already facing out and moving towards the endemic phase of COVID-19. Therefore, it may confound the effect on the variables of this study. And lastly, the sample population of this study came from a single center, which is a teaching hospital in Pahang, Malaysia. Hence, the results must be interpreted with cautious if it is to be applied to a population from different setting and background. Nevertheless, the findings may be useful in improving the organization management by implementing a suitable programmed for nurses.

4. CONCLUSION

Findings of the current study show that lack of self-efficiency which encompasses ability to handle problems, control irritation and carried out task as planned were perceived as the main stress experienced by Malaysian nurses during the pandemic COVID-19. Thus, it is pivotal that the nurse's manager and higher authority of the organization focuses on improving the efficiency of these nurses, through targeted programme focusing on problem solving, emotional and on-the-job management plan, along with accessibility to resources, positive work environment and supports.

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RESEARCH **Open Access**

The Effectiveness of Ladder Climbing Games on The Knowledge, Attitude, and Practice of Sorting Waste

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Abstract

Students' environmental knowledge is strongly related to environmental attitudes and behavior changes, which impact environmental sustainability. Game media is one of the student environmental learning methods. The study aims to evaluate two types of games (Ladder climbing and Trash trees) to increase elementary school students' knowledge, attitudes, and practices (KAP) in waste sorting. The study used a non-equivalent control group design involving 156 elementary school students in grades 4 and 5. All participants were grouped into ladder climbing games/LCG (n=156) and trash trees/TTG (n=156), then an assessment of knowledge, attitude, and practice (KAP) before and after the trial. All data were analyzed with statistical software (Alpha=0.05), with the Wilcoxon and Mann-Whitney tests. The N-Gain scores test is also applied to get the effectiveness value. The study found that most participants were aged 10 and 11 years (88.8%), and there were more female students (55.2%) than males. LCG intervention improves KAP (135.45%, 47.71%, and 92.59%) more than TTG (54.39%, 21.95%, and 54.51%). Significantly, there were differences in KAP values before and after the intervention and between the two types of intervention (p-value <0.05). Study has also found that the LCG method is more effective than the TTG (N-Gain score > 70%). The study has proven that the game method (LCG and TTG) can improve students' KAP in waste sorting. However, the LCG method is more effective than the TTG. The game method is a wise choice to apply to elementary school education so that it is expected to shape environmental behavior.

Keywords: Game, KAP, Ladder Climbing, Trash Tree, Waste.

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1. INTRODUCTION

Waste is the residue of human activities or natural processes in solid form (Pemerintah Indonesia, 2008). Community consumption patterns contributed to the causes of waste in Sleman in 2018 of 8,000 m^3 per day (Pemerintah Daerah Kota Yogyakarta, 2018). According to Kementerian Kesehatan Republik Indonesia, (2014), one of the indications of a community living clean and healthy is managing waste. Waste management must be carried out comprehensively and integrated from upstream to downstream. The upstream aspect is waste management activities at the generation (source) level and sorting waste (Sucipto, 2012).

Primary education plays a vital role in shaping environmental behavior. The students' low environmental knowledge is related to the teacher's lack of practical experience in sustainable waste management for environmental sustainability. Environmental sustainability can be achieved when environmental attitudes, environmental awareness, and environmental knowledge are connected or communicated from teachers to students (Adeolu, Enesi, & Adeolu, 2014; Debrah, Vidal, & Dinis, 2021; Kwan & Stimpson, 2003; Pavlátová, 2017). According to Yusuf & Nurihsan (2006), elementary period can be called an intellectual stage, which is a realistic stage, curious about something and learn. Games are a way of learning that can be done in elementary schools to increase students' knowledge and understanding, which will then shape behavior (Basiroen, Purbasari, & Yuliana, 2021; Dzakirotillah, Suwerda, & Istiqomah, 2018; Frost & Wortham, 2021; Jørgensen, Madsen, & Læssøe, 2018; Kamid, Sofnidar, Septi, & Citra, 2021; Munthe, 2020; van Amstel & Teixeira Carneiro, 2020; Yudianto, Mukarromah, & Yani, 2012). Several studies have also reported that knowledge interventions on how to sort waste through games have been able to improve knowledge and practice of good waste sorting (Dzakirotillah et al., 2018; Gunn & McCallum, 2005; Pavlátová, 2017; Solikha, Suchainah, & Rasyida, 2020; van Amstel & Teixeira Carneiro, 2020).

A preliminary study was conducted on January 5, 2021, with 20 students (10 students in grade IV and 10 students in grade V at SD Negeri Kanoman) by providing questions about waste, types of waste, and waste segregation practices. The preliminary study results found that 17 (out of 20 students) knew the meaning of waste, and only 5 (out of 20 students) knew the type. Even though 18 (out of 20 students) stated that they could sort waste, the practical results showed that waste was still mixed based on its type. The study results also found that the school has provided different trash cans according to the type, but students have yet to sort waste properly.

Several learning methods at the school-age stage include speeches, interactive games, puzzles, matching, and role play (Frost & Wortham, 2021; Kamid et al., 2021; Mustafa & Yusoff, 2011; van Amstel & Teixeira Carneiro, 2020). Games provide several stimuli for children to increase their knowledge about environmental health problems (Dzakirotillah et al., 2018; Fitriastuti, 2015; Gunn & McCallum, 2005; Munthe, 2020; Oktaviani, Kertin, Dahliani, & Komalasari, 2022; Yudianto et al., 2012). Games are also a form of recreation and can benefit children's development (Frost & Wortham, 2021; Ivy, Road, Lee, & Chuan, 1998; Jørgensen et al., 2018; Mustafa & Yusoff, 2011; Yusuf & Nurihsan, 2006).

One game that aims to improve students' knowledge, attitudes, and practices (KAP) in waste sorting is the Trash-Tree Game (TTG). According to Aini (2020), TTG can significantly increase the value of knowledge (56.34%), attitude (26.61%), and practice (146.39%). Although the research results have generally yielded encouraging results, the increase in the value of knowledge and attitudes is still low, possibly due to the lack of student participation in the game. According to Gunn & McCallum (2005), games should be able to attract students' interest to be actively involved and interact with each other, so that the impact on increasing knowledge, attitudes, and skills.

In this study, Ladder-climbing games (LCG) were developed. This game is similar to the snack and ladder games but differs in the design of the board game. This game contains the meaning and types of waste, how to sort waste and the appropriate trash can. The study aims to evaluate the effectiveness of two game interventions (Ladder-climbing games/LCG and Trash-tree games/TTG), to increase students' KAP in sorting waste.

2. RESEARCH METHOD

This study is a quasi-experimental study with a non-equivalent control group design. The study was conducted in March-July 2021 after obtaining approval from the Health Research Ethics Committee, Politeknik Kesehatan Kementerian Kesehatan Yogyakarta (No.LB.01.01/KE-01/VIII/282/2021). Guided by the Helsinki protocol, consent is taken, and data handling is confidential. There is no risk of harm to participants, participants have the right to withdraw during the study, and all procedures are explained before intervention.

This study involved 116 students from SD Negeri Kanoman and SD Negeri Patran, Bantul Regency, Yogyakarta. The determination of the two schools is purposive, considering the similarities in their characteristics (location, school status, and curriculum). Randomly, SD Negeri Kanoman was in LCG, and SD Negeri Patran was assigned to TTG. Each school randomly selected 58 fifth and sixth-grade students. The determination of fifth and sixth graders as research subjects follows Djamarah (2011), that students are 9-12 years old, already have realistic observations, can think critically and logically, and have a high curiosity. All participants were grouped into two groups (LGC and TTG). This game contains sorting waste, including types of waste, sorting, collecting, and processing.

Data collection uses a written test to measure knowledge and attitudes and a checklist to measure sorting waste practices. The tools used in the study were: 1) questions to measure knowledge and attitudes, 2) a checklist to measure practices, 3) LCG and TTG equipment, and 4) samples of organic, inorganic, and hazardous waste.

The study was carried out starting with the pre-test to measure students' KAP before the intervention, the waste sorting education intervention with two types of games (LGC and TTG), and the post-test to measure the effect of the intervention on students' KAP. The measurement procedure for the post-test is the same as for the pre-test and uses the same questions. The post-test was carried out after all participants received education on waste sorting using the game method. The difference between the pre-post scores and the post-test average measures changes in KAP.

Knowledge is students' understanding of types of waste, types of waste containers, and how to sort waste. Knowledge is measured using 12 written questions in multiple-choice form. Measurements were made once in the pre-test and three times in the post-test. Correct answers get a value of 1, and wrong answers get 0.

Attitude is the student's response and acceptance of statements about sorting waste according to its type. The attitude was measured with ten written questions using a Likert Scale of five favorable and five unfavorable statements. In a favorable statement, a value of 1 if choosing "agree" and 0 if "disagree". The assessment is the opposite of the unfavorable statement. Attitudes were measured once in the pre-test and three times in the post-test.

Practice is the action taken by students in sorting waste. The measurement is carried out using a checklist which the author will fill in based on the respondent's practice in sorting the waste samples provided. If the respondent is correct in placing the waste, he will get a value of 1; if he is wrong, he will get a value of 0. The maximum score obtained is 6. The practice of sorting waste is measured with a pre-test and three post-tests. Waste sorting education is carried out with two types of games, namely LCG (experiment) and TTG (control). Participants in each type of game are divided into 5-6 groups. Each group can play one type of game (three repetitions) according to the previously described game instructions.

Data is entered into statistical software after being checked for completeness, edited, and coded. Then performed univariate and bivariate analysis. Univariate to obtain the characteristics of each variable. Bivariate to assess the effect of the intervention.

Before the bivariate test stage, a normality test (Kolmogorov-Smirnov Test) was carried out to determine the data distribution. The Wilcoxon test was applied to determine differences in variable values (KAP) before and after the intervention. Meanwhile, the Man-Whitney test was used for differences in variable values (KAP) between the two types of intervention (LCG and TTG). The analysis was performed at a 95% confidence level ($\alpha = 0.05$).

In the final section, n-Gain scores are analyzed to evaluate the effectiveness of the intervention method (LCG and TTG) to increase KAP. N-Gain scores are calculated based on the difference between the pre-test and post-test values against the ideal score. The interpretation of the N-Gain scores is: "High-g" courses as those with (<g>) > 0.7; "Medium-g" courses as those with 0.7 > (<g>) > 0.3; "Low-g" courses as those with (<g>) < 0.3 (Hake, 1999; Sihaloho, Sahyar, & Ginting, 2017; Solikha et al., 2020).

3. RESULTS AND DISCUSSION

Table 1. Characteristic of participants

Characteristics	**LCG n (%)**	**TTG n (%)**	**N (%)**
Gender			
Male	28 (48.3)	24 (41.4)	52 (44.8)
Female	30 (51.7)	34 (58.6)	64 (55.2)
Age (years)			
9	8 (13.8)	2 (3.4)	10 (8.6)
10	25 (43.1)	26 (44.8)	51 (44.0)
11	24 (41.4)	27 (46.6)	51 (44.0)
12	1 (1.7)	2 (3.4)	3 (2.6)
13	0 (0.0)	1 (1.7)	1 (0.9)

A total of 116 students participated in the study, half in the LCG group and the rest in the TTG group. Table 1 shows more female participants (55.2%) than males. Most participants (88.8%) were aged 10 and 11 years. The lowest age is nine years, and the highest is 13 years.

Table 2. Average of Pre and post-test scores

Intervention	**Variable**	**Pre-test (Min-max)**	**Post-test (Min-max)**	**Increase (%)**
LCG	Knowledge	4.3 (1.0-8.0)	10.3 (7.0-12.0)	135.45
	Attitude	6.0 (2.0-8.0)	8.9 (6.0-10.0)	47.71
	Practice	2.8 (0.0-5.0)	5.4 (3.3-6.0)	92.59
TTG	Knowledge	4.9 (3.0-9.0)	7.6 (4.0-11.0)	54.39
	Attitude	7.1 (3.0-9.0)	8.7 (5.0-10.0)	21.95
	Practice	2.9 (0.0-5.0)	4.5 (2.0-6.0)	54.51

In the LCG group (Table 2), the student knowledge increased by 135.45%, from 4.3 (1.0-8.0) to 10.3 (7.0-12.0). Student attitudes increased by 47.71%, from 6.0 (2.0-8.0) to 8.9 (6.0-10.0). Meanwhile, in practice, there was an almost double increase (92.59%), from 2.8 (0.0-5.0) to 5.4 (3.3-6.0).

Even though it shows an increasing trend, the increase in TTG interventions is smaller than that of LCG (Table 2). The students' knowledge scores increased by 54.39%, from 4.9

(3.0-9.0) to 7.6 (4.0-11.0). Attitude increased from 7.1 (3.0-9.0) to 8.7 (5.0-10.0), or 21.95%. The practice increased by 51.51%, from 2.9 (0.0-5.0) to 4.5 (2.0-6.0).

Table 3. Normality test results.

Intervention	Variabel	Pre-test		Post-test	
		p-value	Interpretation	p-value	Interpretation
LCG	Knowledge	0.000*	Non-normal	0.000*	Non-normal
	Attitude	0.000*	Non-normal	0.000*	Non-normal
	Practice	0.016*	Non-normal	0.000*	Non-normal
TTG	Knowledge	0.000*	Non-normal	0.009*	Non-normal
	Attitude	0.000*	Non-normal	0.000*	Non-normal
	Practice	0.000*	Non-normal	0.000*	Non-normal

A normality test was performed with the Kolmogorov Smirnov. The analysis results (Table 3) show that the values of all variables (KAP) in both types of intervention are non-normal distributed (p-value <0.05). Based on the results of this test, bivariate analysis was performed using non-parametric statistics, using the Wilcoxon and Mann-Whitney tests.

Table 4. Wilcoxon's test results.

Intervention	Variable	Pre-test (Min-max)	Post-test (Min-max)	p-value
LCG	Knowledge	4.3 (1.0-8.0)	10.3 (7.0-12.0)	0,0001
	Attitude	6.0 (2.0-8.0)	8.9 (6.0-10.0)	0,0001
	Practice	2.8 (0.0-5.0)	5.4 (3.3-6.0)	0,0001
TTG	Knowledge	4.9 (3.0-9.0)	7.6 (4.0-11.0)	0,0001
	Attitude	7.1 (3.0-9.0)	8.7 (5.0-10.0)	0,0001
	Practice	2.9 (0.0-5.0)	4.5 (2.0-6.0)	0,0001

KAP measurements were carried out once in the pre-test and three repetitions in the post-test. In the LCG method (Table 4), there is a significant difference in KAP scores before and after the intervention (p-value <0.05). Intervention with TTG also showed a significant difference.

Table 5. Man-Whitney and N-Gain score test results.

Variables	Intervention	p-value	N-Gain score	Category
Knowledge	LCG	0.0001*	0.77	High
	TTG		0.38	Medium
Attitude	LCG	0.0001*	0.73	High
	TTG		0.53	Medium
Practice	LCG	0.0001*	0.81	High
	TTG		0.52	Medium

The Man-Whitney test results (Table 5) show a significant difference in knowledge between the LCG and TTG methods (p-value <0.05). Similarly, the Attitude and Practice variables also show significant differences (p-value <0.05).

The results of the analysis of N-Gain scores (Table 5) show that the LCG method is more effective for increasing knowledge about waste sorting (N-Gain scores = 0.77) compared to the TTG method (N-Gain scores = 0.38). Likewise, in attitude and practice, the LCG method is more effective (N-Gain scores = 0.73 and 0.81) than the TTG method (N-Gain scores = 0.53 and 0.52). These results conclude that the LCG method is more effective than the TTG in improving KAP students' waste sorting.

The study results (Table 2) show that LCG can increase students' knowledge in sorting waste by 135.45%, or from 4.3 (1.0-8.0) to 10.3 (7.0-12.0). The results of the statistical analysis (Table 4) proved a significant difference between the pre and post-test (p-value <0.05). Although TTG also increased students' knowledge, the increase in knowledge scores was only 54.39%, from 4.9 (3.0-9.0) to 7.6 (4.0-11.3).

The Man-Whitney and N-Gain scores test identified a comparison of the two methods (Table 5). Both methods showed significant differences (p-value <0.05). N-Gain scores analysis shows that the value of the LCG method is 77.0%, while the TTG is 38.0%. These results prove that the LCG method is more effective for increasing knowledge of waste sorting than TTG. N-Gain scores > 70% indicate that the intervention method is in the effective category (Hake, 1999; Sihaloho et al., 2017; Solikha et al., 2020).

Knowledge is the result of one's knowledge of objects through the five senses they have. The ears and eyes are senses that have more influence on one's knowledge (Notoatmodjo, 2014). Knowledge is essential in determining behavior and influencing decision-making (Samdin, Bakori, & Hassan, 2012). LCG makes respondents actively use their eyes and ears in playing games. The eyes see every step and question card, and the ears listen to the questions. Coordination of the two senses increased respondents' knowledge in sorting waste compared to the TTG method.

Games are designed with attractive pictures and writing, so players can understand and memorize them quickly. In the game, players are required to win the competition actively. If unable to answer the question, the player cannot advance to the next step. Games have rules, goals, choices, challenges, points, and criteria for winning or losing (Prensky, 2007). Games are a stimulus that can be given to children to increase knowledge about health problems in their environment (Yudianto et al., 2012).

Several studies have reported the game method to increase students' knowledge. Three-dimensional box games can increase students' waste sorting knowledge by around 5.13% (Munthe, 2020), sorting card games can increase students' knowledge by 55.14% (Dzakirotillah et al., 2018), and TTG can increase by around 56.34% (Aini, 2020). Compared to the previous game, the LCG method can improve students' knowledge better (135.45%).

The effect of the game method (Table 2) shows that LCG can improve student attitudes by around 47.71%, from 6.0 (2.0-8.0) to 8.9 (6.0-10.0). Meanwhile, the TTG increased by around 21.95%, from 7.1 (3.0-9.0) to 8.7 (5.0-10.0). The two-game methods significantly (p-value <0.05) have a changing effect on students' attitudes in sorting waste (Table 4). However, the LCG method (Table 5) shows higher effectiveness (N-Gain scores = 73.0%) than TTG (N-Gain scores = 53.0%).

Attitude is a way of thinking or feeling about something that can cause changes in behavior (Fitriastuti, 2015; Frost & Wortham, 2021; MacBlain, 2018; Notoatmodjo, 2014). It also depends on a person's beliefs about the results of his actions, whether positive or negative (Gunn & McCallum, 2005). In the game, indications of attitude can be seen from players' efforts in answering right and wrong questions (Mustafa & Yusoff, 2011). In LCG, the communication element is contained in the question cards that must be answered correctly to play to the end. For that, players must be active and compete in answering questions. In answering, respondents can provide ideas and responses in providing answers.

LCG increased attitude by around 47.71%, while TTG increased by 21.95%. The results showed that the LCG method had a more significant impact on improving students' attitudes toward sorting waste. According to Gunn & McCallum (2005), games are another way to help students learn. Knowledge alone is not enough to motivate individuals to change their behavior, but a strong positive attitude will maintain certain behaviors in the long term (Dzakirotillah et

al., 2018; Mustafa & Yusoff, 2011). According to Adeolu et al. (2014), every activity must begin with adequate knowledge, which will drive attitude change.

In this study (Table 2), an increase in aspects of training with LCG was obtained by around 92.59%, from 2.8 (0.0-5.0) to 5.4 (3.3-6.0). Meanwhile, the TTG was around 54.51%, from 2.9 (0.0-5.0) to 4.5 (2.0-6.0). Statistically, there was a significant difference between before and after the intervention (p-value <0.05). These results indicate that the LCG method provides a more significant effect than TTG.

Table 5 shows that the effect of practice in sorting waste from the two-game methods is significantly different (p-value <0.05). However, the LCG method shows higher effectiveness (N-Gain scores = 73.0%) than TTG (N-Gain scores = 53.0%). LCG method can be applied to improve KAP students in sorting waste.

The study results confirmed the previous study that the game method can improve students' KAP in sorting waste. The results presented by Dzakirotillah et al., (2018) with the sort card game method, Munthe (2020) with a three-dimensional box game, and Aini (2020) with a trash tree game.

Training is a personal process after a stimulus, assessment, or opinion of what they know (Frost & Wortham, 2021; MacBlain, 2018; Notoatmodjo, 2014). Games provide several stimuli to children to increase their knowledge, attitudes, and practices regarding health issues (Frost & Wortham, 2021; Gunn & McCallum, 2005; Notoatmodjo, 2014; Oktaviani et al., 2022; Yudianto et al., 2012). In addition, games are also a form of recreation that is beneficial to the psychological development of children (Frost & Wortham, 2021; Jørgensen et al., 2018; MacBlain, 2018; Mustafa & Yusoff, 2011; Yusuf & Nurihsan, 2006).

According to Notoatmodjo (2014), several methods are used in health promotion, including the game method. Games in learning have several advantages in that they can help improve students' cognition, which ultimately shapes behavior (Frost & Wortham, 2021; MacBlain, 2018). Three main factors determine behavior: predisposing, enabling, and reinforcing (Green, Kreuter, Deeds, & Partridge, 1991; Notoatmodjo, 2014). Predisposing are attitudes, knowledge, beliefs, values, and personality factors influenced by individual or group motivation. Enabling factors are factors that allow a behavior to occur. Enabling factors are also supporting factors, including facilities or infrastructure, environmental conditions, and community resources in the environment (Kreuter et al., 2007; Kreuter & Wray, 2003).

In this study, education using the game method was carried out in three replications to increase students' understanding of waste sorting. According to Bandura (1977), one of the learning phases is the retention phase. In the retention phase, the subject matter will be remembered for a long time if repeated. Retention is storing new understandings and behaviors obtained after receiving information. Giving information that is done repeatedly affects the survival of the material that has been studied.

4. CONCLUSION

The study results prove that the game method can improve students' KAP in environmental management. However, the LCG method had a better effect on increasing KAP (135.45%, 47.71%, and 92.59%) than TTG (54.39%, 21.95%, and 54.51%). The N-Gain Score analysis (> 70%) has also proven that the LCG method is more effective for increasing the KAP of elementary school students in sorting waste. The change in the tutorial teaching method to a game method in environmental education for elementary school children is highly expected so that environmental behavior is formed from an early age.

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RESEARCH **Open Access**

The Effect of Dayak Onion Extract (*Eleutherine palmifolia (L.) Merr*) on Swimming Time and Oxidative Stress Levels in Mice with the Forced Swimming Test Model

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Abstract

Excessive physical exercise can increase the occurrence of oxidative stress, which is characterized by cell damage caused by free radicals. Antioxidants found in Dayak Onion such as flavonoids, saponins, tannins, and vitamin C can be used as alternative ingredients to neutralize free radicals. The purpose of this study was to determine the effect of dose and duration of administration of Dayak onion extract on malondialdehyde (MDA) levels in a rat model of the forced gum test, extraction of Dayak onions using 96% ethanol. The type if research is Randomized Pre and Post Test Control Group Design. Male Sprague Dawley rats aged 2 months (weighing 150-200g) were divided into 5 groups: K- (control group, rats not given Dayak Onion extract but underwent forced swimming test), K+ (rats given xanthine and forced swimming test), P1 (rats given Dayak Onion extract at a dose of 50 mg/200 rats body weight/day), P2 (rats given Dayak Onion extract at a dose of 100 mg/200 rats body weight/day), P3 (rats given Dayak Onion extract at a dose of 200 mg/200 rats body weight/day). Dayak Onion extract was administered for 21 days with for 21 days with forced swimming test treatment, and changes in MDA levels were observed. The results showed that the administration of Dayak onion extract at a dose of 50 mg/200 rats/day, 100 mg/200 rats/day, and 200 mg/200 rats/day had an effect on preventing the increase in MDA, but at a dose of 200 mg/200 rats mice/day is the optimal dose. The conclusion is administration of Dayak Onion (Eleutherine Palmifolia (L.) Merr) significantly decreased MDA levels in male Sprague Dawley rats with forced swimming test model.

Keywords: Dayak Onion, Antioxidant, MDA, Forced Swimming Test.

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1. INTRODUCTION

Humans spend a large portion of their waking hours being physically active, around 85-90% (Dewi et al., 2016). The physical activity as any movement that involves the skeletal muscles and requires energy expenditure (Westerterp, 2013). With the increasing demands of modern life, including the need to work harder to maintain one's livelihood, physical activity in the work setting continues to rise (Mattioli et al., 2020). Unfortunately, due to poor time management, people often engage in physical activity that surpasses their body's endurance, leading to potential negative impacts on their health (Asih et al., 2018).

As part of the body's metabolism, free radicals and reactive oxygen species (ROS) are routinely produced by cells (Andrés et al., 2021). If the production of free radicals exceeds the body's antioxidant defenses, it can lead to oxidative stress. One of the contributing factors to oxidative stress is excessive physical activity (Kruk & Duchnik, 2014). Various studies have reported that acute aerobic physical activity, particularly at high intensities can lead to increased oxidative stress (Pingitore et al., 2015). The mechanisms behind this include the impact of increased oxygen consumption during exercise, which is 10 to 15 times higher than at rest, leading to increased pro-oxidants and relatively inadequate antioxidants compared to pro-oxidants (Arazi et al., 2021). According to Krzeszowiak et al., (2014) and Pittaluga et al., (2015), excessive physical activity can increase the occurrence of oxidative stress and malondialdehyde (MDA) levels in the blood (Krzeszowiak et al., 2014; Pittaluga et al., 2015). MDA is a useful indicator of oxidative stress, as higher levels of MDA indicate higher levels of oxidative stress (Singh et al., 2014). When free radicals cause lipid peroxidation in cell membranes under oxidative stress conditions, lipid production occurs, as noted by (Morales and Munné-Bosch, 2019). Since cell membranes function as enzymes or receptors, oxidative stress in cell membranes can lead to cellular dysfunction and cell death (Sari, 2018)

Base on the information provided, Malondialdehyde (MDA) is a byproduct of the homolytic decomposition of lipid peroxidation in cell membranes. This process generates more more free radicals, which can cause metabolic and cellular disorders by damaging the cell membrane and causing lipid peroxidation. The effects of lipid peroxidation include altered membrane fluidity, permeability, and function (Riyana, Mudigdo & Wasita, et al., 2019). The production of MDA and other lipid peroxides increases during high-intensity exercise compared to low-intensity exercise, as evidenced by an increase in lipid hydroperoxides. This suggest that exercise-induced oxidative stress can contribute to cellular damage through the production of free radicals and lipid peroxidation (Souza-Silva et al., 2016). Overall, MDA and lipid peroxidation are indicators of oxidative stress and cellular damage. Strategies to reduce oxidative stress, such as antioxidant supplementation of exercise training, may help mitigate the negative effects of free radicals and lipid peroxidation on cellular function and health (Riyana et al., 2022).

Prevent oxidative stress, antioxidants can be administered through natural food sources of supplements. Natural food sources of antioxidants include Vitamin A, vitamin C, vitamin e, saponins, and flavonoids. Indonesia, which is a tropical region, has various plants that have the potential to help improve health, one of which is Eleutherine palmifolia, also know as "Bawang Dayak" (Hendrawan et al., 2020). This plant is commonly found on the island of Borneo and has been traditionally used by local people as a medicinal plant. The part of the plant that can be used is the bulb. This plant is empirically known to have anti-inflammatory and anti-cancer properties. Phytochemical testing conducted by Wigati and Rahardian, (2018) revealed that Dayak Onion contains flavonoids, saponins, tannins, alkaloids, quinones, provitamins, and various other essential minerals that are useful as central nervous system stimulants, antioxidants, anti-inflammatories, and blood circulatory enhancers (Wigati & Rahardian,

2018). Ginsenosides, derivatives of saponin compounds, are useful as tonics that can increase resistance to stress, fatigue, and various other diseases (Chen et al., 2016).

The results of the Dayak Onion extract test showed an inhibitory or antioxidant activity on free radicals using the DPPH method. The IC_{50} value of the ethanol extract of Dayak Onion bulbs reached 52.38 ppm (Yuswi, et al., 2017). The antioxidant activity in Dayak Onion is able to prevent the oxidation of body cells by oxygen, such as hydrogen peroxide, superoxide, hydroxyl radicals, and other free radicals (Muti'ah et al., 2020). However, no research has been conducted on the effect of using Dayak Onions to prevent oxidative stress in experimental animals that perform physical activity using the forced swimming test method.

The purpose of this study is to examine the impact of Dayak Onion extract on the levels of MDA in male Sprague Dawley rats by utilizing the forced swimming test model. There has been limited investigation conducted on the influence of Dayak Onion extract on MDA levels as a marker for oxidative stress, particularly using the forced swimming test model in rats. Therefore, additional research is required to gain a more comprehensive understanding of this subject.

2. RESEARCH METHOD

This study used a Randomized Pre and Post Test Control Group Design, with an experimental population of male white rats (Sprague Dawley) aged 2 months with a body weight of 150-200g. The research was conducted for 21 days during March 2023 at the Laboratory of the Center for Food and Nutrition Research, Gadjah Mada University. Five groups of experimental animals were installed, namely K- (control group without Onion Dayak extract but given FST), K+ (control group given xanthine and FST), P1 (given Onion Dayak extract at a dose of 50 mg/200 rat body weight/day), P2 (given Dayak onion extract at a dose of 100 mg/200 rats/day), and P3 (given Dayak onion extract at a dose of 200 mg/200 rats/day). Dayak onions are crushed (chopped) and dried in an oven at ±40ºC for 8 hours. The dried simplicia was then crushed and sieved using mesh no. 40. As much as 10 kg of Dayak onion bulbs were obtained from the Palangkaraya area. Dayak onions were macerated using 96% ethanol with a ratio of 1:5 for 3 days; every 24 hours the stirring process is carried out. The maserate obtained was then filtered and evaporated using a temperature of 50°C to obtain a thick extract of Dayak onion. The extraction results were in the form of thick extract of Dayak onion as a test material which was stored in a bottle at refrigerator temperature (±4°C) and protected from sunlight to prevent nutrient damage. Mice were acclimatized for 7 days, after the condition was completed, blood samples were taken to measure MDA levels before treatment. Dayak onion extraction using mice was measured swimming in a water bath measuring 90cm x 45cm and 35cm deep, with a water temperature of 25º ± 1ºC, one hour after administration of shallot extract on day 21 (Li et al., 2022). Mice were considered exhausted if they showed no movement to the surface for 10 seconds, with their heads under the air, tails stretched, bodies stretched, and all four legs immobile (Abbasi-Maleki et al., 2020). After the force swim test, another blood sample was taken to determine MDA levels (posttest).

The data gathered in this study were reported as the mean standard deviation. Before performing any statistical analysis, tests were conducted to assess the homogeneity and normality of the data. The Paired T-Test was utilized to analyze the data, and Post-Hoc LSD was employed to perform further statistical analysis. Statistical significance was determined using a p-value of less than 0,05. Ethical certificate number: 47/UN27.06.11/KEP/EC/2023.

3. RESULTS AND DISCUSSION

Tabel 1. Test of Onion Dayak Determination.

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Ordo	Liliales
Famil	Iridaceae
Sub-Familia	Papilionoideae
Genus	Eleutherine
Spesies	Eleutherine Palmifolia (L.) Merr
Sinonim	Eleutherine bulbosa (Mil.) Urb., Eleutherine americana (Aubl.) Merr. Ex K.Heyne, Sisyrinchium palmifolium (Klatt) Baker.
Region Name	Dayak Onion

A determination test on the Dayak onion (*eleutherine palmifolia (L.) Merr*) was carried out to determine the authenticity of the Dayak onion species. Dayak onions themselves have many types so the determination test avoids ingredients being mixed with other ingredients so that they have fewer benefits. The determination test on Dayak onions was carried out using visual observation techniques. This method is used to observe the external characteristics of plants which may indicate sex or plant determination. For example, in some plants, differences in size, shape, color, or patterns in reproductive organs such as flowers or other structures can make a difference (Malendes & Bunyamin, 2017). By carrying out a determination test, it can be guaranteed that the Dayak onions used contain active compounds that are beneficial to health. In addition, the determination test can also help avoid consuming products whose authenticity and quality are not guaranteed. Therefore, the determination test is very important to ensure the safety and efficacy of Dayak onions as natural ingredients used in medicine or health supplements.

Dayak onion determination test description of the determination test analysis. A total of 10 kg of Dayak onion bulbs were obtained from the Palangkaraya area. A total of 50 grams of the material was determined at the Plant Systematics Laboratory, Faculty of Biology, Gadjah Mada University, Yogyakarta. The results of the determination show that the onion bulbs used have the Latin name eleutherine palmifolia (L.) Merr, with the regional name Bawang Dayak.

Table 2. Testing the content of Dayak Onion.

Type of Analysis	**Analysis Methods**	**Analysis Results**
Antioksidan IC-50	Dpph-Spectrophotometry	196,36
Vitamin C	Spectrophotometry	2182,15 mg/100g

Table 2 presents the content of Dayak Onion extract obtained from Buntok District, Palangkaraya City, Central Kalimantan Province. The extraction process was carried out at the Laboratory of the Center for Food and Nutrition Research, Gadjah Mada University. The starting material consists of 10 kg of Dayak onions which are sliced and dried in an oven at 60°C until the moisture content reaches ≤ 10%. The dry material was then ground and sieved using mesh no. 40. Furthermore, the Dayak onions were macerated in 96% ethanol solvent with a ratio of 1:7 for 3 days, with stirring every 24 hours. The resulting maceration was then filtered and concentrated using a rotary evaporator at 50°C to obtain concentrated Dayak onion extract.

Antioxidant yield was obtained in Dayak onion extract of 196.36 ppm. Using 96% ethanol as a supplier, referring to previous research (Yuswi et al., 2017), in order to get maximum antioxidant results.

Table 3. The effect of Dayak Onion extract on the MDA level of Sprague Dawley White rats using the forced Swimming Test on day 1 to day 28.

Group	MDA Levels (nmol/ml)			P^b
	Day-1	Day-21	Δ MDA Days 1 - 21	
K-	1,03±.0.09	10,16±0,29	9,13±0,35	0,000*
K+	0,97±0,15	2,20±0,30	1,23±0,16	0,000*
P1	0,88±0,15	5,34±0,53	4,45±0,58	0,000*
P2	0,98±0,16	3,53±0,42	2,55±0,34	0,000*
P3	0,95±0,12	2,68±0,35	1,73±0,31	0,000*

Note:
K- : Test animals group not given Dayak Onion extract but still given FST
K+: Test animals group given xanthine and FST
P1 : Test animals group given Dayak Onion extract dose of 50 mg/ 200 g/BW and FST
P2 : Test animals group given Dayak Onion extract dose of 100 mg/ 200 g/BW and FST
P3 : Test animals group given Dayak Onion extract dose of 200 mg/ 200 g/BW and FST

Table 3 presents the impact of Dayak Onion extract on MDA levels in male Sprague Dawley white rats using the FST from day 1 to day 28. MDA level measurement was conducted after acclimation to establish a baseline for normal MDA levels in rats that have not yet experienced oxidative stress or are still in good health. The findings revealed that high-intensity physical activity could cause an increase in oxidative stress, which was indicated by an increase in MDA levels. All treatment groups, including the control groups, demonstrated an increase in MDA levels. The K- group showed a sharp increase in MDA levels of 9,13 nmol/ml. the K+ group, which was given xanthine, showed an increase in MDA levels of 1,23 nmol/ml, while the P3 group had a similar increase in MDA levels as the K+ group, which was 1,73 nmol/mL. overall, the administration of Dayak Onion extract with P1 (extract dose of 50 mg/200 rats body weight/day), P2 (extract dose of 100 mg/200 rats body weight/day), and P3 (extract dose of 200 mg/200 rats body weight/day) treatments significantly prevented an increase in MDA levels ($p<0,001$).

Tabel 4. Post-Hoc LSD Analysis of the Effect of Dayak Onion Extract on Swimming Test Levels of Sprague Dawley White Rats using Forced Swimming Test.

Groups	Treatment	*P*
K-	K+	0,000*
	P1	0,000*
	P2	0,000*
	P3	0,000*
K+	P1	0,000*
	P2	0,000*
	P3	0,0367
P1	P2	0,000*
	P3	0,000*
P2	P3	0,000*

Note:
K- : Test animals group not given Dayak Onion extract but still given FST
K+ : Test animals group given xanthine and FST
P1 : Test animals group given Dayak Onion extract dose of 50 mg/ 200 rats body weight/day
P2 : Test animals group given Dayak Onion extract dose of 100 mg/ 200 rats body weight/day
P3 : Test animals group given Dayak Onion extract dose of 200 mg/ 200 rats body weight/day

Table 4, it can be observed that all groups, P1, P2, and P3, exhibit significant values. Hence, it can be deduced that the bawang dayak extract can influence the endurance and swimming duration in the forced swimming test rat model. Vigorous physical activities such as swimming can lead to an upsurge in the generation of free radicals within the body. These unstable molecules, known as free radicals, are capable of causing oxidative stress and cellular damage. This is why the role of antioxidants becomes pivotal, as they function to safeguard the body's cells against harm stemming from free radicals. When the test subjects engage in swimming, their bodily metabolism escalates to produce the requisite energy (Gomes et al., 2012). Consequently, there is an increase in the production of free radicals as a byproduct of this metabolic process. Uncontrolled generation of free radicals may result in oxidative stress, which in turn damages the body's cells and contributes to fatigue as well as the risk of injuries (Abbasi-Maleki et al., 2020).

Antioxidants act as a protective shield for the body against free radicals. They bind with these radicals and put a halt to potentially hazardous chain reactions that could harm the cells (Aversa et al., 2016). By mitigating oxidative stress, antioxidants play a role in maintaining cellular equilibrium and supporting recovery following intense physical activities (Brancaccio et al., 2020). However, it's imperative to note the intricacies of the relationship between antioxidants and physical exertion. Certain studies have suggested that the intake of antioxidant supplements could have adverse effects on the body's adaptation to physical exercises (Higgins et al., 2020). This is because the body requires a certain level of mild oxidative stress to adapt and reinforce its natural antioxidant defenses. Consequently, it is advisable to acquire antioxidants from natural food sources like fruits, vegetables, legumes, and grains (Poletta et al., 2016).

Table 5. The effect of Dayak Onion extract on the MDA level of Sprague Dawley White rats using the forced Swimming Test on day 1 to day 21.

Groups	**Treatment**	***P***
K-	P+	0,000*
	P1	0,000*
	P2	0,000*
	P3	0,000*
K+	P1	0,000*
	P2	0,000*
	P3	0,051
P1	P2	0,000*
	P3	0,000*
P2	P3	0,002*

Note:
K- : Test animals group not given Dayak Onion extract but still given FST
K+ : Test animals group given xanthine and FST
P1 : Test animals group given Dayak Onion extract dose of 50 mg/ 200 rats body weight/day
P2 : Test animals group given Dayak Onion extract dose of 100 mg/ 200 rats body weight/day
P3 : Test animals group given Dayak Onion extract dose of 200 mg/ 200 rats body weight/day

Table 5 presents the impact of Dayak Onion extract on MDA levels in male Sprague Dawley white rats using the FST from day 1 to day 21. MDA level measurement was conducted after acclimation to establish a baseline for normal MDA levels in rats that have not yet experienced oxidative stress or are still in good health. The findings revealed that high-intensity physical activity could cause an increase in oxidative stress, which was indicated by an increase in MDA levels. All treatment groups, including the control groups, demonstrated an increase

in MDA levels. The K- group showed a sharp increase in MDA levels of 9,13 nmol/ml. the K+ group, which was given xanthine, showed an increase in MDA levels of 1,23 nmol/ml, while the P3 group had a similar increase in MDA levels as the K+ group, which was 1,73 nmol/mL. Overall, the administration of Dayak Onion extract with P1 (extract dose of 50 mg/200 rats body weight/day), P2 (extract dose of 100 mg/200 rats body weight/day), and P3 (extract dose of 200 mg/200 rats body weight/day) treatments significantly prevented an increase in MDA levels ($p<0,000$). The advantage of using the forced swimming test method is that it is easy and effective to make the rat model exhausted, and can cause an increase in oxidative stress in experimental animals (Qi et al., 2014).

Post-Hoc LSD in table 4 of the effect Dayak onion extract on MDA levels in male Sprague Dawley white rats in the FST model showed significant results for almost all of the test samples. The test results for groups P1,P2, and P3 showed a significant difference in blood MDA levels in male Sprague Dawley rats among the treatment groups. However, different results were shown by the K+ and P5 groups, indicating that the p-value was greater than 0,05. This suggests that there is no significant difference in blood MDA levels in male Sprague Dawley rats between the FST + Xanthine and FST + Dayak Onion extract 200mg/200rats body weight/day treatment groups on day 28. It can be concluded that Dayak Onion extract has therapeutic effects equivalent to those of xanthine drugs. Therefore, Dayak Onion can used as an adjuvant to enhance the optimization of the effects obtained. Xanthine drugs work by inhibiting the enzyme xanthine oxidase, which can convert xanthine into uric acid, which can accumulate and cause fatigue (Rachmania et al., 2021).

The antioxidant process affects MDA (malondialdehyde) by protecting cells from oxidative damage induced by free radicals. MDA is a product of lipid oxidation which is formed when free radicals damage fat molecules in cell membranes. Free radicals are molecules that are unstable and have an excess of a single electron. They can damage cells and cause oxidative stress in the body. Oxidative stress occurs when the production of free radicals exceeds the body's ability to cope with and neutralize them using endogenous (produced by the body) or exogenous (obtained from food and supplements) antioxidants. Antioxidants act as the body's defense against free radicals by stopping the chain reactions produced by free radicals. They stop free radicals by donating electrons to free radical molecules, thereby preventing them from damaging healthy cells. In terms of MDA, antioxidants can reduce MDA formation by protecting lipids in cell membranes from oxidative damage. MDA has toxic properties and can damage DNA, proteins, and cell membranes. Excessive accumulation of MDA can contribute to various diseases, including cardiovascular, neurodegenerative, and cancer (Wigati & Rahardian, 2018). By consuming antioxidant-rich foods or using antioxidant supplements, it can help the body slow down the formation of MDA and reduce the risk of cell damage caused by oxidative stress. Some examples of foods rich in antioxidants include berries, dark green vegetables, nuts, seeds, and spices. In the study of the effect of Dayak onion extract on blood MDA in Sprague Dawley male white rats, the FST model showed significant results for all test samples. The test results in groups P1, P2, P3 showed significant differences in blood MDA levels in male Sprague Dawley rats between groups for each treatment given ($p<0.05$). The antioxidant compound of Dayak onion extract can reduce blood MDA levels in FST model SD male rats. This decrease was influenced by the antioxidant content of Dayak onions which can inhibit free radicals by suppressing the process of lipid peroxidation. Phytochemical compounds in Dayak onions such as flavonoids, tannins, saponins, alkaloids and other compounds can physiologically improve circulation in the central nervous system or blood circulation in the peripheral nerves. Flavonoid compounds can suppress free radicals and stabilize ROS because they will be oxidized by radical compounds resulting in more stable and less reactive radicals (Panche et al., 2016). Tannins have a cooling effect and can coat the

underlying tissue, so that nerve cells are protected from harmful external stimuli (Qi et al., 2014).

Vitamin C can efficiently prevent the formation of superoxide, hydrogen peroxide, hydroxyl radicals, peroxyl radicals, and oxygen radicals (Zuraida et al., 2015). Vitamin C is more effective in inhibiting lipid peroxidation by peroxyl radicals than other plasma components such as -tocopherol. Vitamin C can prevent membrane peroxidation by increasing tocopherol activity and preventing cell damage due to free radicals. Antioxidants can help protect muscle cells from the oxidative damage that occurs during intense exercise, by protecting the integrity of muscle cells. Antioxidants can help prevent the damage that DOMS can cause. By reducing inflammation and cell damage, antioxidants reduce the intensity and duration of DOMS. This study also showed that the forced swimming test model increased blood serum MDA levels in Sprague Dawley male white rats and administration of Dayak onion extract could reduce serum MDA levels for 21 days.

4. CONCLUSION

The current study was the first of its kind to examine the impact of Dayak Onion extract on malondialdehyde (MDA) levels in male Sprague Dawley rats utilizing the forced swimming test model. Results showed that the administration of Dayak Onion extract significantly decreased serum MDA levels, indicating a suppression of oxidative stress conditions. The data also revealed that the P3 treatment group, which received a dose of 200 mg/200 rats body weight/day, was the most effective treatment, showing better outcomes than the other treatment groups.

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RESEARCH **Open Access**

The Use of Digital Media "Tayo Prenatal" on Anxiety Pregnant Women

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Abstract

Globally, people are experiencing increased feelings of stress, anxiety, and depression as a consequence of the situation that has arisen due to the current pandemic. Pregnant women also often feel anxious and afraid of being exposed to COVID-19, which has an impact on anxiety and mood disorders. Yoga is an ancient way of living in harmony with oneself (body, emotions, and mind) and nature and can improve individual health and reduce stress. This study aims to determine the average difference in anxiety in pregnant women after being given "prenatal tayo". This research is a quasi-experiment using a pretest-Posttest Control Group Design, with 25 respondents fulfilling the inclusion and exclusion criteria. The inclusion criteria in this study were pregnant women with gestational ages between 14 and ≤ 30 weeks, being able to read and write, and owning a smartphone. Exclusion criteria in this study were pregnant women with pregnancy complications and pregnant women with a history of previous miscarriages caused by a weak uterus or heart disease. The sampling technique is purposive sampling. Statistical tests using independent T test and Paired T-Test. There is a difference in the anxiety of pregnant women before and after being given "Tayo Prenatal". More research is needed regarding changes in anxiety in pregnant women measured every week to determine the effect of the intervention of giving "Tayo Prenatal" compared to giving Yoga.

Keywords: Yoga Online, COVID-19, Anxiety, Pregnant Women.

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1. INTRODUCTION

COVID-19 is causing increased mortality and morbidity, but also enormous economic loss, social and cultural disruption, which may raise concerns about the potential for widespread increases in mental health problems (Ransing et al., 2020; Wang et al., 2020). Globally, people are experiencing increased feelings of stress, anxiety, and depression as a consequence of the situations that have arisen due to the pandemic (Huang & Zhao, 2020). Centers for Disease Control and Prevention (CDC) advise everyone, including pregnant women, to stay at home or maintain a distance of at least 1 meter outside the home to reduce the risk of contracting COVID 19 (Centers for Disease Control and Prevention, 2020). The isolation and social distancing felt by pregnant women will increase the risk of anxiety and mood disorders (Mcgonagle et al., 2020).

Pregnant women are a high risk group for COVID 19 (Allotey et al., 2020; Ellington et al., 2020; Taubman–Ben-Ari et al., 2020). Pregnant women are more susceptible to lung infections due to physical changes in the respiratory system (Allotey et al., 2020; Ellington et al., 2020). Pregnant women also often feel anxious and afraid of being exposed to COVID-19, which has an impact on anxiety and mood disorders (PAMD) (Durankuş & Aksu, 2020; Mcgonagle et al., 2020). Pregnant women had significantly higher rates of mood disorders during the COVID-19 pandemic compared to the general population (Harville et al., 2010). Recent data suggest that pregnant women are at high risk for COVID-19 infection and hypoxic disorders because of changes in cardiorespiratory and immune function (Dashraath et al., 2020).

In low- and middle-income countries, antenatal depression has become a major public health problem, with a prevalence of 25.3% (95% confidence interval) [CI]: 21,4-29,6%) (Shidhaye et al., 2020). Research conducted by Lin et al., (2022) showed that worldwide, around 12% of women suffer from depression during pregnancy (Lin et al., 2022). Severe life disturbances due to COVID-19, fear of contracting the disease, and anticipation of adverse economic impacts have led to an increase in symptoms of depression, anxiety, and stress among the general public as well as healthcare providers (Moreno et al., 2020).

In addition, depression during pregnancy has been reported to be a cause of intrauterine growth restriction, preterm birth, or low birth weight. Unfortunately, most women with perinatal depression seem unlikely to receive therapy. Pharmacotherapy is the most common treatment for patients with depression, although most antidepressants have been shown to produce adverse fetal effects in animals. One meta-analysis previously reported that the efficacy of antidepressants in the treatment of pregnant women with depression is unclear (Lin et al., 2022). These antidepressants may have adverse effects on the fetus, so nonpharmacological treatments appear to be safer methods of treating depression during pregnancy, such as psychotherapy, music therapy, and exercise (Lin et al., 2022; Ponting et al., 2020).

Study Davenport et al reported that many pregnant women have experienced a decrease in their level of physical activity since the start of social distancing and isolation at home, which can increase the risk of mental health (Davenport et al., 2020). Recommendations from the American College of Sports Medicine suggest that pregnant women who do a minimum of 150 minutes of physical activity per week, such as yoga, swimming, and walking, have a lower anxiety score than those who do not (Hermann et al., 2021; Hyun et al., 2022; Liguori & Medicine, 2020). Yoga is an ancient way of living in harmony with oneself (body, emotions, and mind) and nature (Jasti et al., 2020). Yoga involves relaxation and meditation, which can improve the psychological symptoms you are experiencing (Selman et al., 2015). Evidence shows that yoga can be a suitable strategy for improving individual health and reducing stress

during the COVID-19 pandemic and beyond (Gallegos et al., 2017; Pascoe et al., 2017; Zou et al., 2018).

Yoga is mostly introduced and practiced through face-to-face yoga classes delivered by certified professional experts. However, for some people, it can be difficult to leave the house to attend regular yoga classes. Study Strömberg et al., (2021) stated that respondents did not join face-to-face yoga classes because it was too time-consuming and tiring to leave their homes twice a week to travel (sometimes long distances). The distance to the location of the health worker, costs, and time for implementation are some of the things that are often found to be barriers for pregnant women coming to do prenatal yoga. Intervention is needed to deal with these problems according to current conditions. Tele-intervention, which uses telecommunications technology to support remote clinical health care, health-related education, and public health. Recent trials of remote cardiac rehabilitation show that the use of tele-technology can help increase enrollment, reduce risk factors, and increase the cost-benefit ratio (Selman et al., 2015).

Advances in video conferencing technology have made it easier for individuals who face these barriers to participate in prenatal yoga from home. These programs have the potential for significant cost savings as well as the ability to reach larger numbers of people in communities. Access to a live coach and commitment to a person or group can also help with adherence to a yoga program, and online platforms provide convenience and accountability. Successful implementation of a real-time home-based yoga program will increase access and increase adherence among participants (Selman et al., 2015).

The results of a preliminary study at the Wolaang Public Health Center stated that classes on pregnant women and pregnancy exercise had been held. However, this activity did not work because, at the time it was held, many pregnant women were working and selling in the market. In addition, many pregnant women are too lazy to come to the Community Health Center because the distance from where they live to the Community Health Center is far and there is no one to accompany them. The average number of pregnant women in the second trimester at the Wolaang Community Health Center from January to March was 26 pregnant women. The results of interviews with 6 pregnant women stated that 3 pregnant women sometimes had difficulty sleeping, complained of pain in the back and hips; 2 experienced anxiety during pregnancy; and 1 pregnant woman reached the consultation stage with a psychiatrist. The aim of this research is to determine the differences in the use of digital media "tayo prenatal" on anxiety in pregnant women at the Wolaang Community Health Center, East Langowan District, Minahasa Regency.

2. RESEARCH METHOD

The research design uses the quasi-experiment method using the Pretest-Posttest Control Group Design. Sampling was done using the purposive sampling technique. The inclusion criteria in this study were pregnant women with gestational ages between 14 and ≤ 30 weeks, being able to read and write, and owning a smartphone. Exclusion criteria in this study were pregnant women with pregnancy complications and pregnant women with a history of previous miscarriages caused by a weak uterus or heart disease. Purposive sampling method was used to recruit participants based on inclusion criteria and exclusion criteria. The sample size was calculated using Open Epi Version 3 with a confidence level of 95%. The sample size was 23 respondents.. To avoid dropping out, the number of samples was increased by 10% so that there were now 25 respondents.

Respondents dropped out if they left the WhatsApp group, experienced problems with their pregnancy, or did not actively join the prenatal yoga conference after being given the third treatment. The intervention was given for approximately 60 minutes in each session. The duration of the intervention was in accordance with Strömberg et al., (2021) that yoga

intervention was given for 60 minutes. The intervention was carried out for 8 weeks (Howie-Esquivel et al., 2010; Selman et al., 2015). An instrument for measuring sleep quality using the HARS scale. This research has been approved by the research ethics committee of the Manado Health Polytechnic Ministry of Health with number KEPK.01/08/138/2022. This study was analyzed by independent T test and Paired T-Test.

3. RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondent Characteristics.

Mother's Characteristics	Group				Total
	Yoga		Tayo Prenatal		
	n	%	n	%	
Average age (min-max)	22.00 (14-34)		27.04 (21-34)		
Educational					
Low (Primary school- Junior high school)	13	52	8	32	21
Tinggi (Senior high school-College)	12	48	17	68	29
Mother's job					
Housewife	8	32	7	28	15
Working mother	17	68	18	72	35
Parity					
Primipara	16	64	14	56	30
Multipara	9	36	11	44	20
Anxiety, mean (min-max)	21.56 (14-32)		25.12 (18-38)		

Table 1 shows the characteristics of the respondents. Characteristics of respondents "Tayo Prenatal" average age of 27.04 years and Yoga respondents average age of 22 years. The minimum and maximum ages for the "Tayo Prenatal" group are 21-34 years, while the minimum and maximum ages for the Yoga group are 14-34 years. The number of respondents in the Yoga group was almost the same, namely low education (52%) and higher education (48%). The majority of respondents in the "Tayo Prenatal" group have higher education (68%). The majority of work in the Yoga and "Tayo Prenatal" groups are working mothers. Mothers who worked in the Yoga group were 17 (68%) while in the "Tayo Prenatal" group there were 18 (72%). Parity in the Yoga and "Tayo Prenatal" groups is for the majority of Primipara mothers. There were 16 (64%) of the primiparous mothers in the group given Yoga, while in the "Tayo Prenatal" group there were 14 (56%). Respondents' anxiety during the pre-test was higher in the Tayo Prenatal group (25.12) than in the Yoga group (21.56). The minimum scores and maximum scores for the Yoga group are 14-32 while the minimum scores and maximum scores for the "Tayo Prenatal" group are 18-38.

Table 2. Differences in average anxiety before and after being given Yoga and Tayo Prenatal.

Variable	*Pre test*	*Post test*	Δ mean	p-value
	Mean ± SD	Mean ± (SD)	95% CI	
Anxiety				
Yoga	21.56 ± 5.347	18.80 ± 5.292	2.760 (2.461-3.059)	0.000
Tayo Prenatal	25.12 ± 5.403	21.76 ± 5.190	3.360 (2.916 – 3.804)	0.000

Table 2 shows the mother's anxiety score after being given "Tayo Prenatal". The average pre-test anxiety score for pregnant women in the Yoga group was lower (21.56) compared to the “Tayo Prenatal” group (25.12). After being given interventions in the form of "Tayo Prenatal" and yoga, anxiety scores decreased in both groups. The anxiety score after being given Yoga and "Tayo Prenatal" decreased. in the “Tayo Prenatal” group (21.76) and the Yoga group (18.80). The statistical test showed a p value <0.05 so that there was a significant difference in anxiety before and after being given "Tayo Prenatal".

Table 3. Differences in the average decrease in anxiety and sleep quality in the Tayo Prenatal group and the Yoga group.

Variable	Mean (SD)	CI 95%	Δ mean	p-value
Anxiety				
Yoga	2.76 (0.723)	0.077-1.123	0.60	0.026
Tayo Prenatal	3.36 (1.075)			

Based on table 3, it can be seen that statistically the average score for reducing anxiety in the "Tayo Prenatal" group is higher than the Yoga group. Statistical tests showed that the anxiety variable had a p-value <0.05 so it was concluded that there were differences in anxiety in the yoga group and the Tayo Prenatal group. An increase in the score of the anxiety variable showed that the average score increase in the "Tayo Prenatal" group was higher (3.36) than the Yoga group (2.76).

This research is an intervention study on the use of digital media "tayo prenatal" on anxiety in pregnant women. The study was conducted for 8 weeks, and pre-test and post-test evaluations were carried out at the beginning and end of the activity. This study used home-based remote intervention (Zoom). The reason for using this intervention is that because of the COVID-19 pandemic, many pregnant women are isolated and limited in their activities. Pregnant women find it helpful because they don't have to go outside the house to do yoga activities, which also saves time and money. However, technological problems sometimes result in poor video streaming quality.

Several studies emphasize the importance of exercise for pregnant women, which can be beneficial for reducing anxiety during pregnancy. In addition, exercise can provide anti-inflammatory and antiviral effects (Birsner & Gyamfi-Bannerman, 2020). Alternative, non-face-to-face online programs are used in some settings, and there is some evidence of their effectiveness for pregnant women (Hyun et al., 2022).

This study examines the effect of a prenatal virtual yoga practice program for pregnant women to reduce anxiety during pregnancy, which is called Tele Health Yoga, abbreviated as "Tayo Prenatal". "Tayo Prenatal" focuses on breathing movements and light stretching that are safe for pregnant women to use at home.

Anxiety in pregnant women can have an impact on increasing neonatal mortality and morbidity in infants. The findings in this study indicate that Tayo Prenatal can significantly reduce anxiety in pregnant women and offer a model for providing care for pregnant women. Compliance in the Tayo Prenatal group was good, satisfaction was high, and respondents felt more privacy to ask questions because they were in the breakout room. Whereas adherence in the control group was not good because the distance between the respondent's house and the health service facility was quite far and the respondent was not free to ask yoga practitioners.

The results of the Tayo Prenatal intervention showed that there was a significant difference in reducing anxiety in respondents who were given Tayo Prenatal and yoga. Several respondents said that the benefits of "tayo yoga" are that it is more flexible and saves time. This is in accordance with research by Selman et al., that the benefits of Tele-Yoga are cost savings and the ability to reach more people in society (Selman et al., 2015).

Pregnant women with high levels of anxiety have a poorer quality of life which can have a negative impact on childbirth, such as premature birth and Sectio caesarea delivery. Anxiety in pregnancy can also affect postpartum recovery, cause problems bonding between mother and baby, and increase the risk of anxiety and even depression later in life. In addition, it has a negative impact on fetal brain development, which can affect learning and behavior in childhood (Duchette et al., 2021).

Research by Davenport et al reports that many pregnant women have experienced a decrease in their level of physical activity since the start of social distancing and isolation at home during the COVID-19 pandemic, which can increase mental health risks (Davenport et al., 2020). Recommendations from the American College of Sports Medicine suggest that pregnant women who do a minimum of 150 minutes of physical activity per week, such as yoga, swimming, and walking, have a lower anxiety score than those who do not (Hermann et al., 2021; Hyun et al., 2022; Liguori & Medicine, 2020).

Several studies emphasize the importance of exercise for pregnant women, which can be beneficial for reducing anxiety and stress during pregnancy. In addition, it can provide anti-inflammatory and antiviral effects (Birsner & Gyamfi-Bannerman, 2020). Alternative online, non-face-to-face programs are used in some settings, and there is some evidence of their effectiveness in pregnant women (Hyun et al., 2022).

The results of the Tayo Prenatal intervention showed that there were significant differences in reducing anxiety in respondents who were given Tayo Prenatal and face-to-face yoga. The average reduction in anxiety for pregnant women given Tayo Prenatal was (3.36) higher than for pregnant women given Yoga (2.76). Some respondents said that the benefits of "tayo yoga" are that it is more flexible and saves time. According to research by Selman et al., the benefits of Tele-Yoga are increased flexibility and strength, increased motivation, increased ability to overcome shortness of breath, improved sleep, and becoming better able to deal with anxiety or stress (Selman et al., 2015).

Other factors that affect anxiety are age, occupation, education, and the parity of pregnant women. A person's psychology is influenced by age. With increasing age, the level of emotional maturity of a person will increase. A healthy reproductive age ranges from 20-35 years old. Pregnant women younger than 20 years or older than 35 years have a high-risk pregnancy that can cause anxiety and sleep disturbances (Hamdiah et al., 2017).

The majority of mothers' education in the Tayo Prenatal and yoga groups was in the higher education group. Higher education can help mothers have a broader education and more easily understand the information provided (Pratiwi et al., 2021). Low education is a contributing factor to the occurrence of anxiety and sleep disturbances.

Work also affects anxiety and sleep disturbances experienced by pregnant women. Pregnant women who work worry about losing their jobs if their work cannot be completed because of their pregnancy. On the other hand, if the work of pregnant women is not too heavy and does not require too much energy, and the mother can do it during pregnancy, her work can have a positive impact (Said, Kanine & Bidjuni, 2015).

Parity is the number of deliveries a mother has experienced, both live births and stillbirths. The anxiety experienced by primiparous mothers is certainly different from that of multiparous women, because multiparous mothers have had previous birth experience (Pratiwi et al., 2021). For primigravidas, the pregnancy they are experiencing is their first experience, so the third trimester is felt to be even more worrying because it is getting closer to the delivery process. Mothers will tend to feel anxious and experience sleep disturbances with their pregnancy, feel anxious, and be afraid of facing childbirth, considering that ignorance is a contributing factor to anxiety.

The weakness in this study is that it is the first study on the use of online "Tayo Prenatal" for pregnant women, and therefore, this study has limitations. The first is the inconsistency of the software used. Pregnant women with several conditions who cannot do "Tayo Prenatal" virtually can view Zoom recordings. The solution so that pregnant women are monitored in "Tayo Prenatal" is for pregnant women to send videos of researchers demonstrating yoga. This study shows that pregnant women are willing to take part in "Tayo Prenatal" activities. The limitation of this research is that researchers do not yet know whether pregnant women are willing to continue using "Tayo Prenatal" if this activity is not subsidized (given an internet package).

4. CONCLUSION

There is a difference in the anxiety of pregnant women before and after being given "Tayo Prenatal". Providing the "Tayo Prenatal" intervention can save time and money. Pregnant women don't need to leave the house to do yoga activities. More research is needed regarding changes in anxiety in pregnant women measured every week to determine the effect of the intervention of giving "Tayo Prenatal" compared to giving Yoga.

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RESEARCH **Open Access**

The Impact of Stigma on Medication Compliance for Tuberculosis Patients at the Health Center in Bandar Lampung City

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Abstract

Tuberculosis, a lethal infectious illness, is known as the ninth leading cause of mortality worldwide. Self-stigma might emerge from the social stigma that Tuberculosis patients experience in their social environment. Stigma is triggered by five factors: self-isolation, supportive views, discrimination experiences, social withdrawal, and stigma resistance. The purpose of this study was to see how Tuberculosis stigma affected medication adherence at Bandar Lampung City Health Center. This study is a quantitative study employing a case-control technique. The simple random sampling technique was utilized with a total sampling of up to 54 respondents who fulfilled the inclusion criteria. Data collection through the completion of the questionnaire. A bivariate chi-square test and a multivariate logical regression test were utilized to analyze the data. The findings indicated age, sex, marital status, education, occupation, self-isolation, views of support, experience of discrimination, social withdrawal, and rejection Stigma: p-value of self-isolation = 0.000, views of support = 0.000, experience of discrimination = 0.007, social withdrawal = 0.001, resistance to stigma = 0.000. The value of the logistic regression equation is Y = a + b1 X + b2 X + b3 X. This study concludes that stigma resistance is the most influential factor impacting medication adherence. This study suggests that tuberculosis sufferers do not withdraw, may contribute to society, socialize more, get along conveniently, and overcome stigma by thinking positively.

Keywords: Tuberculosis, Stigma, Compliance with Medication.

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1. INTRODUCTION

Tuberculosis is an infectious disease of the respiratory tract which is still a problem for people in the world. Based on data collected by the World Health Organization (WHO) in 2015, it was noted that there were 10.4 million cases of tuberculosis worldwide, with details of 5.9 million cases in men, 3.5 million cases in women, and 1 million cases in children (WHO 2016). Tuberculosis is the ninth leading cause of death worldwide and is the leading cause of deadly infectious disease.

In 2016 it is estimated that 10.4 million people suffer from tuberculosis, consisting of 90%, namely adults, 65%, and men 10%, people with HIV. Most of the estimated number of cases in 2016 occurred in the Southeast Asia Region (45%), the African Region (25%), and the Western Pacific Region (17%), and a smaller proportion of cases occurred in the Eastern Mediterranean Region (7%), European Region (3%) and American Region (3%). The top five countries, with 56% of estimated cases are India, Indonesia, China, Philippines, and Pakistan (in descending order) (WHO, 2016).

The prevalence of the Indonesian population diagnosed with tuberculosis by health workers according to the Basic Health Research Results (Riskesdas) of the Indonesian Ministry of Health in 2018 is 0.4 percent. The five provinces with the highest incidence of tuberculosis were West Java (0.7%), Papua (0.6%), DKI Jakarta (0.6%), Gorontalo (0.5%), Banten (0.4%), and West Papua (0.4%) (Kementerian Kesehatan Republik Indonesia, 2019).

According to the health profile of Lampung province in 2018, which was sourced from data from the Lampung provincial health office. Until the end of December 2018, the performance of TB disease control was monitored at any time by measuring the output of activities in the form of a case detection rate (CDR) for pulmonary Tuberculosis, and CDR for pulmonary Tuberculosis. Bandar Lampung City as much as 59.10% of the estimated cases or Case Notification Rate (CNR) in 2018 the national target was 70% (Dinas Kesehatan Provinsi Lampung, 2015). The success rate of treatment in Lampung Province in 2019 has reached the target of 92.6%. Based on data from the Lampung provincial health office in 2018, the city of Bandar Lampung ranks second highest with 1,871 cases and the one that ranks first is Central Lampung, while the smallest Tuberculosis cases handled are West Lampung district (Dinas Kesehatan Kota Bandar Lampung, 2014). Based on a survey from the Bandar Lampung City Health Office in 2014, tuberculosis cases decreased by 1.4% from the number of tuberculosis cases in 2013 (Dinas Kesehatan Kota Bandar Lampung, 2014).

The findings of smear (+) pulmonary tuberculosis were evenly distributed in all health centers and the highest were found in Long-hospitalized health centers with 108 cases. Tuberculosis case data of all types according to a 2016 survey by the Bandar Lampung City Health Office, the largest prevalence was in Long-hospital health centers, with 189 cases. The latest data on Tuberculosis cases for the 1st and 2nd quarter of 2019 by the Bandar Lampung City Health Office, it was recorded that the most tuberculosis cases that experienced drug resistance were at Long Inpatient Health Center with 80 patients, while the second largest was in Sukaraja Health Center and Satellite with the number of sufferers respectively 65 and 60 patients. In that situation, it is necessary to control tuberculosis, Directly Observed Treatment Shortcourse (DOTS) is a strategy recommended by WHO globally to prevent and eradicate pulmonary tuberculosis, because the cure rate reaches 95% (Dinas Kesehatan Kota Bandar Lampung, 2014), (Kipp, et al., 2015).

Based on Permenkes No. 67 of 2016 concerning Tuberculosis control, one of the principles of Tuberculosis treatment is that drugs are taken regularly which is supervised by the Drug Ingestion Supervisor (PMO) until the completion of treatment (Kementerian Kesehatan Republik Indonesia, 2016). Tuberculosis treatment aims to cure patients, prevent death, prevent re-emergence, break the chain of transmission, and prevent bacterial resistance to anti-tuberculosis drugs (Kipp, et al., 2015).

Tuberculosis is also a disease that triggers stigma. The stigma experienced by Tuberculosis patients does not only come from family and society (social stigma) but can also come from Tuberculosis sufferers themselves which is commonly called self-stigma (self-stigma/internalized stigma). Self-stigma will arise because of the social stigma that Tuberculosis sufferers get from their environment (Arininta, 2019), (Hammarlund, et al., 2018), (Oladimeji, et al., (2018). The social stigma commonly found in Tuberculosis sufferers includes that Tuberculosis disease is related to the presence of HIV infection, that the patient does something immoral, is an infectious disease that can be transmitted through the use of the same eating utensils, smoking, and due to middle to lower economic factors. Self-stigma can appear starting with the social stigma that TB patients get from their social environment (Arininta, 2019).

The emergence of stigma is caused by a lack of knowledge about Tuberculosis disease, and the existence of myths/assumptions that are not true in society. The results showed that self-stigma was still experienced by Tuberculosis clients who took medication at Malingping Public Health Center with a mild stigma category (Sari, 2018). This research is in line with the research of Stigma results in a decreased quality of life for Tuberculosis patients and patients experiencing mild depression (Lee, et al., 2017).

The study conducted by Ritsher, (2003); Riyanto, (2011) about self-stigma can be measured by a questionnaire developed by Endria, (2019), two researchers to be adopted, modified from the internalized stigma or self-stigma instrument for ritsher's mental disorder. The questionnaire instrument was evaluated for its reliability and validity, and the results categorized self-stigma into five instruments such as self-isolation, support for beliefs, discrimination experiences, social withdrawal, and resistance to stigma. The questionnaire was designed to assess the self-stigma of mental patients, but the questionnaire could also be modified to examine other illnesses that are not related to mental illness, but are still related to assessing self-stigma (Ritsher, 2003), (Watson, et al., 2007). The researchers used an instrument in the form of questionnaire developed by the researchers by soliciting opinions and input from 3 experts (Medical Surgery, Psychiatry, and Management) in the study that they also conducted to measure the impact of stigma on tuberculosis patients (Ritsher, 2003); (Iribarren, 2020).

Multiple factors, including late access to health care premature treatment discontinuation, can contribute to a surge in the number of Tuberculosis cases. One of the reasons underlying delays in seeking treatment and premature discontinuation of treatment is the stigma from society associated with Tuberculosis sufferers (Kipp, et al., 2015). As a result, Tuberculosis patients experience guilt, uncertainty, and an inferiority complex. According to the findings of a study conducted by researchers in collaboration with the individual in charge of the Tuberculosis program at the Health Center, there are still some patients who are ashamed of having Tuberculosis disease. Besides, there are still residents who choose to transfer their medical treatment to another Medical Center.

Efforts should be made to discover the feelings felt and experienced by Tuberculosis sufferers so that the patient’s feelings might improve in a positive direction for the suffering. With the patient's state, the tuberculosis eradication effort will fail since the patient is too humiliated to seek treatment and will stop taking medication. As a result, Tuberculosis cannot be eliminated. The goal of this study was to see how Tuberculosis stigma affected medication adherence at the Bandar Lampung City Health Center.

2. RESEARCH METHOD

The case-control method was used in this quantitative study. The case-control design was employed in this study to assess the effect of stigma on medication adherence in tuberculosis (TB) patients. All tuberculosis patients treated at the Panjang Sukaraja and Satellite Health Centers in Bandar Lampung City were included in this study. The simple random sampling technique was applied, with a total sampling of up to 54 respondents who fulfilled the inclusion criteria: tuberculosis patients, Bandar Lampung residents, aged > 17 years, had a minimum education of junior high school, were willing to be respondents, and the exclusions of this study were not psychologically disturbed; answers were not influenced by neighbors.

The study was conducted at the Panjang Sukaraja and Satellite Health Centers in Bandar Lampung. Data was obtained by filling out a questionnaire during the research period, which lasted from June to December 2021. A bivariate chi-square test was employed for data analysis, and a logistic regression test was performed for multivariate analysis. Ethical Clearance No. 614/EC/KEP-UNMAL/XI/2021.

3. RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Patient Characteristics at the Bandar Lampung City Health Center (n=54).

Variable	Category	Total	%
Age	Children <11	4	7.4
	Teenagers 12-25	9	16.7
	Adults 26-45	19	35.2
	Elderly> 46	22	40.7
Gender	Male	29	53.7
	Women	25	46.3
Marital status	Marry	36	66.7
	Single	18	33.3
Education	SD and Not School	21	38.9
	Junior High	16	29.6
	High school	15	27.8
	Diploma and Undergraduate	2	3.7
Occupation	Student	10	18.5
	TNI / POLRI and PNS	1	1.9
	Private employees	5	9.3
	entrepreneur	14	25.9
	Others	24	44.4
Isolated	Isolated	26	48.1
	Not Alienated	28	51.9
Support View	Negative Views	28	51.9
	Positive Outlook	26	48.1
Experience of Discrimination	Discriminated	16	29.6
	Not Discriminated	38	70.4
Social Withdrawal	Withdraw	25	46.3
	Not Withdrawing	29	53.7
Stigma Resistance	Not Against Stigma	21	38.9
	Against Stigma	33	61.1
Medication	Not obey	27	50

Compliance	Obey	27	50
	Total	54	

Table 1 shows that the age group of respondents aged <11 years is 4 people (7.4%), 9 people 12-25 years old (16.7%), 19 adults 26-45 years (35.2%), and the elderly> 46 years 22 people (40.7%). Most of the ages were elderly> 46 years, 22 people (40.7%) and the lowest were children aged <11 years as many as 4 people (7.4%). The frequency distribution of the characteristics of health center respondents based on gender was male as many as 29 people (53.7%) and 25 women (46.3%). The frequency distribution of health center characteristics based on the marital status of married respondents was 36 people (66.7%) and 18 people (33.3%) were unmarried. The frequency distribution of the characteristics of health center respondents based on primary and non-school education was 21 people (38.9%), 16 junior high school students (29.6%), 15 high school students (27.8%), and Diploma and Tier 1 2 people (3.7%). The highest educational status was Not yet School and SD 21 people (38.9%) and the lowest was Diploma and Undergraduate as many as 2 people (3.7%). Frequency distribution of the characteristics of health center respondents based on the occupation of 54 respondents, student respondents as many as 10 people (18.5%), TNI / POLRI and 1 civil servant (1.9%), private employees 5 people (9.3%), 14 entrepreneurs (25.9%), and Others 24 people (44.4%). Most occupations are Others as many as 24 people (44.4%) and the lowest is TNI / POLRI and PNS as many as 1 person (1.9%).

The frequency distribution of the characteristics of the health center respondents was based on self-isolation from 54 respondents, the most respondents were not isolated as many as 28 people (83.0%), and isolated respondents were 26 people (48.1%). The frequency distribution of the characteristics of the health center respondents was based on the support of the views of 54 respondents, 28 respondents (51.9%) with negative views, and 26 respondents (80.8%). The frequency distribution of the characteristics of health center respondents is based on the experience of discrimination from 54 respondents, 38 people (70.4%) are not discriminated, and 16 people are not discriminated against (29.6%). The frequency distribution of health center respondent characteristics is based on social withdrawal from 54 respondents, 29 people (53.7%) did not withdraw, while 25 people (46.3%) withdrew. The frequency distribution of the characteristics of health center respondents based on Stigma Resistance from 54 respondents, Against Stigma as many as 33 people (85.3%), it is different for respondents Not Against Stigma as many as 21 people (38.9%). The frequency distribution of the characteristics of health center respondents was based on adherence to taking medication from 54 respondents, 27 respondents (50%) did not comply with medicine, and 27 respondents (50%) did not comply with medicine.

Table 2. The Relationship between Self-isolation Against, Support Views, Discrimination Experience, and Compliance with drinking Drugs for TB Patients at the Bandar Lampung City Health Center.

Self-isolation	**Medication Compliance**				**Total**		**p- value**	**OR (95% CI)**
	Case		**Control**					
	n	**%**	**n**	**%**				
Isolated	21	80.8	5	21.4	26	48.1	0.00	15,400 (4,077-58,166)
Not Alienated	6	19.2	22	78.6	28	51.9		
Total	27	100	27	100	54	100		
View Support	**Medication Compliance**				**Total**	**%**	**p-value**	**OR (95% CI)**
	Case		**Control**					

	n	%	n	%				
Negative Views	22	78.6	6	22.2	28	51.9	0.00	15,400 (4,077-58,166)
Positive Outlook	5	19.2	21	77.7	26	48.1		
Total	27	50	27	50	54	100		

Experience of discrimination	Medication Compliance				Total	%	p-value	OR (95% CI)
	Case		Control					
	n	%	n	%				
Discriminated	13	48.1	3	11.1	16	29.6	0.007	7,429 (1,799-30,668)
Not Discriminated	14	51.8	24	88.9	38	70.4		
Total	27	50	27	50	54	100		

Table 2 show that the respondents in most cases were Outcasts, with as many as 21 persons (80.8%), while respondents who were not isolated were 6 people (19.2%). Statistically, the study's findings obtained a p-value = 0.00, which is less than the 5% (0.05) significance level, indicating that there is a significant association between isolation and medication adherence. According to the results of the foregoing study, the OR value is 15,400, indicating that respondents who are isolated are at 15.4 times the risk of respondents who are not isolated.

Table 2 show that the respondents with the most unfavorable views were 22 people (78.6%), while the respondents with the most positive views were 5 people (19.2%). Statistically, the study's results obtained a P-value = 0.00, which is less than the 5% (0.05) significance level, indicating that there is a meaningful association between view support and medicine adherence. The analysis above shows that the OR value = 15,400 which indicates that respondents who have a negative view are 15.4 times riskier than respondents who have a positive view.

Table 2 show that the the respondents in the most cases found were not discriminated against, as many as 14 people (36.8%) while the majority of respondents who were discriminated against were not obedient to taking medicine as many as 13 people (81.2%). Statistically, the results of the study obtained a P-value = 0.007 which is less than the significance value of 5% (0.05), shows that there is a significant relationship between not being discriminated against and adherence to taking medication. The analysis above shows that the OR value = 7,429, which shows that respondents with discrimination have a risk of 7,429 times the risk compared to not being discriminated against.

Table 3. The Relationship between Withdrawal, Stigma Resistance, and Compliance with drinking Drugs for TB Patients at the Bandar Lampung City Health Center.

Withdrawal	Medication Compliance				Total	%	p-value	OR (95% CI)
	Case		Control					
	n	%	n	%				
Withdraw	19	70.4	6	22.2	25	46.3	0.001	8,312 (2,437-28,354)
Not Withdrawing	8	29.6	21	77.7	29	53.7		
Total	27	50	27	50	54	100		

Stigma Resistance	Medication Compliance				Total	%	p-value	OR (95% CI)
	Case		Control					
	n	%	n	%				
Not Against Stigma	18	66.6	3	11.1	21	38.9	0.00	16,000 (3,781-67,700)
Against Stigma	9	33.34	24	88.8	33	61.1		
Total	27	50	27	50	54	100		

Table 3 show that the highest number of respondents were withdrawn as many as 19 people (70.4%) while the respondents in cases who did not withdraw socially were as many as 8 people (29.6%). Statistically, the results of the study showed that the p-value = 0.001 which is less than the significance value of 5% (0.05), this shows that there is a significant relationship between social withdrawal and adherence to taking medication. The analysis above shows that OR = 8.312, which indicates that respondents who withdraw socially are at 8,312 times the risk than respondents who do not withdraw socially.

Table 3 show that 18 people (66.6%) were found the most were Not Against Stigma, while 9 respondents in the Against Stigma case (33.4%). Statistically, the results of the study obtained a p-value = 0.00 which is less than the significance value of 5% (0.05), this shows that there is a significant relationship between stigma resistance and medication adherence. The above analysis shows that OR = 16,000, which indicates that respondents who do not fight stigma have a risk of 16,000 times compared to respondents who are against stigma.

Table 4. Multivariate Stigma Test Results for Tuberculosis Patients Associated with Compliance with Medication at the Bandar Lampung City Health Center

Variable	**B**	**SE**	**P-Value**	**OR**	**95% CI For Exp (B)**	
					Lower	**Upper**
Isolation	2,409	1,153	0.037	11,128	1,161	106.62
Support View	3,149	1,268	0.013	23,314	1,945	279.42
Experience of discrimination	2,890	1,401	0.039	17,989	1,155	208.27
Social Withdrawal	2,325	1,116	0.037	10,226	1,148	91,078
Stigma Resistance	3,311	1,665	0.047	27,424	1,050	716.17
Constant	-9,030	3,239	0.005	0,000		

Table 4 show that the results of the logistic regression test shown above, it can be seen that all variables have a p-value <0.05. The stigma resistance variable has a p-value (0.047) with a greater OR = 27,424 value than the other variables with a confidence level between 1,050 - 716.17. Based on the explanation above, it can be concluded with 95% confidence that we believe that stigma resistance is the dominant variable on medication adherence compared to the variables of self-isolation, shamanism, the experience of discrimination, and social withdrawal.

DISCUSSION

There was a significant relationship between self-isolation status and medication adherence. The results of the analysis obtained p-value = 0.00 with an OR value = 15.400 and a-confidence between 4.077 - 58.166. This research is in line with the results of a study conducted in Malingping, Banten Province, it was found that the results of the analysis showed that 62.09% of the respondents experienced self-isolation in the form of feelings of shame, insecurity, feeling shunned, and feeling not understood by others (Septia, Rahmalia, & Sabrian, 2014).

Self-isolation is a stigma that inhibits healing by eroding one's social status, social networks, and self-confidence, all of which worsen outcomes, including unemployment, isolation, late seeking therapy, symptoms resistant to treatment, prolonging the course of illness, and avoiding hospitalization (Riyanto, 2011). ~~Se~~lf-isolation, even if allowed by the patient's family, does not receive proper care and treatment. Patients with mental disorders in rehabilitation who are cared for by their own families at home or outpatients need support to adhere to the treatment program. To create a cure for the patient itself (Osamor, & Owumi,

2011). The description above proves that if a patient is not isolated, he/she will regularly take medication, which is directly proportional to those who are isolated, so they tend not to regularly take medication. According to researchers, the majority of isolated Tuberculosis sufferers do not obey to take medication, this is because program holders at the health center are less intensive in taking the ball to the sufferers so that they can put themselves in their environment without them feeling embarrassed, disappointed, feeling low compared to people who don't get this disease. This research is in line with a study conducted by Malingping Province which showed that most patients who experience isolation show shame, feel inferior, and feel shunned and not understood by others (Sari, 2018). Self-isolation if left alone by the family does not receive treatment and treatment should have an impact on the patient's recovery due to drug withdrawal (Kwaghe, et al., 2021), (Freeman, 2020).

There is a significant relationship between view support and adherence to taking medication with the analysis results obtained by p-value = 0.00 with an OR = 15.400 and a-trust between 4.077 - 58.166. The positive form of support from families who seek and remind sufferers to regularly take the medication to minimize boredom or non-compliance with taking the medication regularly because the side effects of drugs felt by patients are disturbing, and lack of initiative to take patient medication, as well as bad emotions from sufferers. This effort is carried out by one of the families persuading the sufferer, and giving understanding or advice to the sufferer so that the behavior of a family can be classified as a form of informative family support. This type of family support is intended so that this information can be used to solve personal problems and other problems. This information includes providing advice, direction, suggestions, and information needed (Moya & Lusk, 2013).

In a study by Pare, Amiruddin, & Leida, (2012), Herawati, Abdurakhman, & Rundamintasih, (2020), conducted a study on the effect of family support on adherence to taking anti-tuberculosis drugs, involving 76 male subjects and 60 female subjects with pulmonary tuberculosis, ranging in age from 21 to 70 years. The results of this study indicate that the greatest influence on increasing adherence to taking anti-tuberculosis drugs in pulmonary tuberculosis patients is attention to the progress of treatment, followed by transportation assistance, encouragement of treatment and not avoiding the family of tuberculosis sufferer. Arafa, (2022) research leads to the behavior of compliance with taking medication in schizophrenia sufferers, namely the existence of family support provided to sufferers in terms of treatment. The support mentioned above such as delivering control, giving medication, and emotional support such as not tiring to care for the patient so as not to avoid the sufferer because there will be positive attitudes or feelings towards the sufferer (Minarni, et al., 2015)

In the absence of family support, Tuberculosis sufferers tend to think negatively which will reduce their self-confidence in their recovery. The description above proves that if there is a negative viewpoint, it will allow non-adherence to taking medication, and is directly proportional to adherence to taking medication if a Tuberculosis patient has a positive view. Above has been explained, researchers argue that the majority of Tuberculosis sufferers who have a negative view do not comply with taking medication, this is because Tuberculosis patients in their environment cannot live well, cannot make decisions well, and cannot contribute to society such as participating in recitation, social gathering, and monthly RT gatherings because they are shunned in society.

There was a significant relationship between diet and the incidence of RA. The results of the analysis showed that *p-value* = 0.007 with an OR value = 7,429 and a confidence between 1,799 and 30,668. Status The results of this study are in line with Sari Y's research in 2018 in the Malingping Health Center area regarding the experience of discrimination experienced by 36.29% of respondents, in the form of neglect and unwillingness to interact with Tuberculosis clients. Tuberculosis sufferers choose to stay away and be alone.

Health status is the result of the interaction of various factors, both internal (internal) and external (external). This internal factor consists of individual physical and psychological factors. Meanwhile, external factors include socio-economic, socio-cultural, environmental, political, educational, and so on. Lawrance Green analyzes human behavior from a health level. One of the factors that still influence a person's behavior in undergoing treatment is discrimination received by patients.

Research conducted by Pare, Amiruddin, & Leida, (2012), respondents received more acts of good discrimination by 44 people (59.5%) compared to less good discrimination, namely 30 people (40.5%). Several researchers found that the socio-cultural factor of society, which they call social discrimination, is a very determining factor, namely from the aspect of treatment compliance with the result that the cure rate for Tuberculosis treatment is still low. Patients who do not regularly seek treatment are more likely to be discriminated against by the community as many as 13 people (59.1%). Patients who regularly seek treatment are found to be not discriminated against as many as 35 people (67.3%) and in the less discriminated category are 17 people (32.7%). The result of cross-tabulation of the discrimination variable with pulmonary Tuberculosis patient behavior obtained OR = 2.974, which means that pulmonary Tuberculosis patients who have discrimination are less at risk of getting treatment regularly compared to pulmonary tuberculosis patients who have good discrimination. If seen from the upper and lower limit values (95% CI 1.063 - 8.318), then discrimination is statistically significant.

The success of Tuberculosis treatment does not only depend on medical aspects. But also on the social aspect which plays a role in patient motivation to undergo regular treatment. In society, there is still a view that TB disease is a hereditary disease and is difficult to treat, so pulmonary TB sufferers often receive discriminatory treatment such as being avoided or shunned.

Research conducted by Directorate General of Disease Control and Environmental Health, Ministry of Health of the Republic of Indonesia, (2014), in Tangerang District found that public knowledge about pulmonary tuberculosis was not good enough and the attitude of society towards sufferers was also lacking (Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan, Kementerian Kesehatan Republik Indonesia, 2014). There is still discrimination in the community regarding pulmonary tuberculosis which says that pulmonary tuberculosis is an infectious disease and witchcraft, so they choose not to hang out with or be close to people who suffer from pulmonary tuberculosis (Dinas Kesehatan Kota Bandar Lampung, 2014).

Various acts of discrimination are accepted by Pulmonary TB patients. Most of the pulmonary TB patients received discrimination from their neighbors in the form of being avoided and not spoken to because they were afraid that the disease would move away and had been viewed cynically by their neighbors. So counseling about Pulmonary TB to the public needs to be done so that people can understand how to behave towards pulmonary TB patients in their environment.

Based on the description above, it proves that the more discriminated a person is, it triggers a decrease in medication adherence, and the more that person is not discriminated against, the more obedient the person is taking medication. According to the description above researchers argue that the majority of discriminated TB sufferers do not comply with taking medication, this is because TB sufferers are physically weak, they are insecure, they also do not dare to hang out with their friends in the neighborhood where they live, because many people in their environment think TB disease harmless and incurable and contagious. So they

are discriminated against in their environment because the environment tends not to embrace the TB sufferer.

There is a significant relationship between social withdrawal and adherence to taking medication, with the results of the analysis obtained *p-value* = 0.001 with an OR = 8.312 value and a trust between 2.437 - 28.354.

The research result is in line with research undertaken by Saraswati, Hasanah, & Al Ummah., (2016) in Kebumen where feelings of inferiority or low self-esteem are also experienced by patients with TB as one of the forms of stigma feelings of self-owned. This is consistent with the results of research done by Saraswati, Hasanah, and Al Ummah that as many as 51.6% of respondents in the study experienced self-less, as indicated by the lack of confidence when interacting with other people to avoid contact with the eyes while talking and looked down as there are physical changes experienced by the sufferer, a sense of alienation, disrespect, and feeling of no use to others.

The results of quantitative and qualitative research conducted by Moya, & Lusk, (2013) in Mexico state that the majority of TB clients feel that they feel shunned, discriminated against, useless, sad, depressed, angry, afraid of transmission, and lose their jobs.

The description above proves that the cause of this problem is the withdrawal by a person who tends to not be adherent to taking medication, and is directly proportional to patients who do not withdraw socially, they tend to comply with taking medication.

Researchers argue that the majority of TB sufferers withdraw socially and do not comply with taking medication, this is because family members tend to be apathetic towards them, their families tend not to pay attention to the sufferer, and do not remind them to continue taking medication. This is also inseparable from the lack of community health center cadres who are enthusiastic about providing education to their families, according to cadres in the field, TB sufferers are more clumsy, avoid being close to other people, feel strange, and feel a burden to others.

There is a significant relationship between stigma resistance and medication adherence, with the results of the analysis obtained *p-value* = 0.00 with an OR = 16,000 and confidence between 3,781 and 67,700.

The results of the above research are in line with the research by Prasetyo, & Gunawijaya, (2017) entitled The Benefits of Support Groups for People with Schizophrenia to Improve Self-control: A Case Study in the Indonesian schizophrenia care community (KPSI) Jakarta states that social stigma has a strong influence on ODS (people with schizophrenia) in fostering fear and anger, thus causing ODS to tend to shut down because they don't want their identity to be known. One of the ways that ODS can fight against social stigma is done by admitting that they have *Schizophrenia* disorder and making themselves a tool to educate the public through direct testimony in public. This open attitude has been effective in opening up the public's perspective on ODS and has turned to making ODS a party to consult on similar problems faced.

The strong motivation to want to heal triggers Stigma resistance as research conducted by Unalan, et al., (2008), states that adequate self-defense is shown by the feeling and self-confidence to be able to face various situations that result from the disease, which in this case is self-stigma caused by TB. This is because fewer respondents underwent treatment> 3 months than respondents who were in the intensive treatment phase (<3 months). Respondents with a treatment period of> 3 months can feel positive feelings and develop a belief in themselves that they can still contribute to their environment during illness, can still complete work well, and feel comfortable being close to other people. This is followed by the research that TB patients who have undergone a long treatment will experience a decrease in the negative impact of their TB disease, both physically and psychologically. and when a person has a high motivation to seek treatment and is optimistic that he will recover.

The description above proves that stigma resistance has an effect on medication adherence, and is directly proportional to respondents who do not fight stigma tend to not adhere to taking medication. Researchers argue that the majority of TB sufferers who do not fight stigma do not adhere to taking medication, this is because they feel they are not strong fighters, they are also burdened to help their family's economy because they feel physically weak and feel they must be cared for. Family members of TB sufferers do not help all the sufferers' needs, for the patients, wherever they go, continue to take medication regularly. Following the study done by Unalan, et al's research (2008) motivation to recover is adequate self-defense shown by feelings and self-confidence to be able to deal with various situations that are a result of the disease, Prasetyo, and Gunawijaya's research (2017) one way to fight Stigma is by admit themselves with direct testimony to the public and an open attitude. As well as research by Minarni, & Sudagijono, (2015). Saying support for those closest to you, starting from taking medication, reminding you to take medicine, and emotional support for tuberculosis sufferers will lead to positive attitudes and feelings towards sufferers.

The stigma resistance variable has a value of OR = 27,424 compared to self-isolation, a value of OR = 11,128, support for the viewpoint of OR = 23,314, the experience of discrimination, a value of OR = 17,989, and social withdrawal, the value of OR = 10,226, so that stigma resistance is the most dominant variable on medication adherence.

The results of this study are in line with research conducted by the research conducted by (Courtwright, & Turner, 2010), which states that the stigma of tuberculosis can cause treatment delays and harm treatment continuity in TB clients. This stigma is also often attached to health problems, including tuberculosis. The reasons why TB stigma appears to include its transmission, inaccurate knowledge of its causes, its treatment or contact with marginalized groups such as poverty, racial minorities, sex workers, prison prisoners, and people infected with HIV / AIDS, (Pare, Amiruddin, & Leida, 2012)

Research conducted by (Mathew, & Takalkar, 2007), in Indian society, found that TB patients in India often experience rejection and social isolation from society. Therefore, myths and stigma must be dispelled to control Tuberculosis. The problem of TB disease morbidity and mortality and the low coverage rate of TB patient detection is a complex health problem that is also influenced by many factors, which include internal and external factors. Internal factors play an important role in determining the health of individuals and groups, namely the behavior of the sufferer itself. TB patients also feel inferior to their environment and workplace.

Some tuberculosis sufferers frequently assert that they are discriminated against by society. This is due to people's fear of grasping the sickness. Patients determine whether or not other individuals will avoid them, and certain patients may avoid socializing in society. The strong stigma demonstrated by stigma resistance also reflects a high expectation of the treatment process, implying that stigma reduction programs should strive to convert stigma into support for them.

Stigma is a social interaction between individuals who are and are not stigmatized. Stigma develops as a consequence of experiencing prejudice from others, as well as feelings of humiliation that develop within the patient. Support for these patients is critical for diminishing self-stigma and its consequences. Some tuberculosis patients frequently report community discrimination. This is due to people's continued fear of engaging in the sickness. Patients estimate if others would avoid them, or whether certain patients will escape society by rarely mingling in society. Fighting Stigma demonstrates high expectations for the treatment process and demonstrates that Stigma Resistance programs should strive to change stigma into support for them.

From the parts contained in the instrument, it was found that almost all respondents (85%) had low stigma measurements. This is in line with the results of the study which showed that almost all respondents with low stigma resistance tended to disobey medication which was directly proportional to their adherence. In addition to its impact on the treatment process, stigma can cause patients to feel inferior (Somma, et al., 2008).

The results of research conducted by Moya, & Lusk, (2013), state that stigma can cause psychological stress, depression, fear, problems in marriage, problems at work and exacerbate disease conditions. In the community, these impacts may not have much effect. However, tuberculosis patients can feel inferior and feel they have no friends. Some patients who visit the Pulmonary Health Center often do not say that they have tuberculosis because they are afraid and ashamed and are shunned by their friends.

Researchers argue that stigma resistance plays a very important role by influencing patients to take medication regularly and when sufferers fight stigma, the person tends to obey the medication. But if the person does not fight the stigma, then they are less likely to adhere to taking medication, therefore if the patient feels positive, he will be more obedient and enthusiastic in his treatment. This study is in line with research conducted by Courtwright and Turner (2010) that tuberculosis stigma can cause delays in treatment and endanger the continuity of treatment in TB clients. Likewise, research conducted by (Mathew, & Takalkar, 2007) in Indian society found that TB patients in India often experience resistance and social isolation from society.

This study has multiple limitations and weaknesses, including: (1). The study was carried out at three health centers, namely Health Center Panjang, Health Center Sukaraja, and Health Center Satelit, which varied in regional, occupational, and socioeconomic characteristics. This study employed a case-control design, in which participants were chosen once the disease was already in progress (retrospective), allowing for bias and making confounding factors harder to discover. The researcher merely looks at the variables Self-isolation, View Support, Discrimination Experience, Relationship with Social Withdrawal, and Stigma Resistance, despite there are many more variables that have yet to be examined and compared. (2). This study also reveals that there are child responders who filled out the questionnaire based on the opinions of their parents, indicating that it needs to be evaluated again for accuracy. This study also demonstrates that TB patients' emotions differ from what their relatives experience, indicating the need for questions that contrast what family members perceive and patients' thoughts so that the data is consistent.

4. CONCLUSION

The conclusion is that stigma towards people with tuberculosis could result in treatment delays, which may endanger the patient by exacerbating the condition. This stigma arises from an absence of community awareness about how tuberculosis is transmitted, how to treat it, and how to prevent it. Both the manner of transmission of tuberculosis infection, as well as fear, are frequently linked to medical issues. The genesis of the TB stigma is due to the fact that tuberculosis is closely associated with marginalized groups such as the poor, racial minorities, sex workers, smokers, and persons infected with HIV/AIDS. According to the findings of this study, there is a substantial association between stigma and treatment experience, self-isolation, family support, and resistance to adherence to treatment.

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RESEARCH **Open Access**

Assessing Interventions for Declining Childhood Immunization Dropout - A Systematic Review

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Abstract

Childhood routine immunization is a critical stage to ensure the health of infants and protect against serious diseases. Therefore, adequate strategies are urgently needed to increase childhood immunization coverage to prevent global disease and death. This review has identified the effect of interventions to increase immunization coverage among children in developing countries. A review included published studies from 2013 to 2023 on randomized controlled trials (RCT) and pre-post intervention that met eligible criteria. All included studies had been conducted in English-published articles on Pub Med and Google Scholar, without being limited to geographical sites. A total of 1107 published articles were accessed and 12 final eligible articles were reviewed. 66.67% of the included studies were conducted in Africa, 16.67% in South East Asia countries, and others were conducted in East Asia and America. These studies demonstrated that different interventions (SMS and call reminders, sticker reminders, immunization education, home-based records, and community-centered) had significant increases in immunization coverage for childhood compared to the control group with standard care or without any interventions. The present findings suggest that interventions including implementing SMS and call reminders, sticker reminders, education both from health workers and local leaders, and home-based records can potentially reduce immunization dropout. However, strategies to improve coverage for immunization uptake should also be considered preferred community-based to extend the marginal groups.

Keywords: Intervention, Immunization Dropout, Immunization Uptake Coverage.

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1. INTRODUCTION

Routine childhood immunization is critical and has effectively reduced morbidity and mortality. In 2021, about 21.9 million children missed their routine first dose of measles, far from 2019 levels of 19.2 million. Moreover, in the same year, 25 million children were unvaccinated or incompletely vaccinated (Rachlin et al., 2022; WHO, 2023). Indonesia, the most populous country in Southeast Asia, reported only 58% of infants fully immunized, much lower than the 93% national coverage target (Kementerian Kesehatan Republik Indonesia, 2018).

Despite significant progress, the expanded immunization program still faces a higher number of incomplete or immunization dropout rates is still an issue. It was defined that the dropout rate is the rate difference between the first and the last dose or the rate difference between the initial vaccine and the last vaccine (Chanie et al., 2021). Multiple factors may cause increased immunization dropouts. A previous study has proved that living in rural areas, non-compliance with the order of arrival during vaccination in health facilities, and lack of a reminder system on days before the scheduled vaccination were significantly associated with high dropout rates (Kayembe-Ntumba et al., 2022). In addition, social norms, poor quality of health services, and concern about side effects cause vaccine hesitancy, resulting in a greater number of incomplete immunizations (Powelson et al., 2022).

Several strategies were introduced to help the challenges to improve routine immunization coverage. Developed policies, guidelines, human resources, management of vaccines, service delivery, communication, and community partnership were established (Shen et al., 2014). In addition, various approaches have been taken, starting from technology-based, application-based, and community empowerment. Expanding these strategy efforts provides opportunities to address the barrier, while transformative changes are required to improve the effectiveness of the intervention.

In literature searching, many studies were focused on estimating the predictive factors of immunization coverage. It was also found that few studies developed interventions or new strategies to encourage caregivers to bring children for routine immunization. However, some studies offered the developed interventions without assessing the impact on immunization coverage. Addressing these underlying deficiencies, therefore, this review aimed to identify and review the different types of interventions and the effects to reduce the dropout vaccination rate among children in the different regions.

2. RESEARCH METHOD

This study searched Google Scholar and PubMed with no geographical setting restricted as published from 2015 up to 2023. Literature searching was conducted focusing on combinations of the following terms: "reducing immunization dropouts"; "intervention"; and "evaluation of the interventions". Studies were excluded if the article developed tools or other interventions without assessing the impact on the immunization dropout rate. We prioritize selecting existing randomized controlled trials (RCTs), quasi-trials, and before-after intervention studies and reported immunization coverage outcomes. We also searched for additional articles by searching the references of included articles.

The authors screened the title and abstracts. Then, those authors assessed the full text of all potentially eligible studies. The authors discussed whether the articles met the present study's context regarding the topic, the outcome, and the study design.

Microsoft Excel spreadsheet (2021) software was utilized for data extraction. The authors independently extracted all relevant data using the Population, Intervention, Control, and Outcome format to guide the extraction of information from the articles. Information was extracted on the first author's name, year of publication, study setting, study design, participants, intervention, control, and outcome. The authors discussed the discrepancy between studies to get the final decisions on the articles to be reviewed.

The included studies were analyzed by summarizing the introduced interventions. The outcome of the study, rate of immunization coverage or immunization dropouts, was reported as similar to the studies. To validate the findings, we also compared the findings across studies.

The bias assessment was conducted according to the Cochrane Handbook for Systematic Reviews of Interventions (Chandler et al., 2019). The domains included in the bias measurement were bias arising from the selection of the study's participants, intended interventions, missing outcome data, bias in the measurement of the outcome, and bias in the selection of the reported finding. Overall risk-of-bias judgment was categorized as low bias, some concerns, and a high risk of bias (Higgins et al., 2019).

3. RESULTS AND DISCUSSION

One thousand one hundred articles were retrieved using a search strategy about interventions to reduce immunization dropout through online search engines such as; PubMed and Google Scholar. Titles and abstracts were screened and 311 irrelevant articles were excluded. Full texts of the 41 remaining articles were assessed for eligibility, and 12 articles met the inclusion criteria (Figure 1).

The studies included in this review were conducted in different sites. Studies represented four regions; 66.67% were based in Africa and 16.67% were conducted in South East Asia. The majority of studies were randomized control trials (66.67%) and pre-post-interventions for the rest. All included articles assessed the impact of different interventions on the number of immunization dropouts. The characteristics of the included studies are presented in Table 1.

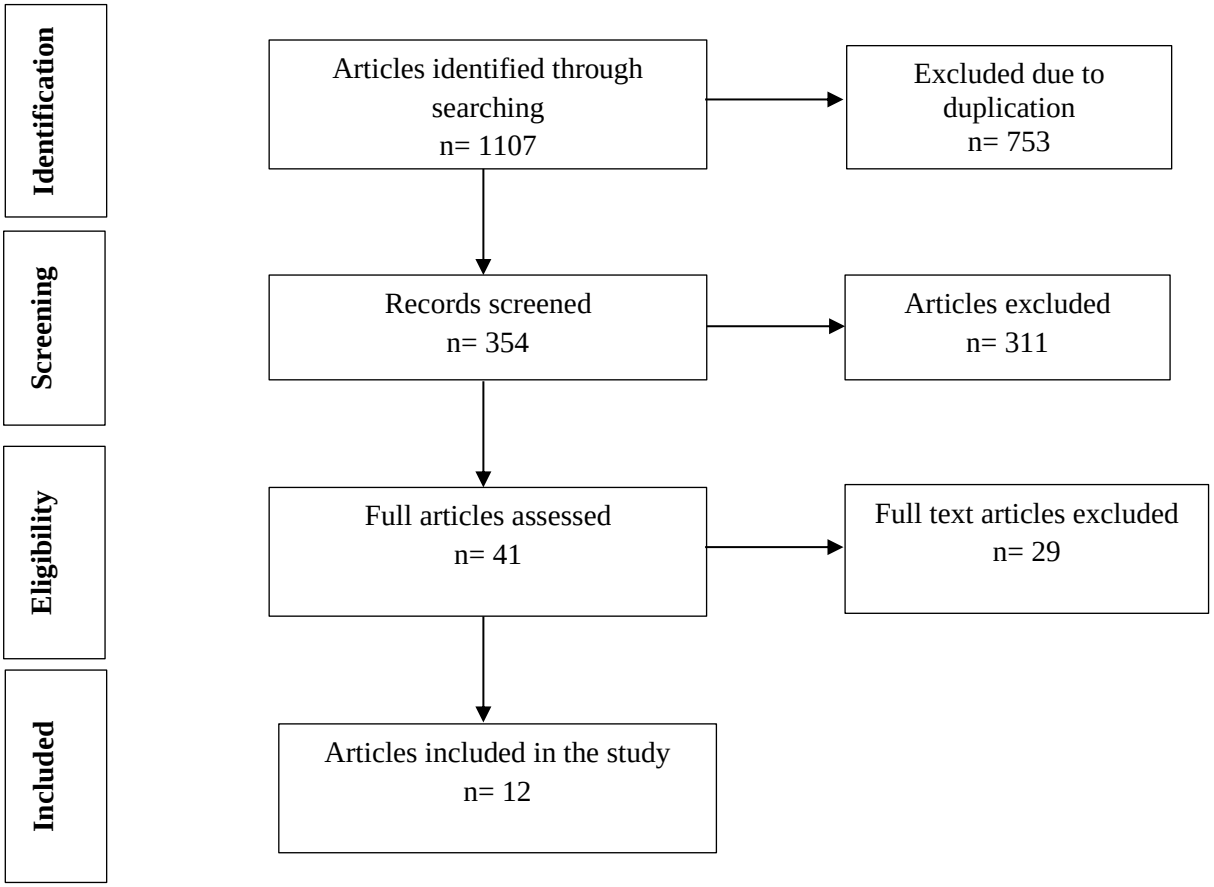

Figure 1. PRISMA Flowchart for Study Selection Process.

Table 1. Characteristics of the Included Studies Regarding the Interventions of Increasing Immunization Coverage or Reducing Immunization Dropout.

Variable	Number of studies	%
Study regions		
Africa	8	66.67
Côte d'Ivoire	1	8.33
Nigeria	5	41.67
Kenya	1	8.33
Zimbabwe	1	8.33
South East Asia:	2	16.67
Indonesia	1	8.33
Vietnam	1	8.33
East Asia	1	8.33
China	1	8.33
America	1	8.33
Arizona	1	8.33
Study design		
Randomized controlled trials (RCT)	8	66.67
Pre and post-intervention	4	33.33
Interventions		
SMS reminder	2	16.67
Phone calls	1	8.33
Routine health education and SMS reminders	1	8.33
Phone calls and SMS reminders	1	8.33
SMS or voice message reminder	1	8.33
SMS or providing stickers for reminders	1	8.33
SMS reminders, phone calls, and SMS health education	1	8.33
Home-based record (HBR) only and a combination of HBR and appointment sticker	1	8.33
Vaccination education session	1	8.33
Training of the traditional and religious leaders	1	8.33
Health Start Program (state-run community health workers' maternal and child health home visiting program)	1	8.33
Primary outcome(s)		
Increase immunization completion and timeliness	2	16.67
Increase certain immunizations coverage	4	33.33
Increase full immunization coverage	4	33.33
Reduce the dropout rate of full immunization	2	16.67
Immunization target		
BCG, OPV, Pentavalent 3, PCV, measles, and yellow fever	2	16.67
DPT3	2	16.67
Pentavalent 1-3 (DPT-HB-Hib) and Measles	1	8.33
Pentavalent	2	16.67
OPV1, Pentavalent	1	8.33
BCG, HepB1, OPV1, DTP1, MR, JEV	1	8.33
BCG, DPT3, hepatitis B, Hib, OPV, measles	1	8.33
BCG, DPT 1-3, Measles	1	8.33
BCG, measles	1	8.33

From 41 full-text articles through screening, it can be seen that most of the excluded studies were due to a lack of the outcome of this study interest (34.48%). 27.59% of the studies were description analysis, hence, this review could not assess the magnitude of the intervention effects. The lowest proportion was insufficient information regarding the outcome (3.45%).

Table 2. Characteristics of the Reasons for Studies Exclusion.

Reason for Exclusion	**No. of Studies**	**%**
Studies developed tools without assessing the findings' impact on the outcome	10	34.48
Studies did not assess any intervention	5	17.24
Descriptive studies	8	27.59
Studies presented protocol	3	10.34
Cross-sectional or cohort studies	2	6.70
Insufficient information regarding the rate of immunization coverage trends pre and post-intervention	1	3.45
Total	29	100

For risk-of-bias assessment, three (25%) out of the 12 studies introduced a high risk of bias and raise some concerns in at least one domain (Dissieka et al., 2019; Ekhaguere et al., 2019; Ibraheem et al., 2021). It was also found that 16.67% of studies raise a concern in one domain (Oyo-Ita et al., 2021; Wallace et al., 2019), two papers (16.67%) determined to be at low risk of bias for all domains (Eze & Adeleye, 2015; Wightman et al., 2022), and others were potentially met the methodological criteria (Bangure et al., 2015; Haji et al., 2016; Hu et al., 2017; Ijeoma, et al., 2015; Nguyen et al., 2017).

Table 2. Summary of the Studies of Intervention to Increase Immunization Rate or Reduce Immunization Dropout

Study and year	Site	Study Design	Participants	Intervention	Control	Outcome: Immunization coverage/dropout (%)			
						Indicators	Pre/ Control	Post/ Intervention	Change
(Dissieka et al., 2019)	North-central region, Côte d'Ivoire	RCT	Infants ≤12 months	Providing mothers with mobile phone message (voice or text) reminders two days before each scheduled visit and two additional reminders for missed doses (n= 798)	No phone reminder messages (n= 798)	Pentavalent 1 visit attendance	76.1	86.6	+10.5 [a]
						Pentavalent 2 visit attendance	67.3	81.0	+13.7 [a]
						Pentavalent 3 visit attendance	58.3	74.2	+15.9 [a]
(Eze & Adeleye, 2015)	South Nigeria	RCT	Infants at their first immunization session (BCG) and second immunization (DPT1)	SMS text reminders	No intervention	DPT3 coverage (Timeliness of immunization completion)			
						Early	60.3	69.0	+8.7 [a]
						Delayed	39.7	31.0	-8.7 [ref.]
(Ibraheem et al., 2021)	Ilorin, Nigeria	Pre-post-intervention	Infants presenting for the first dose of vaccine in the five infant NPI scheduled visits	Call reminders (n= 140), SMS reminders (n= 140), health education messages (n= 140)	Routine care (n= 140)	Timeliness of presentation / receipt of immunization completion:			
						• Six weeks	54.2	99.2; 97.1; 98.5	+45; +42.9; +44.3 [a]
						• Ten weeks	72.1	93.2; 90.1; 86.7	
						• Fourteen weeks	66.9		

						visit (appropriate) • 10 weeks visit (appropriate) • 14 weeks visit (appropriate) • 9 months visit (appropriate)	36.6	87.2; 69.9; 64.9 89.4; 63.7; 56.5	+20.3; +17.2;+ 13.8[a] +20.3; +3; +2 [a] +52.8; +27.1;+ 19.9[a]
(Ekhaguere et al., 2019)	Nigeria	RCT	Children aged 0–12 weeks/ newborn infants	Automated voice call text and email immunization reminders (n= 300)	No reminders (n= 300)	The proportion of infants who received immunization: • Penta-1 at 6 weeks	83 84 78 65	86 85 84 73	+3 [b] +1 [b] +6 [a] +8 [a]

						• Penta-2 at 10 weeks • Penta-3 at 14 weeks • Measles at 12 months • All immunizations	47	57	+10 [a]
(Haji et al., 2016)	Kenya	Pre and post-intervention	Children aged <12 months presenting for the first dose of pentavalent vaccine	Provide SMS (n= 372) or sticker reminders (n= 372)	No reminder (n= 372)	Immunization dropouts • SMS reminder • Sticker reminder	17 17	3.5 16	-13.5 [a] -1 [b]
(Wallace et al., 2019)	West Java, Indonesia	RCT	All children who received DTPcv1	Home-based records and appointment sticker (n= 1103), home-based record only (n= 1434)	Standard care (n= 1079)	Timeliness of DTPcv3 coverage: End of the 200-day study period Within 60 days of DTPcv1	78 23 52 61	77; 74 32; 24 55; 47 61; 53	-1; -4 [b] +9; +1 [a] +3; -5 [a] 0; -8 [b]

						Within 70 days of DTPcv1 Within 90 days of DTPcv1			
(Bangure et al., 2015)	Kadoma, Zimbabwe	RCT	Children aged <12 months right after they were born or during the 3rd and 7th-day visits after the infants born	Routine health education and SMS reminders (n= 152)	Routine health education (n= 152)	Timeliness of immunization coverage: • 6th week • 10th week • 14th week	82 80 75	97 96 95	+15 +16 +20
(Hu et al., 2017)	Zhejiang Province, Eastern China	RCT	Infants <12 months	Vaccination education session (n= 418)	No intervention (n= 433)	The coverage of full immunization scheduled: • BCG • HepB1 • OPV1 • DTP1 • MR • JEV	84.1 88.0 66.1 60.0 75.1 52.9 33.0	82.1 89.0 73.9 72.0 92.1 65.1 51.9	-2 [b] +1 [b] +7.8 [a] +12 [a] +17 [a] +12.2 [a] +18.9 [a]

						• Full immunization (overall)			
(Nguyen et al., 2017)	Vietnam	Pre and post-intervention	All children born in Ben Tre	SMS reminders (2014: n= 4078; 2015: n= 3374)	No intervention (n= 3997)	Full immunization coverage (2013 as preintervention/baseline): • 2014 • 2015	75.4 75.4	81.7 99.2	+6.3 [a] +23.8 [a]
(Ijeoma, 2015)	South Eastern Nigeria	RCT	Infants that that commenced their childhood immunizations in the month of April	Telephone calls reminders (n= 119)	Standard care (n= 119)	Immunization dropout: • April - BCG/measles - DPT • May - BCG/measles - DPT	45 21 37 14	37 14 47 22	-8 [b] -7[a] +10 [b] +8[b]
(Wightman et al., 2022)	Arizona, USA	Pre-post-intervention	Firstborn	Arizona's Health Start Program (n= 3004)	Standard care (n= 18,266)	7 vaccination series intended for young children: HepB, DTaP/DTP, Hib, PCV13,	27.7 62.8	29.3 67.9	+1.6 [b] +5.1 [a]

						MMR, Varicella. On scheduled completion, all series Completion by age 5, all series			
(Oyo-Ita et al., 2021)	Cross River State, Nigeria	RCT	children aged 0–23 months	Training of the traditional and religious leaders (TRLs): • Baseline: n= 1297 • Mid-term: n= 1302 • Final evaluation: n= 1276	No intervention • Baseline: n= 1301 • Mid-term: n= 1268 • Final evaluation: n= 1274	up-to-date vaccination for BCG, OPV, Pentavalent 3, PCV, measles, and yellow fever appropriate for the age • Baseline • Mid-term • Final evaluation	48 56 55	46 54 52	-2 -2 -3

[a] *Significant change;* [b] *no significant change;* [ref.] *reference category*

This review study reported ten studies investigating the intervention's effects on reducing infants' immunization dropout. These studies developed interventions, including healthcare providers-centered, technology approach, and community-based interventions. Most studies utilized health workers to manually remind participants, such as text or phone call reminders, sticker reminders, or giving education sessions.

The adoption of short message services (SMS) has been documented to enhance immunization coverage. SMS reminders were associated with no immunization delay and increased the proportion of children receiving routine immunization. Participants were willing to receive and they assumed that it was beneficial so that immunization was on time (Bangure et al., 2015). In addition, the budget effectiveness proved the use of SMS was reasonable as it was cheaper than home visiting (Nguyen et al., 2017). However, another study showed that most participants preferred receiving voice reminders over text messages. This may be due to a lack of technology exposure and low educational background since the study was conducted in rural areas (Dissieka et al., 2019).

Following up on the fact that parents tend to prefer voice messages over text messages, another study intervened with phone calls (Brown et al., 2016; Ijeoma, 2015; Ibraheem et al., 2021). This intervention has shown positive results in improving the rate of appointments kept (Huldah Ijeoma, 2015). Undeniably, through phone call reminders, the participants tend to give responses and non-responses directly and even clarifications during calls. Phone call reminders proved improvements with the inception of the recall intervention. Yet, this method would be more expensive than text messages (Mekonnen et al., 2019; Obi-Jeff et al., 2022).

Both text reminders and phone calls require effort from health workers, henceforth, time and human resource dependence become a consideration (Brown et al., 2020). Automated reminders using technology applications may be more beneficial. A positive lesson was learned from a previous study conducted in Nigeria, where integrated a software application to send automated voice call text and email reminders (Ekhaguere et al., 2019). The reminders were sent automatically 2 days before the scheduled date of the Penta-1, 2, 3, and measles immunization based on the prior data regarding the date of birth of the newborn. While this finding significantly improved immunization completion and timeliness, growing evidence of its effectiveness resulted from poor phone and internet networks. This is acknowledged as the consequence of web-based text and call systems.

The added health workers-centered method was the home-based record (HBR) and placing an appointment sticker on HBR (Wallace et al., 2019). The findings highlight the success of this method in getting a significantly higher number of individuals to bring their children for more timely vaccinations compared to the control group. Health workers provided an HBR to ensure that the caregiver is aware of the immunization services the child has and has not received. In addition, placing a parental appointment sticker on the HBR could be used to ensure that parents return promptly for the next childhood immunization. This intervention provides an inexpensive and effective tool for promoting childhood immunization, however, policies requiring the presentation of the record should be considered with care, as some children may drop out of the system if the child is turned away from immunization services just because the caregiver forgot the child's record (WHO, 2015).

Among all the innovative interventions, health education plays an essential as the basic need to improve immunization coverage. Education could be done through technology or by individuals. The previous study evaluated the SMS immunization facts which contain health education regarding immunization and also received automatic messages indicating the next appointment date (Bangure et al., 2015; Ibraheem et al., 2021). As a result, significant improvement in the vaccination knowledge among participants in the intervention group was

one of the most clearly identified outcomes, followed by positive trends in the increased immunization coverage (Hu et al., 2017).

Nonetheless, the majority of the existing interventions mentioned above are still health worker-centered. There has not been a reciprocal communication relationship or an active role from the caregivers themselves, meaning that strengthening routine immunization programs needs considered to focus on building awareness among residents through social engagement (Mahachi et al., 2022; Syed et al., 2023). Arizona's Health Start Program (HSP) was a well-established model by promotes the optimal use of community-based family healthcare services and education services through the use of community health workers (CHWs) for maternal and child health home visits (Wightman et al., 2022). Families in the CHW home visiting intervention were significantly more likely to report better immunization outcomes by utilizing CHWs who live in and reflect the ethnic, cultural, and socioeconomic characteristics of the local society. In addition, increasing parental knowledge through local leaders may be more sufficient to reach marginalized communities (Haldane et al., 2019) due to geographical or socioeconomic factors to encourage children's immunization completion. Mobilizing communities for immunization may strengthen weak links in the causal chain, as traditional and religious leaders (TRLs) met the local characteristics, thus the information dissemination through local language may impact a greater outreach (Sabarwal et al., 2015). Despite the fact that a multi-component intervention involving TRLs had an insignificant effect on the proportion of children up-to-date with vaccination, the effectiveness in increasing the proportion of children receiving at least one vaccination should be considered (Oyo-Ita et al., 2021).

Of all the interventions, the most underlying consideration was rural settings. Though the effects of the implementations against immunization dropout were found significant, the application of the offered method faces similar barriers. The use of electronic or technology-based services may be struggling due to insufficient electricity and an internet connection, thus electronic-based reminders, such as SMS reminders and phone calls, may also be considered for future studies.

This systematic review on outcomes of community participation in high and upper-middle-income countries is the first of its kind to be conducted. A strength of this review was the use of a wide range of databases and the inclusion of papers in multiple languages to ensure broad representation.

The present study is a comprehensive and updated review of childhood immunization interventions including randomized trial evidence and pre-post studies. However, different settings and scales of the targeted population may influence these findings, therefore, this systematic review study may be subject to several limitations. First, included studies may be overestimated to African countries as 70% of the findings were conducted in African regions. Different characteristics at different sites could impact the results of the interventions. Second, literature searching only uses Google Scholar and PubMed databases, hence, this may result in limited articles found. However, the small number of identified studies has reflected the big-picture objectives of this study based on strategic search keywords.

4. CONCLUSION

Overall, the most common interventions are phone calls and text messages to remind caregivers to bring infants for routine immunization on appointed dates. The impact of the interventions varied by study setting and sample characteristics, however, all the included studies proved to be significantly associated with an increasing trend of immunization rates. Nevertheless, these findings still face obstacles in the implementation, hence, improving social engagement is way better to reach the marginal groups that have limited internet connection and electricity.

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RESEARCH **Open Access**

The Effect of Visual Media Education in the Management Therapy on the Level of Knowledge of Patients Diabetes Mellitus with Comorbid

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Abstract

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both and is often accompanied by increased blood pressure. One of the drug-related problems that are frequently encountered is patient non-compliance in taking drugs. This can occur due to a lack of knowledge about managing pharmacological and non-pharmacological therapies, making therapeutic outcomes difficult. This study aims to determine the effect of visual media education on managing pharmacological and non-pharmacological treatment on the level of knowledge of type 2 DM patients with comorbid hypertension. This type of research is quasi-experimental, with pretest and posttest designs without a control group design. The research sample is the age group that has the age of 18-68 years, as many as 123 people using Purposive Sampling. The results showed that the level of knowledge before being given education was in a good category (4.81%), sufficient (42.29%), and less (52.90%). After being given education visual media, there was an increase in knowledge results for the good (74.25%), sufficient (18.14%) and poor (7.61%) categories. The results of the Wilcoxon test analysis obtained a p-value (0.000) < (0.005), which means that there is an effect of visual media education on the level of knowledge of type 2 DM patients with comorbid hypertension. Through the results of this study, it is hoped that pharmacists can provide ongoing educational counselling to chronic disease patients receiving polypharmacy to prevent drug-related problems.

Keywords: Education, Diabetes Mellitus, Hypertension, Knowledge.

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1. INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both. Hyperglycemia is one of the typical signs of DM, in the form of an increase in blood glucose levels that exceed normal limits and is often accompanied by an increase in blood pressure (hypertension). In 2017, about 462 million people were diagnosed with type 2 diabetes, with an estimated 6.28% of the world's population (4.4% of those aged 15-49 years, 15% of those aged 50-69, and 22% of those aged 50-69). >70 years old) (Khan et al., 2020). Based on East Java Health Profile data, the prevalence of hypertension in East Java reached 13.47% (about 935,736 population), with the proportion of men 13.78% (547,823 residents) and women 13.25% (387,913 residents).

The increasing prevalence of DM cases with hypertension has influential risk factors such as obesity, stress, unhealthy lifestyles, diet and unhealthy eating patterns. This unhealthy diet and lifestyle can lead to acute and chronic patient complications. If it is not handled properly and to prevent complications, it is necessary to have therapy management (Trento et al., 2020). The pharmacological treatment used for DM patients with hypertension, antihypertensives are Angiotensin-converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARBs), which have long been considered the cornerstone of anti-hypertensive treatment in diabetic patients. Previous studies have demonstrated that both renin-angiotensin-aldosterone system (RAAS) blockers, ACEI and ARB, are associated with preventing new-onset DM in hypertensive patients (Grossman & Grossman, 2017). ARBs or ACEIs are recommended for hypertension with diabetes, heart disease and stroke. ARBs or ACEIs in DM can reduce progression to DM nephropathy or chronic kidney disease because they have a vasodilating effect on the efferent arteriole of the kidney, thereby providing a renoprotective effect (Utami et al., 2020).

According to research (Devarajan et al., 2017), the most commonly used Oral Antidiabetic (OAD) are metformin (biguanide group) and glimepiride (sulphonylurea group). In DM patients, the use of the combination glimepiride/metformin showed a significant decrease in glycemic parameters. The use of metformin single OAD is a first-line therapy for DM patients, which is effective and safe, inexpensive, and can reduce the risk of cardiovascular events and mortality rates (American Diabetes Association, 2019). Non-pharmacological therapy in DM patients with hypertension can be managed by monitoring blood sugar, adjusting diet and weight, regular exercise, adherence to hypoglycemic drugs, and routine blood sugar control (Oyekale, 2019). Blood sugar control is also balanced with blood pressure control, which can be done by maintaining a lifestyle modification by regulating the diet DASH (The Dietary Approach to Stop Hypertension) is a diet pattern by adjusting the consumption of fruits, vegetables, low-fat dairy products, efforts to reduce salt and red meat intake (Siervo et al., 2015). Therefore, it is very important to balance pharmacological therapy and lifestyle modification, one of which is by adjusting the DASH diet.

In addition, education can also be given, which is one of the four pillars of DM management, which also affects the patient's success in carrying out metabolic control. Education using visual media is a means of conveying messages or information to patients, combined with depiction media that can only be read by the sense of sight. It is hoped that visual aids can help improve people's understanding and memory regarding drug use. Providing education is one of the efforts that can be used to increase the knowledge and skills of DM patients with hypertension. This is also supported by research (Wahyuni et al., 2019) that increased knowledge of hypertension prevention was obtained by respondents after receiving intervention through video media. Previous research (Sidrotullah et al., 2022) used a questionnaire measuring knowledge and adherence to medication in diabetes mellitus patients which resulted in a relationship between the level of knowledge and adherence to medication

in patients with type 2 diabetes mellitus. It is important to increase patient understanding through the use of visual educational media, one of which is by providing explanatory brochures or leaflets medication with pictures. Therefore, it is important to provide appropriate information and education both pharmacologically and non-pharmacologically related to the management of diabetes mellitus with hypertension in the hope of increasing attitudes about patient care, controlling the disease they suffer and preventing complications in Type 2 DM with comorbid hypertension.

2. RESEARCH METHOD

This research has been done through research testing and is declared ethically worthy. The research design used a one-month quasi-experimental pre-post test with a purposive sampling method and obtained 123 outpatients at Clinic "X" Lamongan City. The research was conducted in February-March 2021 using primary data. The inclusion criteria of the research sample: outpatients with a diagnosis of type 2 diabetes mellitus with hypertension with age > 17 years; Willing to be a respondent in the study by signing the consent form. Exclusion Criteria: Patients who cannot communicate well. (this condition is believed to make them incapacitated). The variables of this study consisted of independent variables, sociodemography, and dependent variables: knowledge of pharmacological and non-pharmacological therapy. Data collection is done by filling out a questionnaire before receiving visual media education (Pretest), after which the patient will receive visual education in the form of a short educational video related to the management of pharmacological and non-pharmacological therapy in type 2 DM patients with hypertension (three times the respondents are given the intervention) After that, the questionnaire will be filled again (Posttest). The research instrument that will be used is a closed questionnaire consisting of 20 questions (10 questions for pharmacological therapy and ten questions for non-pharmacological therapy) tested for validity and reliability on 30 respondents from the research sample. If the calculated r-value> r-table value with = 5%, the questions in the questionnaire are declared valid. The value of the r-table for 30 respondents is 0.312. The results demonstrate that each item of pharmacological and non-pharmacological therapy management has an r value greater than the r-table, which is 0.4. Hence, the question item is declared valid and can be employed for research

Data analysis was carried out statistically and descriptively. Descriptive analysis was conducted to see the level of pharmacological and non-pharmacological knowledge. The results of the descriptive calculations will be put into categories: 76-100% good category, 56-70% sufficient category, and 56% poor category (Sugiyono, 2017). Statistical analysis was carried out to see the effect of visual media education in managing pharmacological and non-pharmacological therapy on the level of knowledge of Type 2 DM patients with comorbid hypertension. Hypothesis testing was carried out using the Wilcoxon Sign Rank Test using the IBM SPSS Statistics 26 application. This research has an ethics certificate issued by the University of Muhammadiyah Lamongan with No 226/EC/KEPK-S2/02/2021.

3. RESULTS AND DISCUSSION

In this study, 123 respondents met the inclusion criteria. Data on the characteristics of the respondents are presented in Table 1. Based on the data on the characteristics of the respondents, it is known that 34.15% of respondents are in the late elderly age, namely 56-65 years, who also have a Body Mass Index (BMI) in the overweight category 44.72% A total of 60.98% respondents are women and 46.34% of respondents come from basic education. Most of the respondents work as farmers 45.53%.

The obesity factor is closely related to the incidence of insulin resistance and fat distribution, which can cause risk factors for metabolic syndrome and cardiovascular disease (CVD). Impaired insulin work and insulin secretion contribute to the risk of hyperglycemia, hyperlipidemia, hypertension and obesity, which leads to the metabolic syndrome. Men are more susceptible to metabolic syndrome than premenopausal women; However, protection in women is reduced significantly when estrogen levels decrease. Consistent with these findings, when compared with premenopausal women, postmenopausal women and men of the same age have the same risk of developing insulin resistance (De Paoli et al., 2021). Women are more at risk of diabetes mellitus 2,777 times greater than men. In addition, factors from the hormone estrogen affect HDL levels to be low and LDL to be high, leading to high blood pressure (Kusumawaty et al., 2016).

The age characteristic is dominated by the late elderly (56-65 years) (34.15%). As you age, your blood pressure will also increase. The majority of hypertensive patients occur at the age of over 40 years. In conditions of hypertension, the arterial walls will experience thickening caused by the buildup of collagen in the muscle layer, causing the blood vessels to narrow and become stiff so that in the end the elasticity of the blood vessels decreases. Other studies also show that age 50 will be 5.2 times more at risk of suffering from DM than the age group <50 years (Tsalissavrina et al., 2018).

At the education level, most of the respondents had an elementary school education (46.34%). A person's education level determines the knowledge, attitudes and behavior. The lower a person's level of education, the less information obtained in this case will lead to unhealthy behavior and lifestyle for hypertensive patients such as a lack of understanding of the dangers and prevention of hypertension and DM (Restuning, 2015). The last characteristic based on Body Mass Index (BMI) is that the majority of DM patients with hypertension were in the overweight category (44.72%). BMI is related to systolic blood pressure. Being overweight increases the risk of cardiovascular disease because the greater the body mass, the more blood is needed to supply oxygen and food to the body's tissues. So that the volume of blood circulating through the blood vessels increases and puts high blood pressure on the arterial walls, resulting in increased blood pressure. Patients who are overweight or obese tend to ignore their ideal body weight and diet. As a result, the potential for diabetes is much higher (Adnan et al., 2013).

Table 1. Characteristics of Respondents at Clinic "X" Lamongan period February-March 2021.

Variable	Total (n=123)	Percentage (%)
Age (years old)		
17-25	7	5.69
26-35	20	16.26
36-45	34	27.64
46-55	20	16.26
56-65	42	34.15
Sex		
Male	48	39.02
Female	75	60.98
Education		
No Education	57	46.34
Primary school	24	19.51
Junior high school	17	13.82
Senior high school	25	20.33
Occupation		
Farmer	56	45.53

Housewife	34	27.64
Entrepreneur	33	26.83
Body Mass Index (BMI)		
Underweight (<18,5 kg/m^2)	31	25.20
Normal (18,5-22,9 kg/m^2)	37	30.08
Overweight (> 23 kg/m^2)	55	44.72

Based on the research results on the level of knowledge of pharmacological therapy in DM patients with hypertension, several indicators of questions were asked (Table 2). In the indicator, The accuracy of the type of drug consumed with indications, the pretest results show the sufficient category, and after being given education using visual media, it is in a good category. This study's most commonly prescribed oral antidiabetic drugs were metformin and glimepiride. Likewise, in research (Moon et al., 2017), oral antidiabetic therapy metformin monotherapy or a combination of metformin and sulfonylureas are the most commonly prescribed antidiabetic options. While the antihypertensives were amlodipine and captopril. This is like in a study (Utami & Octavia, 2022), hypertensive patients with comorbid DM were most dominantly using amlodipine for antihypertensives, and glimepiride for antidiabetics. Research from (Fares et al., 2016) also stated that based on randomized controlled trials amlodipine is considered effective and has high efficacy so that it can be the first line of prevention and reduction of cardiovascular events. Antidiabetic Glimpiride has less hypoglycemic side effects than glibenclamide, so amlodipine was chosen because it has no effect on insulin sensitivity. The provision of drug information education related to general indications for antidiabetic and antihypertensive has been informed in advance from the doctor conducting the examination. Knowledge related to the names of drugs consumed by patients is an important and underlying factor for providing therapy from clinicians (doctors), for example, requiring drug replacement due to drug-related problems that may occur (Kurnia et al., 2020).

The purpose of using oral antidiabetic and antihypertensive drugs consumed by patients should be accompanied by an understanding the rules for taking drugs and the frequency of using the right drugs. Most patients belong to the category of good knowledge after being given education regarding the frequency of administration of metformin and captopril drugs, but they still do not know the exact frequency of glimepiride administration. Likewise, with the accuracy of the rules for taking amlodipine and glibenclamide. Based on (James, et al, 2014) not all antihypertensive drugs can be taken right after eating there is a class of antihypertensive drugs that should be taken before eating or on an empty stomach, namely the ACE inhibitor group, the drug used is captopril. Captopril belongs to the Acei group and has a bioavailability of 60-75% so it is absorbed quickly on an empty stomach. Food can reduce drug bioavailability by about 24-30% (Ko et al., 2019). In the CCB group consumed after meals in this case, amlodipine has a bioavailability of 60-65% amlodipine absorption is not affected by food intake (Kang et al., 2018). Amlodipine has a maximum concentration in the body of 6-12 hours and t1/2 is longer than 30-50 hours, so amlodipine is taken only once a day (Kang et al., 2018). For nifedipine, in contrast to amlodipine, peak blood levels are reached within 20 minutes and have an elimination half-life (t1/2) of 4 hours, so it is given three times a day. Captopril has a half-life (t1/2) of 2-3 hours, so it can be given 2-3 times a day (Ilic et al., 2015). Knowledge related to the rules of use and the frequency of administration is very important because it can be a cause of non-fulfillment of drug-related needs (Drug Related Needs), namely the effectiveness of a drug and related to the availability of drugs in the blood (drug levels are too low, and it could also be that drug levels are too high and pass through the blood). minimum limit of toxic concentrations (so that it can harm the patient) which can indirectly cause problems related to treatment. Drug-related problems need to be a concern because they can affect variations in

patient responses to the expected therapeutic outcomes. In the Study (Utami, Octavia, & Fandinata, 2020) there were 11 patients who showed various negative responses such as an increase in blood pressure after being observed for 3 months of therapy, some of them had co-morbidities with DM. This is influenced by the inaccuracy in choosing a single therapy given to patients who have comorbidities, causing variations in negative responses which can also be seen from the increase in blood pressure produced for three months.

In the indicators related to the potential side effects of metformin, it is still in the category of sufficient level of knowledge (*posttest*), then captopril and nifedipine are in the good category. The side effect of metformin can cause gastrointestinal disturbances, and a potential side effect of captopril is dry cough on captopril administration there is an inhibition of the conversion of angiotensin I to angiotensin II which can cause bradykinin degradation and is also inhibited so that bradykinin levels in the blood increase. An increase in bradykinin can stimulate chemoreceptors in the airways which causes itching, a cough reflex will occur (Yılmaz, 2019). The potential side effect of nifedipine and amlodipine is orthostatic hypotension (a decrease in blood pressure when a person stands where a decrease in systolic blood pressure of at least 20 mmHg or a decrease in dastolic pressure of at least 10 mmHg within three minutes of standing) which can be overcome by taking it sitting upright for 5 minutes and not immediately with a standing position because it can cause dizziness or fainting. The potential side effect of antihypertensives of the Ca Channel Blocker class, it is also necessary to pay attention to the risk of other drug problems such as drug interactions that can occur with the use of NSAIDs, patients are known to sometimes also take NSAIDs when the body feels sick. Therefore, knowledge of information on the risk of interaction of antihypertensive drugs with NSAIDs is also important to be educated (Utami, Octavia, & Fandinata, 2020).

Table 2. Pretest and Posttest Results Related to Pharmacological Therapy at the Lamongan "X" Clinic for the period February-March 2021.

Question indicator	**Pretest (n=123)**			**Posttest (n=123)**		
	F	**%**	**Category**	**F**	**%**	**Category**
The accuracy of the type of drug consumed with indications	81	65.85	Enough	113	91.87	Good
Accuracy of use of Metformin drug use rules	60	48.78	Less	95	77.23	Good
Accuracy in the use of the rules for using the drug Amlodipine	65	52.84	Less	93	75.61	Enough
The accuracy of using the rules for using the drug Glibenclamide	63	51.22	Less	93	75.61	Enough
The Accuracy of the Frequency of Metformin Use	66	53.66	Less	96	78.05	Good
The Accuracy of the Frequency of Using Captopril	62	50.41	Less	95	77.24	Good
The Accuracy of the Frequency of Use of Glimepiride Drugs	63	51.22	Less	93	75.61	Enough
Potential Metformin Side EffectsPotential Nifedipin	51	41.46	Less	90	73.17	Enough
Side Effects Potential Captopril	55	44.71	Less	94	76.42	Good

Side Effects	63	51.22	Less	99	80.49	Good

The level of knowledge of non-pharmacological therapy (Table 3), most of the patients had a good level of knowledge after being given education. Preventing DM and Hypertension requires lifestyle adjustments, regular physical activity, proper dietary planning such as the DASH (Dietary Approach to Stop Hypertension) diet in hypertensive patients, regular exercise, adherence to hypoglycemic medication, and blood sugar checks. can help optimize the therapeutic outcome to be achieved. Knowledge of controlling the patient's glycemic level is influenced by patient compliance with dietary recommendations including the type and amount of food consumed, whereas if the patient's level of knowledge is low, it is one of the obstacles to achieving treatment goals and will also result in the patient requiring examination or treatment that is not actually needed (Muhammed et al., 2021). Compliance with taking medication can also be improved by storing medication using the pillbox method, making it easier for patients to consume medication more effectively and efficiently (Utami, et al., 2022)(Utami, Octavia, & Fandinata., 2020).

Some patients are still unfamiliar with the term DASH diet for hypertension, but after being given education, many have understood that it is very important to control diet. In addition, the types of vegetables, fruit, and sugar and salt restrictions up to the appropriate dose are still poorly understood. Foods that are recommended for hypertension patients are vegetables. Vegetables contain vitamins and minerals that are beneficial for health, one of which is controlling blood pressure such as celery vegetables contain potassium compounds and can reduce blood pressure by + 7.67 mmHg, knowledge related to food can provide the positive effect is not only in the form of energy but also helps control blood pressure (Siervo et al., 2015). High salt intake can increase the mass of the left ventricle resulting in pressure on the arteries so that blood pressure increases. To lower systolic and diastolic blood pressure, it can be done with a daily salt diet by limiting gram intake to no more than 5 grams per day. Limiting salt consumption to < 6 grams per day can lower blood pressure by 2-8 mmHg.

Restrictions on the consumption of marine fish also need to be considered for blood pressure control, if you consume seafood > 4 pieces a week and do it every day it will be difficult to control blood pressure. Knowledge related to the dose of fish consumption will help patients estimate the amount of fish consumed so that there is no increase in blood pressure. Likewise, with the dietary dose for blood sugar control and preventing obesity, the recommended diet composition for diabetics is carbohydrates of 45-65% of the total/total calories needed every day, and the recommended protein of 10-20% of total calories, and for fat, 20-25% of total calories are needed, and ±25 grams of fiber is fiber that has nutritional value (Oyekale, 2019)

Obesity is one of the risk factors for hypertension and DM which will inhibit the uptake of sugar (glucose) by muscle tissue so that high blood sugar levels if it lasts for a long time cause hypertension. Knowledge related to the number of calories can provide information for patients to avoid high-calorie foods such as red meat. Providing pharmacological and non-pharmacological education will have many benefits, especially in patients who have a high risk of cardiovascular disease (DM, HT, and obesity) as in this study. This is also supported by research (Wahyuni et al., 2019) that there is a significant difference in effectiveness between videos and slide presentations in improving attitudes towards preventing hypertension.

Table 3. Pretest and Posttest Results Related to Non-Pharmacological Therapy at the Lamongan "X" Clinic for the period February-March 2021.

Question indicator	Pretest (n=123)			Posttest (n=123		
	F	%	Category	F	%	Category
Disease prevention concept	77	62.60	Enough	107	86.99	Good
Patient lifestyle management concept	82	66.67	Enough	105	85.36	Good
The concept of setting the patient's diet	57	46.34	Less	109	88.62	Good
Types of food that can be consumed	59	47.97	Less	112	91.06	Good
Amount of food content	58	47.15	Less	89	72.36	Enough
Solutions to Overcome Dietary Disobedience	65	52.85	Less	105	85.36	Good
The right way to control blood sugar	71	57.72	Enough	103	83.74	Good
How to prevent the risk of complications	56	45.53	Less	107	86.99	Good
How to improve medication adherence	65	52.85	Less	109	88.62	Good
Frequency of consumption of fish and vegetables	69	56.10	Enough	108	87.80	Good
Total number of calories on the DASH Diet pole	64	52.03	Less	91	73.98	Enough

Table 4. Overall Knowledge of Respondents Before and After Education at the Lamongan "X" Clinic in 2021.

Knowledge	Pretest		Posttest	
	Frequency (Patient)	Percentage (%)	Frequency (Patient)	Percentage (%)
Good	6	4.88	91	73.98
Enough	52	42.28	32	26.02
Less	65	52.84	0	0
Total	123	100.00	123	100.00

The study's results (Table 4) showed that most of the patients (73.98%) had good knowledge after being educated. Statistical data with Willcoxon also showed a significant difference ($\alpha = 0.000 < 0.005$) after being given an intervention in the form of visual education on the level of knowledge of pharmacological therapy and non-pharmacological treatment in DM and hypertension patients (Table 5).

Table 5. Willcoxon Test Result

Test Result	Mean Rank	z	p
Pretest-Posttest	62.00	-9.652	0.000

Previous research (Sidrotullah et al., 2022) was in the scope of providing questionnaires measuring the level of knowledge, but there was no intervention in the form of direct face-to-face education using visual media. In this study, educational information was provided using visual media with the type of educational delivery in the form of pharmacological and non-pharmacological therapy management included in a brochure equipped with pictures of the

DASH diet settings for patients. The visual media used is very useful in increasing patient knowledge, as in research (Dalal et al., 2014) which explains that there is a significant difference in the results of stable glycemic control without any risk of hypoglycemia in diabetes patients who received counselling and education compared to the control group. Apart from that, research by Chrvala et al. (2016) confirmed that education on drug use accompanied by dietary regulation and regular exercise would be more effective in controlling glycemic HbA1C than education on drug use alone. Based on this explanation, the important role of pharmacist intervention is really needed by the community to significantly influence medication adherence and glycemic control in diabetes mellitus patients (Shareef & Fernandes, 2016).

This research has limitations in conducting research, namely limitations when carrying out educational interventions. It cannot provide maximum comprehensive understanding because some patients sometimes require brief explanations, affecting knowledge assessment.

4. CONCLUSION

Education about pharmacological and non-pharmacological management using visual media in DM patients with hypertension has a positive impact by increasing the level of patient knowledge. On non-pharmacological and pharmacological therapy indicators, patients who previously had a lack of or sufficient knowledge on the results of the pretest experienced an increase in knowledge on posttest results to be good after being given education. Education from a health worker has always been an important role to support improving patients' quality of life.

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RESEARCH **Open Access**

Factors Related to Employer Health Insurance Contribution During COVID-19 Epidemic in Indonesia

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Abstract

The COVID-19 pandemic impacted all sectors of the world, including business. In fact, the employer faced a collapse, and many employees were determined. Another issue is health insurance, which might change before and during the pandemic. The objective of this study was to examine the factors associated with the employer's contribution to health insurance during COVID-19. The secondary data, "Rapid Gender Assessment Survey 2021", was used on 239 employees in Indonesia. The dependent variable in this study was employer contribution to health insurance during the pandemic (yes or no) and the main independent variable was employer contribution before the pandemic. Other sociodemographic variables were also included in the model as controls. This study used univariate, bivariate, and multivariate (binary logistic regression). The result of this study revealed that employers who contributed to health insurance before the pandemic tend to contribute again to health insurance during the pandemic. This study also reviews the legal law, including regulations about national health insurance and employment. The government's intention is needed to ensure the rights of employees are well realized.

Keywords: Health Insurance, Employment, COVID-19 Pandemic.

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1. INTRODUCTION

The COVID-19 pandemic has affected almost all sectors of the world, including the industrial sector. According to the pandemic situation, there is public finance which is the main source to handle the budget allocation, especially for health infrastructure and preparedness for economic stability after the pandemic (Jaelani & Hanim, 2020). In the industrial sector, human resources still need to be more productive even though the day work needs to be reduced but they need risk control and a preventive approach to prevent the transmission (Ambarwati et al., 2022). The economic situation in Indonesia declined because of a contraction in household and corporate expenditure, investment, and exports due to unemployment and underemployment (Ssenyonga, 2021). In Ghana, there was a need the collaboration from all sectors to ensure the insurance industry because there are changes in terms of the economic systems that force employees to work under social distancing regulations and practice the cyber protocol and e-payment (Babuna et al., 2020). The Effect of the pandemic on the economic sector was reported by the Ministry of Health and BPJS (Health Insurance Administrating Affairs) Employment, which described 1.7 million employees from the formal sector and 749.4 thousand informal employees were determined (Agustiana, 2020). More than 40 million people were being unemployed according to data from March to May 2020 (Agarwal & Sommers, 2020). Besides the industrial sectors, there is an impact on the tourism sector as well since there is a social restriction (Riadil, 2020).

In terms of the economic and industrial situations mentioned above, there was a right of employees that needed to meet, especially during the COVID-19 pandemic. During the pandemic, many employees were determined without any severance pay which was called "temporary force majeure" (Neysa & Sarjana, 2020). However, this situation needs to be concerning because there is a provision in Article 151A letter g and Article 154A letter d about the Job Creation Law (*Undang-Undang Cipta Kerja*), it was mentioned that the company has to pay severance pay for workers laid off during the COVID-19 (Neysa & Sarjana, 2020). Furthermore, Regulation Number 13 in 2003 about employment mentioned employers cannot determine the workers if the loss has not reached 2 years, so during the pandemic employers need to have alternative ways to solve the problem (Matantu et al., 2021). About the type of employee, there is found employees in health sectors were the riskiest to be transmitted by the COVID-19 virus so they were the priority (Möhner & Wolik, 2020). Based on the US (United States) data, about half of Americans received health coverage through their employer (King, 2020). The willingness to pay for the vaccine before it was provided for free in China was influenced by family income, employee size in the workplace, and the trend of the pandemic (Wang et al., 2021).

The implementation of Universal Health Coverage (UHC) in Indonesia is rapidly growing because there is a need for some initiative from the government to meet the Sustainable Development Goals (SDGs) by 2030 (Agustiana, 2020). This study focused on the contribution of employers to health insurance during the COVID-19 pandemic. One study in Indonesia revealed only 28% of workers pay the insurance, within particular factors influenced by the number of household members, financial hardship, membership in other social protection, and experience the health services (Dartanto et al., 2020). The rapid growth of UHC in Indonesia is also contributed by the industrial sectors registered the employees and the family members. At the national level, Indonesia provided free health care to the poor, and at the subnational level, due to the decentralization reforms, the local government competed to provide local health care schemes (Aspinall, 2014). In terms of risk in the workplace, there are many potential risks that put the employee at a high level of morbidity and mortality. Occupational and Health

Systems in the workplace need to reach the standard. Apart from the employee itself, there are family members who also need to be concerned.

Most of the studies examined the contribution of employers to health insurance by using the qualitative approach. However, this study used the quantitative data and adjusted to other control variables. The data provided in this study reflected the role of national health insurance and legal law in regulating the right of workers to health insurance. The changes in contribution can be the exact data for policy recommendation. This study aimed to examine the contribution of employers to health insurance during COVID-19 by using a quantitative approach from secondary data.

2. RESEARCH METHOD

This study is a cross-sectional approach using secondary data entitled Rapid Gender Assessment Survey. This study provided the data on health insurance during COVID-19 which was not found in other datasets. The survey was implemented by collaboration between the UN Women's Regional Office for Asia and the Pacific and the Asian Development Bank. The study was a multipurpose survey of COVID-19 data response, including health scopes, main economic activity, unpaid domestic and care work, food hardship, personal and household income, remittances, and government support. Based on geographic coverage, the survey was national coverage with a targeted population aged 18 years and above with access to a mobile phone. The sampling method used in the survey was Digit Dialling (RDD) using numbering plans from national business registers. Mobile phone coverage was 70% with differences based on sex, age, educational attainment, and location. The data collection was done from 14 September to 08 December 2021. The unit of analysis of this study was adults as the representative of the household. This study only selected the adults who were working and completely answered all the questions in the questionnaire. After excluding the observation with the criteria mentioned before, and doing data cleaning, a total of 239 adult workers were brought to the analysis. However, the original survey had a limited number of participants to represent all the Indonesian workers.

In terms of workers' rights during the pandemic, this study focused on the contribution of employers to health insurance during COVID-19 (no/yes). The predictors included the contribution before the pandemic (no/yes), sex (male/female), age group, area of residence (rural/urban), level of education, marital status, and received COVID-19 vaccine for at least 2 doses. The univariate analysis was done to display the general characteristics of informants. The bivariate analysis was done using the Chi-square test to examine the correlation between each predictor to the outcome. The multivariate analysis which is binary logistic regression was done to test the influence of all predictors on the outcome. All the data was tested using STATA version 17. All the datasets can be downloaded following the link: https://data.unwomen.org/publications/two-years-lingering-gendered-consequences-covid-19-asia-and-pacific.

3. RESULTS AND DISCUSSION

Table 1. General characteristics of the respondents

Variables (n = 239)	**Frequency**	**Percentage**
Employer contributed to health insurance during COVID-19		
No	168	70.29
Yes	71	29.71
Employer contributed to health insurance before COVID-19		
No	162	67.78
Yes	77	32.22
Sex		
Male	175	73.22
Female	64	26.78
Age group		
18-29	93	38.91
30-39	75	31.38
40-49	47	19.67
50+	24	10.04
Area of residence		
Rural	93	38.91
Urban (City and town)	146	61.09
Level of Education		
Primary or less than primary	51	21.34
Secondary education	126	52.72
Tertiary	39	16.32
Vocational/College	23	9.62
Marital status		
Married	178	74.48
Unmarried	61	25.52
Completed vaccine COVID-19 for 2 doses		
Yes	167	69.87
No	72	30.13

Table 1 above describes the general characteristics of the respondents. The contribution of employers to provide health insurance to the employees before and during the COVID-19 pandemic decreased from 32.22% to 29.71%. According to other sociodemographic factors, the majority of the respondents were male (73.22%), aged 18 to 29 years old (38.91%), living in the urban area (61.09%), graduated from secondary school (52.72%), were married (74.48%), and have received at least 2 doses of COVID-19 vaccine (69.87%).

Table 2 below displays the bivariate analysis results, which examine the correlation between each independent variable and dependent variable. The bivariate analysis was done using the Chi-Square test. It was found that some variables had a correlation to the dependent variable including contribution before the pandemic (p-value 0.000), level of education (p-value 0.000), and completed COVID-19 vaccine for at least 2 doses (p-value 0.010). Other variables such as sex, age group, area of residence, and marital status were found no correlation with the dependent variable. The data on coverage of health insurance in Indonesia based on

the findings of the study was similar to the findings from the US that found 60% of before the pandemic and 95% of employers continued to do so during the pandemic (Dafny et al., 2020).

Table 2. The bivariate analysis result between each predictor to the outcome variable

Predictor variables (n = 239)	**The employer contributed to health insurance during the COVID-19 pandemic**		**Total**	**p-value**
	No	**Yes**		
Employer contributed to health insurance before COVID-19				0.000
No	155 (92.26)	7 (9.86)	162 (67.78)	
Yes	13 (7.74)	64 (90.14)	77 (32.22)	
Sex				0.750
Male	124 (73.81)	51 (71.83)	175 (73.22)	
Female	44 (26.19)	20 (28.17)	64 (26.78)	
Age group				0.421
18-29	60 (35.71)	33 (46.48)	93 (38.91)	
30-39	55 (32.74)	20 (28.17)	75 (31.38)	
40-49	34 (20.24)	13 (18.31)	47 (19.67)	
50+	19 (11.31)	5 (7.04)	24 (10.04)	
Area of residence				0.054
Rural	72 (42.86)	21 (29.58)	93 (38.91)	
Urban (City and town)	96 (57.14)	50 (70.42)	146 (61.09)	
Level of Education				0.000
Primary or less than primary	47 (27.98)	4 (5.63)	51 (21.34)	
Secondary education	89 (51.98)	37 (52.11)	126 (51.72)	
Tertiary	16 (9.52)	23 (32.39)	39 (16.32)	
Vocational/College	16 (9.52)	7 (9.86)	23 (9.62)	
Marital status				0.211
Married	118 (70.24)	44 (61.97)	162 (67.78)	
Unmarried	50 (29.76)	27 (38.03)	77 (32.22)	
Completed vaccine COVID-19 for 2 doses				0.010
Yes	109 (64.88)	58 (81.69)	167 (69.87)	
No	59 (35.12)	13 (18.31)	72 (30.13)	

Table 3 show that, it was revealed that only the variable of contribution from employers before the pandemic that significantly associated with the contribution of employers during the pandemic. In detail, the employer who contributed to health insurance before the pandemic was 156.6 times more likely to contribute to health insurance during the pandemic compared to the employer who did not contribute. However, other variables were found not significantly associated with the contribution of employers to health insurance during the pandemic. The model is the best model because Pseudo R2 was 0.5891 which has the meaning this model can explain the contribution of employers during the pandemic for 58.91%.

Table 3. The multivariate analysis result between all predictors and the outcome variable.

Variables	**AOR**	**95% C.I.**	***p-value***
Employer contributed to health insurance before COVID-19			
No (ref)	-		
Yes	156.61	45.73 – 536.30	0.000
Sex			
Male (ref)	-		
Female	1.29	0.41 – 4.04	0.657
Age group			
18-29	-		
30-39	0.49	0.13 – 1.82	0.288
40-49	0.56	0.13 – 2.47	0.445
50+	0.77	0.09 – 6.20	0.803
Area of residence			
Rural	-		
Urban (City and town)	0.51	0.16 – 1.60	0.247
Level of Education			
Primary or less than primary	-		
Secondary education	2.69	0.43 – 16.86	0.290
Tertiary	1.80	0.24 – 13.70	0.568
Vocational/College	0.80	0.08 – 8.56	0.860
Marital status			
Married	-		
Unmarried	1.15	0.36 – 3.66	0.813
Completed vaccine COVID-19 for 2 doses			
Yes	-		
No	0.45	0.14 – 1.48	0.190

Note: Log likelihood = - 59.74, Pseudo R2 = 0.5891, LR chi2(11) = 171.32, Prob>chi2 = 0.000, No obs = 239

DISCUSSION

Some other previous studies revealed that BPJS employment and BPJS Health the required to receive wage subsidies during the COVID-19 pandemic (Yudi, 2021). Some studies focus on the legal protection of employees, which revealed two forms of legal protection such as from the employers that are mentioned in the letter of agreement signed by both employer and employee and the work experience letter from the government (Prajnaparamitha, & Ghoni, 2020). Due to the quick transmission of COVID-19, the government regulated the policy to regulate the policy, especially for the elderly (Gama, Budiartha, & Ujianti, 2022). BPJS Employment also reported the lack of implementation of job security protection during the pandemic because some informal sectors have not registered yet (Nasution, Mulyana, & Apandi, 2021). The implementation of social insurance for employees faced a lack of issues including the differences between formal and informal sectors that need legal law from the government (Islahudin et al., 2022).

Another employee right during the pandemic is the responsibility of the employer to pay for termination based on the regulation of job creation no.11 of 2020 (Hutabarat et al., 2021). According to the successfulness of the implementation of BPJS Employment, there are 3 indicators to measure the factors of issues, including 3 indicators such as the ability to pay health insurance, low participants in the informal sector, and the quality of the services (Pristanti, Sukidin, & Hartanto, 2022). During the pandemic, employers also need to do testing, treatment, surveillance, surveillance, workplace modifications, and hygiene as a strategy to make it healthy and safe from the transmission of the virus (Fragala et al., 2021). In terms of health insurance, there is a need the cooperation between employer and employee because, in the Indonesian context, the fee is paid to the employer but not fully (Wang et al., 2021). The

economic recovery post-pandemic needs to be arranged very well because it affects short and long term to the poor and employee (Sparrow et al., 2020). Even though there is regulation, for instance, Large-scale social restriction policy, and lockdown the employee still has the right to have health insurance that covers them and the family (Muhyiddin & Nugroho, 2021). The right and obligations of workers, it was influenced by communication, technology, and globalization based on the UUCK (*Undang-Undang Cipta Kerja*) or Job Creation Law No.11/2020 as the latest labor law in Indonesia, and the outbreak of COVID-19, problems related to industrial relations have become increasingly complex (Hamid, 2021). The protection to the workers, especially health workers during the pandemic is the implementation of Article 28 D paragraph 2 of the Constitution (Wijayanti et al., 2021).

The legal law in terms of employee rights was written legally law including the regulation of the President of Indonesia number 82 in 2018 about health insurance, government regulation apart from Constitution Number 2 in 2020 about Creating jobs, and Regulation Number 24 in 2011, about the national health insurance (President of Indonesia, 2011; President of Indonesia, 2018; President of Indonesia, 2022). According to the legal law, those three facts that health a candidate could enjoy the force.

Based on the findings and discussion above, there is a study limitation. The information on the contribution of employers to health insurance during the COVID-19 pandemic is self-reported data, so there might be underreported data. This study had a limited number of samples that might not represent all Indonesian workers.

4. CONCLUSION

The factor associated with the contribution of employers to health insurance during COVID-19 was the contribution of employers to health insurance before COVID-19. Means that employers who take care to employee before COVID-19 is more likely to care more for the pandemic by continuing to provide health insurance whatever the economic conditions they faced due to the pandemic. The government must make strict rules that employers must continue to provide health insurance even though a pandemic occurs. However, other control variables (sex, age group, area of residence, level of education, marital status, and COVID-19 vaccine) have no significant association with the contribution of employers to health insurance during the pandemic. One impact of the pandemic on the business sector is the collapse of the company and most of the employee was determined. However, there was the right of the employee that needed to be met by the employer based on the legal law. One of the employee's rights is health insurance which is also covered by family members. The government needs to ensure that the implementation of the law to the employees is well implemented, including the law about Social Security Agency on Health, Social Security Administrator for Employment, and Job Creation Law. Furthermore, the next study can be done using mix-method (quantitative and qualitative) for analyzing the impact of the pandemic or other outbreaks on the contribution of employers to health insurance.

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RESEARCH **Open Access**

Father's Role in Exclusive Breastfeeding in Developing Countries: Scoping Review

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Abstract

The father is the closest person after the baby's mother, who plays a role in exclusive breastfeeding. The interventions of dads attempt to improve breastfeeding knowledge, positive attitudes, and fathers' engagement in providing practical, physical, and emotional support to mothers, which can improve breastfeeding behaviors. The purpose of this study is to map current information about the role of fathers in exclusive breastfeeding in developing countries by including relevant sources of evidence from each article that has been found. The research method uses a Scoping review with the Arkey and O'Malley approach. It consists of 5 steps, namely: (1) identifying each scoping review question, (2) identifying relevant articles, (3) selecting articles, (4) charting data (5) compiling, summarizing and reporting results. Article search uses three databases, PubMed, ScienceDirect and Wiley, published between 2018-2022. Keywords used in the search process are (Father Role* OR Partner Role*) AND (Exclusive Breastfeeding* OR Lactation* OR Breast Milk*). There are 14 articles found, including several developing countries from various continents, nine articles from Thailand, Vietnam, Iran, India, Philippines, and China from the Asian continent, and five articles from the countries Tanzania, Ethiopia, and South Africa from the African continent. The results of the study show that the father's role in exclusive breastfeeding in developing countries is to provide emotional support, practical support and informational support so that mothers have a greater chance of producing breast milk more effectively. Husband's support towards breastfeeding mothers positively affects the mother's psychological condition and success, especially in exclusive breastfeeding. The next author is expected to help make the policy if health workers are required, especially the policy for husbands to be involved in giving counseling while accompanying their wives in health facilities.

Keywords: Father, Exclusive Breastfeeding, Role, Developing Countries.

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1. INTRODUCTION

Exclusive breastfeeding began one hour after giving birth and then continued till the child the age of six months (Horwood et al., 2018). Breastfeeding can help children survive and improve the antibodies required to prevent general infections such as diarrhea and pneumonia. Breastfeeding also gives children and moms physical, nutritional, and emotional advantages (Cheema et al., 2020). If it is compared to a mom who doesn't breastfeed exclusively, moms who get support from the husband have the possibility of 3,61 times bigger to do that. The lack of information on exclusive breastfeeding affects the father's role in exclusive breastfeeding (Angraini et al., 2019).

Exclusive breastfeeding is recommended by both the WHO and the American Academy of Pediatrics for infants and young children from the time they are 6 months old until they are 2 years old (Ahmed et al., 2019). In 2016, the average worldwide success rate of exclusive breastfeeding was 38%, according to data from the World Health Organization (WHO). In 2020, 40% of infants in the developing nation of Indonesia were being fed solely by their mothers during the first six months of their lives.

The role of the husband as a motivator by providing motivation/encouragement to become a participant in family (Mukarromah & Astuti, 2023). Father's intervention tries to improve the practice of women's nursing by improving knowledge of breastfeeding, positive attitude, and also involvement in giving practical, physical, and emotional support. After the baby's mother, the father is the next closest person who has a role in exclusive breastfeeding (Alzaheb, 2017). Father's role can make such a huge impact on breastfeeding decisions. Mothers who believe their husband supports them in breastfeeding are more likely to do breastfeeding (Rempel et al., 2017).

The husband's support is the wrong factor that determines the emotional state or mother's feelings so that the hormone oxytocin and prolactin affects emotions and mind and stimulate milk production (Astuti et al., 2021). Father's support in giving Breast milk is the main source of support for nursing mothers, can affect and contribute to the uptake decision regarding initiation continuation of breastfeeding, mother's trust breastfeeding and at the time of weaning baby (Vila-Cande et al., 2018); (Nilsson et al., 2022). Many factors influence in breastfeeding decisions besides being seen of the benefits for the baby's health, class antenatal care, daddy support have a positive impact on breastfeeding continuity (Shitu et al., 2021).

Since the pregnancy period, the father's trust in breastfeeding can be measured. A husband can entrust his wife to breastfeeding for more than 6 months and will help his wife more. On the other hand, women's opinion about their partner's consent to breastfeeding also helps and maybe has a bigger impact on the father's support for breastfeeding. There is no doubt that fathers can affect breastfeeding habits (Zarnowiecki et al., 2018).

Based on the above, it is required subjects scope by using Scoping Review Protocol, which specifically discusses the father's function in breastfeeding. This Scoping Review aims to map the current evidence about the father's role in exclusive breastfeeding in developing countries by inserting relevant research sources from every founded article.

2. RESEARCH METHOD

Scoping Review is an excellent research method to determine the breadth or scope of literature collection about a specific issue. This offers clear indicators about material amounts, available studies, and general descriptions (wide or comprehensive) (Tricco et al., 2018). This research, which focuses on the involvement of fathers in breastfeeding, follows the guidelines established by the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) framework for scoping review (PRISMA-ScR) (Helova et al., 2021).

To get comprehensive findings and depth, the strategy that is used is identifying literature. The purpose of this framework is to explain the research's scope so it can be used for systematic literature review. The process of review grouping proposed by Arksey and O'Malley also used in this scoping review including these steps: (1) identify questions of scoping review; (2)

finding relevant problems; (3) choose article; (4) data graphic; and (5) drawing conclusions and presenting results (Stark et al., 2021).

a. Identify scoping review questions.

In developing the topic focus and strategy of literature searching to formulate questions of the scoping review, the author uses the framework of Population, Exposure, Outcome, and Study Design (PEOS). PEOS is used to simplify identifying more specific keywords according to interest in review focus, extend searching terms that are following developing problems and determine inclusion and exclusion criteria (Peterson et al., 2017).

The following is a framework as a reference for inclusion and exclusion criteria in this Scoping Review:

Table 1. Framework PEOS

P (Population)	E (Exposure)	O (Outcome)	S (Study Design)
Father	Exclusive Breastfeeding	Role	All study in developing countries

According to the framework above, this Scoping review asks, "How is the Role of the Father in Exclusive Breastfeeding in Developing Countries?"

b. Identify relevant articles

Following the formulation of these scoping review questions, the reviewer will select appropriate articles according to the following inclusion and exclusion criteria:

Table 2. Eligibility Criteria

Inclusion Criteria	Exclusion Criteria
Published in the last 5 years (2018-2022) Published in Indonesian or English Full text article Open access article Article that discusses about father's role in exclusive breastfeeding in developing countries Article that discuss factors affect father's role during exclusive breastfeeding in developing countries	1) Review article 2) Opinion article 3) Document/ report/policy framework/ special guide from WHO/ certain formal organization

c. Database

The article search uses three databases, Pubmed, ScienceDirect and Wiley, published between 2018-2022.

d. Literature Searching

Articles are searched by using Boolean, which is AND, OR, NOT, and Truncation (*) as the connector to merge or exclude keywords in search so it obtains the results that are more focused and relevant. Keywords used in the search process are (Father Role* OR Partner Role*) AND (Exclusive Breastfeeding* OR Lactation* OR Breast Milk*).

e. Literature Selection

For writing this scoping review, the author records a literature search using the standard of Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA), after which the data is filtered using the author's criteria (Widiasih et al., 2020). The following are the steps for filtering data using the PRISMA flowchart:

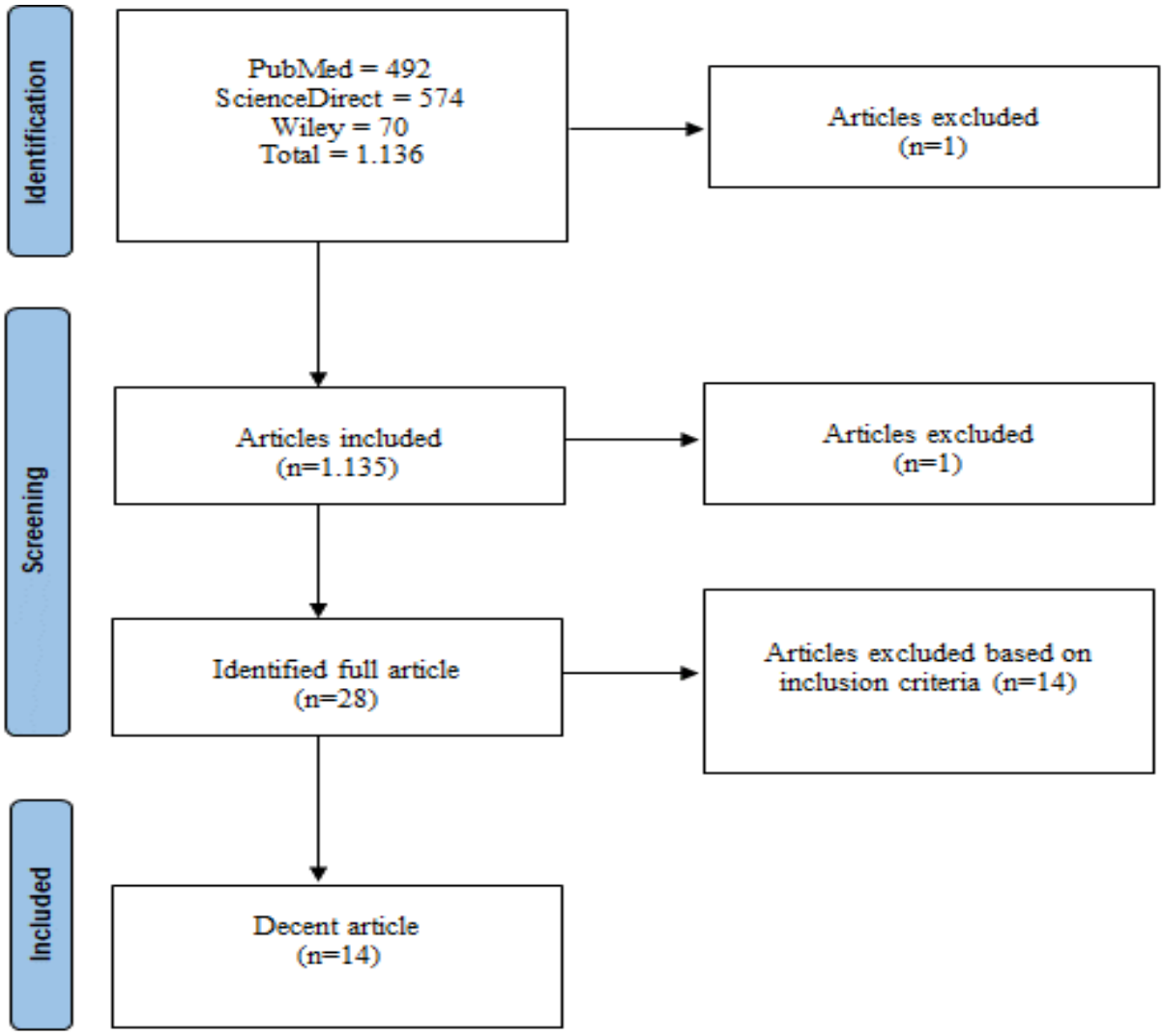

Figure 1. PRISMA-ScR Flowchart

3. RESULTS AND DISCUSSION

a. Data Charting

Data from 14 articles are inserted in the table according to the determined inclusion criteria. The author noted information independently and compared the reviewed data.

Table 3. Article Reference Code

Number	Article Code	Article Reference
1	A1	(Panahi et al., 2022)
2	A2	(Shitu et al., 2021)
3	A3	(Bich et al., 2019)
4	A4	(Bulemela et al., 2019)
5	A5	(Saniel et al., 2021)
6	A6	(Awoke & Mulatu, 2021)
7	A7	(Young et al., 2020)
8	A8	(Van Ryneveld et al., 2020)
9	A9	(Li et al., 2020)
10	A10	(Duan et al., 2022)
11	A11	(Gebremariam et al., 2021)
12	A12	(Budiati et al., 2022)
13	A13	(Krikitrat et al., 2022)
14	A14	(Nie et al., 2021)

Table 4. Data Charting

No	Title/author / year	Country	Purpose	Research Type	Method	Results
1	Educating fathers to improve exclusive breastfeeding practices: a randomized controlled trial (Panahi et al., 2022)	Iran	To assess the effectiveness of the father's education program towards breastfeeding supports, breastfeeding practice and exclusive breastfeeding status.	Randomized controlled trial	Controlled trials randomly on two intervention and control groups. Data collection instrument: Questionnaire with interview Checklist completed through observation The t-test, the paired-samples t-test, the Chi-square test.	Father education enhances breastfeeding practise and increases the quantity and duration of exclusive breastfeeding. This research showed that informing fathers about breastfeeding's advantages and teaching them how to provide support for their partners while they breastfeed increased breastfeeding rates and duration.
2	Knowledge of breastfeeding practice and associated factors among fathers whose wife delivered in last one year in Gurage Zone, Ethiopia (Shitu et al., 2021)	Ethiopia	To study the knowledge and factors that related with breastfeeding practice in the father's role.	Cross sectional	A cross-sectional study based on community is done in the Gurage Zone among 597 fathers. Sample collection technique cluster one is used for using study participants.	The degree of breastfeeding education among fathers in the study area is still low (58.3%). Residences, two or more babies in a house, accompanying during ANC, and index of

						baby disease are independent predictors of father's breastfeeding expertise.
3	Community based father education intervention on breastfeeding practice Results of a quasi-experimental study (Bich et al., 2019)	Vietnam	To promote father's involvement in supporting women associated with early initiation and exclusive breastfeeding.	Quasi-experimental	Two districts in the province of Hai Duong in northern Vietnam, both with roughly the same population size and level of social and economic development, control groups is determined using multivariate logistic regression.	The positive findings on the intervention's influence on early breastfeeding initiation and EBF level at 1, 4, and 6 months have been bolstered by the intervention to include fathers in breastfeeding promotion. Intervention planning and implementation must take into account fathers' socioeconomic status, cultural background, and political affiliation.
4	Supporting breastfeeding: Tanzanian men's knowledge and attitude towards exclusive breastfeeding (Bulemela et al., 2019)	Tanzanian	To describe how women feel about Tanzanian men's support for breast feeding their children.	Qualitative study	In this qualitative study, conducted in three settlements in Kilombero Valley, Ifakara District, we used a focus group to analyse the	The majority of those in this survey understand that the EBF period is significant and helps to lengthen their connection with their

					understanding and outlook of 35 guys.	spouses. However, owing of poverty, EBF can be difficult to obtain. But, there are many males who desire to get more involved. Men believe they require more knowledge regarding EBF.
5	Effectiveness of peer counseling and membership in breastfeeding support groups in promoting optimal breastfeeding behaviors in the Philippines (Saniel et al., 2021)	Philippine	To determine the effectiveness of peer counselor visit during pregnancy and post pregnancy, and membership on breastfeeding supporters group in optimal promoting breastfeeding practice.	Cross-sectional Study	Program Evaluation using the design study type of non-experimental 'before and with a sample size of 2,584 mother-infant pairings from the six sites.	Our research shows that the country has fallen short of its proclaimed goal of having all infants start nursing within an hour of birth and having all infants continue breastfeeding for at least six months. Membership in a breastfeeding supporters group is favourably connected to the commencement of early breastfeeding

						and EBF in 6 months.
6	Determinants of exclusive breastfeeding practice among mothers in Sheka Zone, Southwest Ethiopia: A cross-sectional study (Awoke & Mulatu, 2021)	Ethiopia	To identify the practice determinant of exclusive breastfeeding (EBF) practice in Sheka zone, Ethiopia. Beside that, this research has the purpose to assess EBF practice prevalence in study zones.	Cross-sectional Study	Using the Kebele (a type of administrative unit) as the cluster, a total of 630 thousand random samples are selected. Between June and July of 2017, the interviewer distributed questionnaires to collect data. The EBF prevalence rate is calculated using descriptive statistics.	We found that the government did not achieve its proclaimed goal of having mothers start nursing their babies within an hour of giving birth and having all babies be exclusively breastfed for at least six months.
7	It takes a village: An empirical analysis of how husbands, mothers-in-law, health workers, and mothers influence breastfeeding practices in Uttar Pradesh, India (Young et al., 2020)	India	To understand various influences in breastfeeding practice and modeling the potential impact of program in improving breastfeeding.	Cross-sectional	A total of 1,838 new mothers, 1,194 fathers, and 1,353 grandmothers and grandmother-in-laws participated in the cross-sectional study. using a logistic bivariate regression model.	The results highlighted the need for extensive support for breastfeeding, since they showed that a number of factors influence EIBF, prelacteal feeding, and EBF in Uttar Pradesh. Larger state and national programmes in India are aimed at improving the living conditions of

						married men and their families (Sahu, 2018; UNICEF, 2016; NITI Aayog, 2017).
8	Mothers' experiences of exclusive breastfeeding in a post discharge home setting (Van Ryneveld et al., 2020)	South Africa	For this analysis purpose, it focused on the mother's effort to maintain EBF at home, in the mother's population, including father and other nanny.	Qualitative Study	Between September 2016 and January 2018, the KCH children's ward in a Kenyan coastal village was the site of the IBAMI trial. The KCH children's ward sees about 150 infants under 6 months old each year who have low birth weights.	According to the findings of the study, 20 thousand moms are selected at the time to go home; 18 of them are successful in generating EBF at home, while two are not. Data from two moms who did not have EBF at home were eliminated for this analysis, which focused on the mother's effort to sustain EBF at home. After 4 weeks of being home, 18 mothers who were exclusively breastfeeding when they were released said they were still doing it.

9	Breastfeeding practices and associated factors at the individual, family, health facility and environmental levels in China (Li et al., 2020)	China	To inform about breastfeeding practice and factors related with the individual, family, health facility and environment in China.	Cross-sectional	Sample in this study is a baby under the age of 6 months, with the cluster sampling technique on 10.408 mothers.	This investigation results will gives: Lactation accompaniment in the form of counseling or exclusive breastfeeding practice can increase the prevalence of exclusive breastfeeding. Women who do breastfeeding have the partner's support are more likely to continue breastfeeding. SC childbirth has a more significant effect towards exclusive breastfeeding. Support for breastfeeding mothers, such as special room making for breastfeeding in public places, is really required
10	What are the determinants of low exclusive	China	To look at some demographics in	Cross-sectional Study	Twelve regions and cities across China are	Correct understanding and a favourable

	breastfeeding prevalence in China? A cross-sectional study (Duan et al., 2022)		EBF such as: health service, family support, and community support.		participating in a cross-sectional study. This author employed multistage stratification of cluster sampling to acquire data from face-to-face interviews with moms who completed electronic questionnaires.	mother's attitude towards breast milk are critical in boosting EBF prevalence. The support of the father and grandmother of the baby and environment is another potential route to nursing success. Promotion of milk formula remains a major impediment to EBF practise in China.
11	A cross-sectional comparison of breastfeeding knowledge, attitudes, and perceived partners' support among expectant couples in Mekelle, Ethiopia (Gebremariam et al., 2021)	Ethiopia	To compare knowledge, attitude, and partner breastfeeding support in Mekelle, Ethiopia.	Cross-sectional	This study includes 128 couples based on the criteria. Data was gathered through face-to-face interviews conducted by professional nurses working at public health clinics during September and October 2018.	According to our findings, Ethiopian fathers are enthusiastic promoters of breastfeeding. Breastfeeding intervention in the future should increase father's intervention in nursing and urge moms to improve their partner's intervention in breastfeeding.

12	Fathers' Role in Sustainability of Exclusive Breastfeeding Practice in Post-Cesarean-Section Mothers (Budiati et al., 2022)	Indonesia	To identify the role and husband's support towards post-cesarean-section mothers in exclusive breastfeeding.	Qualitative Study	This research uses a mix of focus group discussions and in-depth interviews as part of a qualitative phenomenological approach. Twelve fathers whose wives had just undergone caesarean sections participated in this study. Thematic content analysis is used to examine data.	Most fathers appear to be eager to involve and assist their partners in providing breast milk to their children. Fathers can encourage and help their partners start and continue exclusive breastfeeding with the right kind of support from family, professional health care, and employers. Help from fathers on all fronts—emotional, practical, and physical—is essential to the success of breastfeeding and the comfort of the mother.
13	Relationships between Thai fathers' self-efficacy to support breastfeeding and exclusive breastfeeding duration	Thailand	To determine the relation between Thai fathers' self efficacy to support exclusive	Cross-sectional Study	This cross-sectional study relies on survey data, research's sample consists of 205 father and mother pairs (410 participants) with 6 months babies.	Analysis of bivariate correlation from survey data showed that the self efficacy score of breastfeeding father and mother is

	(Krikitrat et al., 2022)		breastfeeding and exclusive breastfeeding duration.			positively related with the longer duration of exclusive breastfeeding (also, each). This study concludes that to increase the duration of exclusive breastfeeding in Thailand, self efficacy of father's support in exclusive breastfeeding should be promoted well in the current programs that support exclusive breastfeeding.
14	Exclusive breastfeeding in rural Western China: does father's co-residence matter? (Nie et al., 2021)	Chinese	To determine that living together and father's support are beneficial in breastfeeding.	Cross-sectional Study	A cross-sectional study is done in 13 poor districts. Data on 452 nanny pairs' nursing habits, marital status, family support for breastfeeding, and mothers' ability to make decisions are gathered using a cluster random sample method and standardised questionnaires.	The association between living together and breastfeeding has proved that fathers' support is extremely advantageous for breastfeeding. In West China, living together has a negative relationship with the level of exclusive breastfeeding

				. More practical and emotional skill-based solutions for father education should be developed in order to improve their involvement and respect the mother's decision.

Each chooses study, and a critical assessment is done to determine the selected articles' quality. Critical Assessment Instrument of Joanna Briggs Institute (JBI) is done in review of this Scope for critical assessment. JBI is a research organization and international development that promotes and supports health treatment based on evidence. Critical assessment is the process to evaluate a research paper carefully and methodically for validating and its implementation in clinical practice. There are 14 papers in accordance with problems and author's criteria in critical assessment steps; research design that is used including cross-sectional trial, qualitative, quasi-experimental, and randomized controlled. Each research method has a checklist of different critical appraisals. JBI has a checklist of critical appraisals according to existing research types. Every checklist also has questions with different amounts (Attached).

Article quality in appraisal critical steps the author uses scores of Grade S, B, and C to differentiate the article category, which falls into Good category (Grade A), Fairly Good (Grade B), and Not Good (Grade C).

Table 5. JBI Critical Appriasal Result

Number	Article	Types	Article Grade	Results
1	A1	Randomized controlled trial	A	
2	A2	Cross-sectional Study	A	
3	A3	Quasy experiment study	A	
4	A4	Studi Kualitatif	B	
5	A5	Cross-sectional Study	B	
6	A6	Cross-sectional Study	A	
7	A7	Cross-sectional Study	A	
8	A8	Studi Kualitatif	A	
9	A9	Cross-sectional Study	B	
10	A10	Cross-sectional Study	A	
11	A11	Cross-sectional Study	A	
12	A12	Studi Kualitatif	A	
13	A13	Cross-sectional Study	A	
14	A14	Cross-sectional Study	A	

b. Data/results presentation, discussion and conclussions

Data is extracted from the articles that are found then arranged in several themes. Themes already included in this article's purpose is father's role in exclusive breastfeeding and factors that affect. While the sub-theme in the theme of father's role in exclusive breastfeeding are: a. Practical support, b. Emotional support, c. Informational support and the sub-theme in the theme of factors that affect father's role: a. Knowledge, b. Education, c. Love and responsibility d. Social-economy and culture, e. Health employee.

Table 6. Data Mapping

Number	Theme	Sub-Theme	Article's Number
1	Father's Role in exclusive breastfeeding	a. Practical support	A1, A4, A14
		b. Emotional support	A5, A10. A11, A14
		c. Informational support	A11, A9
2	Factors that affect	a. Knowledge	A2, A11
		b. Education	A1
		c. Love and Responsibility	A4, A6
		d. Social culture	A4, A7
		e. Health employee	A2, A3, A9, A13

Based on the 14 chosen articles there is some characteristic that is country characteristic, research method characteristic and grade article characteristic:

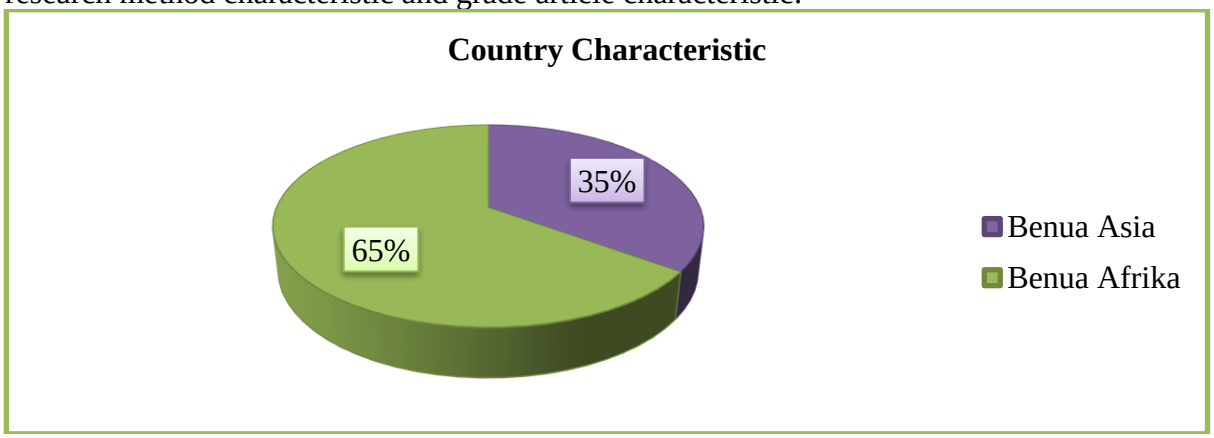

Figure 2. Country Characteristic Diagram

There are 14 articles found including several developing countries from various continents, such as 9 articles from Thailand, Vietnam, Iran, India, Philippines, and China from the Asian continent with a percentage of 65%, and 5 articles from the country Tanzania, Ethiopia, and South Africa from the African continent with a percentage of 35%.

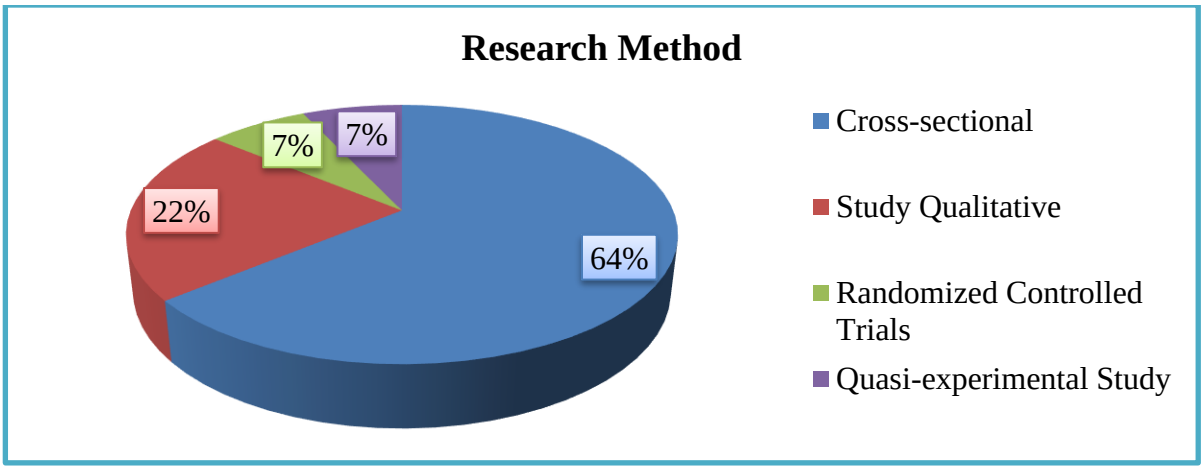

Figure 3. Research Method Diagram

The 14 articles obtained consists of 8 cross-sectional study with a percentage of 64%, 3 qualitative articles with a percentage of 22%, 1 randomized controlled trial with a percentage of 7% and 1 quasi-experimental study with a percentage of 7%.

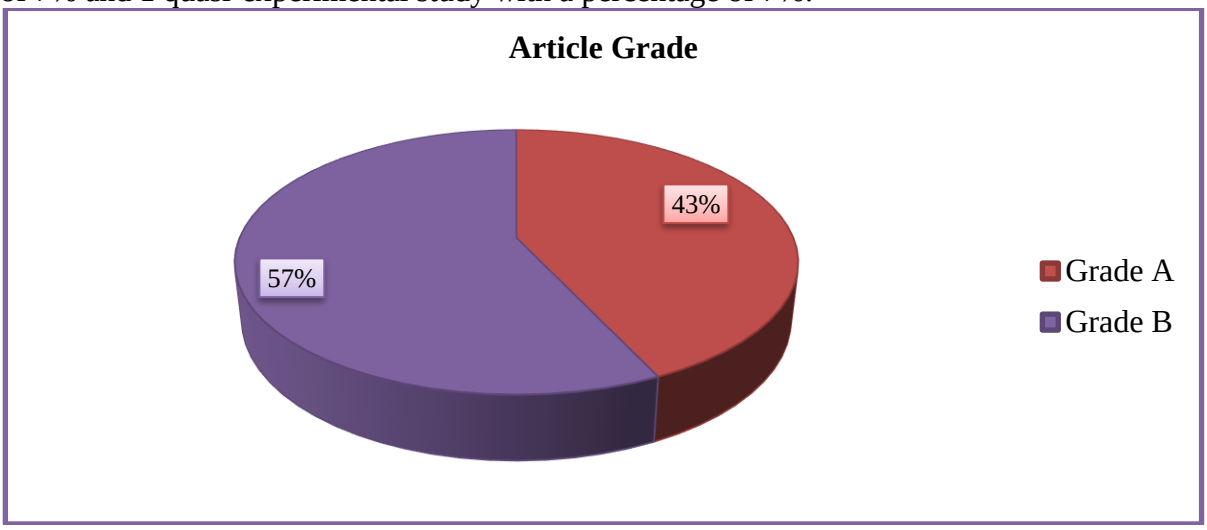

Figure 4. Article Grade Diagram

The 14 articles obtained consist of 11 Grade A articles with a percentage of 57% and 3 Grade B articles with a percentage of 43%.

In this review, the author uses 14 articles following scoping review purposes. Based on 14 chosen articles obtained several father's role in exclusive breastfeeding as follows:

a. Father's Role in Exclusive Breastfeeding

Father's practical support is explained in Article (A1) The support given by husband such as help to do household works and children parenting, reduce daily tasks, manage resting time for mother is enough for mom to dinner for breastfeeding continuity. Article (A4) Support form given by husband for wife in exclusive breastfeeding (EBF) also helps change diapers, carrying the baby, bathe the baby and doing home works that wives usually do. In article (A14) The father's assistance with the baby and around the house (burping, changing diapers, washing clothes) is sufficient to encourage the mother to start nursing early and for a longer period of time.

Women who do breastfeeding are considered to get benefits from emotional support. Positive emotional support can increase the possibility of treatment that encourages health behavior of exclusive breastfeeding (Shepherd et al., 2017). Women will be happy and feel loved by spending time with their wives in giving babies breast milk and bringing emotion

(love for) children and relation power, (A5). Fathers' physical and emotional support for their partners can positively impact a mother's breastfeeding practise. Moms want fathers to be nursing supporters. Men feel that supporting and admiring their partners when breastfeeding is one approach to help moms develop their breastfeeding habit (A11).

Fathers' emotional support, such as encouragement, praise, tenderness, and certainty in difficult times, are also key aspects for effective breastfeeding, since they boost the mother's confidence and assist her to maintain her breast milk supply (A14). Husband presence and family stimulate mothers to increase their confidence and stabilize their feelings, and share a big passion for mothers to give exclusive breastfeeding for their babies, (A10).

Fathers can help their partners in many ways, including providing information on breastfeeding, encouraging and supporting breastfeeding women, and helping out with childcare and housework, (A11). Support from partners can encourage mothers to do exclusive breastfeeding especially in the first 40 days after giving birth is the most meaningful knowledge in breastfeeding, this support is given for mothers by discussing colostrum value and teaching breastfeeding position, (A9).

b. Factors that Affects

Husband breastfeeding knowledge total of knowledge prevalence is 58,3% with 95% trust level. Most of the couples are aware that breast milk is the first meal that is given for the newborn baby after giving birth. The parents agreed that nursing was best for their children, and that doing so exclusively for the first few months after giving birth reduced the mother's risk of becoming pregnant, (A2). Men who learn more about the health benefits of breastfeeding for their infants are more likely to encourage their partners to breastfeed for at least six months, (A11).

The parent-child interaction throughout the family life cycle significantly impacts many facets of daily life. Promoting nursing habits and establishing exclusive breastfeeding can benefit from dads' increased involvement and support, which can be achieved through education. The results showed that providing fathers with breastfeeding education increased their involvement in advocating for and organising breastfeeding-friendly behaviours, (A1).

The amount of time and effort men put into caring for their newborns while their women are nursing significantly impacts how much they love and feel obligated to them. Most males do not advise their partners on effective nursing. Love and this duty emphasize their love for wives and their babies, and men’s duty whether inside or outside the house. Most men feel encouraged to talk and bond with their children. Other men add, besides partners and wives, many family members give affection to the newborn baby (A4).

Fathers in developing countries are responsible for households and subsistence activities. This causes fathers to spend a lot more time far from their children, especially when their children grow, and this can not be the reason for fathers to help mothers in big EBF practice on the babies in the age of 5-6 months, (A6).

Factors that affect father’s role in exclusive breastfeeding are caused by social and culture, as explained in Article (A4) that men's views on their role in the family and how they should treat breastfeeding mothers are influenced by their perceptions of how traditional Tanzanian society in the village treats women. Men tend to believe that they are superior in taking care of the babies and can support women towards EBF. Economic obstacles made one of the mothers prefer to give exclusive breastfeeding. The husband supported the mother’s decisions because it is very economical and practical with high antibody content in breast milk, (A7).

It is explained in article (A2) Health professionals that give information to the people who visit health facilities during pregnancy to get health information. They who accompany their partners also tend to have the right knowledge and attitude to help their wives during the breastfeeding process and excellent education background so the husbands can support their wives. Article (A13) explains that lactation support can be given when visit at mother's home at postpartum period in the form of education or counseling given by health workers for mothers and husbands about exclusive breastfeeding in increasing prevalence of higher exclusive breastfeeding (Li et al., 2020).

In article (A3) explained if counseling activities are carried out in public health centers and home visits, fathers can also be given counseling during labor on the ward, district policy of hospitals when they accompany their wives for childbirth, and it was also explained that father's role affects babies when mothers give exclusive breastfeeding. Article (A9) also explained that mothers require support from health workers in the form of counseling about exclusive breastfeeding and breastfeeding techniques in giving lactation support to breastfeeding mothers.

4. CONCLUSION

According to all the reviewed publications, various reasons can be the difficulties in exclusive breastfeeding, one of them is that fathers are the closest person for mothers to accompany them in every journey during pregnancy, giving birth, and nursing process. Husband's support towards breastfeeding mothers has a good effect on the mother's psychological condition and breastfeeding success, especially in exclusive breastfeeding. Husband's participation in exclusive breastfeeding is very important; Father's problem in helping mothers in the breastfeeding process including house pressure, social and culture problem, awareness, and husband involvement in the counseling process in health facilities. The father's role given in the form of emotional support, practical support, and information support for the smooth running of exclusive breastfeeding. The next author is expected to help make the policy if health workers are required, especially the policy for husbands to be involved in giving counseling while accompanying their wives in health facilities.

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RESEARCH **Open Access**

Community and School-Based Surveys of Soil-Transmitted Helminth Infections on Samosir Island, Indonesia

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Abstract

Soil-transmitted helminth (STH) infections are common in tropical and sub-tropical regions where they can have substantial local public health impacts. This study aimed to evaluate the prevalence of STH infection in the community and children aged 6 to 11 years attending government-run schools in the Simanindo sub-district of Samosir Island. In total, 314 individuals in the community and 187 children aged 6 to 11 years attending government schools were invited to provide a fecal sample. All fecal samples were examined microscopically using the Kato-Katz technique. The prevalence of STH infection in the community was 46.8% (147/314). Infections were caused by Ascaris lumbricoides (n=52), followed by *Trichuris trichiura* (n=48), and hookworms (n=26). The prevalence of STH infection in school-age children was 4.8% in 2023. All infections in this cohort were due to *T. trichiura*. Even though the MDA program effectively controls *A. lumbricoides* and hookworm infections in school children, the problem of controlling *T. trichiura* infection remains. Therefore, selective treatment after fecal sample examination is needed to prevent *T. trichiura* infection and the potential for infection-associated anemia. Health education focusing on personal hygiene and environmental sanitation is still important for preventing STH infections. The suggestion is a new community-based survey with random sampling is necessary to ensure the present prevalence of STH in the community.

Keywords: Soil-Transmitted Helminth Infection, Community, School-Age Children, Samosir, Indonesia.

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1. INTRODUCTION

Soil-transmitted helminths (STHs) can infect humans through the ingestion of eggs or skin penetration by the larvae (Awasthi et al., 2003; CDC, 2023). The species of STHs that most commonly infect humans are *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), and *Ancylostoma duodenale* or *Necator americanus* (hookworms) (WHO, 2020; WHO, 2023a; Kapti et al., 2021). While *A. lumbricoides* and hookworms inhabit the small intestine, *T. trichiura* resides in the cecum and ascending colon. Adult female worms produce thousands of eggs expelled with feces and can contaminate the environment when defecation occurs outdoors. STH transmission of STHs can occur in several ways, including ingesting eggs on unwashed vegetables and in contaminated water, and ingesting eggs in soil through poor hand hygiene (Sutisna et al., 2023). The highest infection prevalence of *A. lumbricoides* and *T. trichiura* is usually found in school-age children, while hookworms are more common in adults (Gordon et al., 2017).

STH infections are common in the tropical and sub-tropical regions (WHO, 2017; Molla and Mamo, 2018; Hotez et al., 2014; Steventon et al., 2012) and disproportionally impact residents with poor sanitation and hygiene practices (Gordon et al., 2017; WHO, 2023b; Sato et al., 2018; Steibaum et al., 2016; Strunz et al., 2014; Blum & Hotez, 2018; Starr & Montgomery, 2011). A high prevalence of STH infection has been reported in regions of Asia, Sub-Saharan Africa, and Latin America, with up to one billion people affected globally (Maleki et al., 2020; Taghipour et al., 2022; Badri et al., 2022). In Indonesia, it is estimated that around 195 million people, including 13 million children under the age of 6 years and 37 million children aged 6 to 12 years, live in areas endemic for STH infections (Tan et al., 2014; Sutisna et al., 2023). In children, STH infections, especially *A. lumbricoides* and *T. trichiura*, continue to pose a significant public health problem (Kapti et al., 2023).

Samosir Island is located in Lake Toba and is considered an important location for international tourism by the Indonesia government (Kementerian Pariwisata dan Ekonomi Kreatif/Badan Pariwisata dan Ekonomi Kreatif, 2023). Therefore, implementing local control programs for communicable diseases, including STH infections, is important to support public health and tourism. Current control programs for STH in Indonesia include health education, disease surveillance, risk factors control, patient management, and MDA, to decrease the prevalence of STHs to < 10% at the districts-level (Kementerian Kesehatan Republik Indonesia, 2017).

This study aimed to evaluate the prevalence of STH infection in the community and in children aged 6 to 11 years attending government-run schools in the Simanindo sub-district of Samosir Island.

2. RESEARCH METHOD

Samosir Island has nine subdistricts (Fig. 1), with a 2021 population of 137,696. The local temperature ranges from 22.0 to 35.0ºC, with 39% to 100% humidity (BPS Kabupaten Samosir, 2022). This study consisted of a community-based survey conducted in September 2015 and an elementary school-based survey conducted in May 2023. Both surveys took place in the Simanindo sub-district, which had a population of 23,039 in 2021. Simanindo is predominately rural, with a small tourist industry (Wandra et al., 2020). A full description of the community-based study has been previously described in Wandra, (2020). Briefly, surveys were conducted in two selected villages based on the recommendations of the Samosir District Health Office and the local health center. Fecal samples were collected from a convenience sample of 314 villagers aged 2 to 80 years.

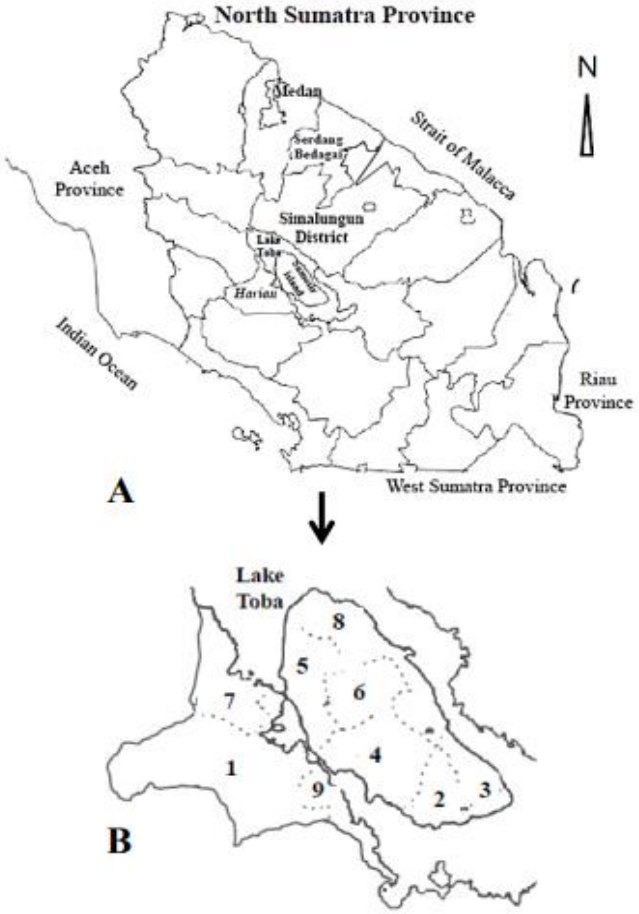

Figure 1. Samosir Island and nine districts in North Sumatra.

Table 1. Number of elementary schools, school children, and fecal samples examined in the Simanindo sub-district of Samosir island

Elementary school	A*/B	Number of school children*	No. of the fecal sample examined	No. of positive STH (%)
Government-run (public) schools	28/7	2543	187	9/187 (4.8)
Private	2/0	316	--	--
Total	30/7	2859	187	9/187 (4.8)

A: No. of elementary school, B: No. of elementary school surveyed
**BPS-SSR, 2022*

Table 1 shows that Simanindo has 30 elementary schools, including 28 government-run (public) schools and 2 private schools. As of 2022, 2859 children 6 to 11 years of age attended these schools, with 2543 children attending government-run schools and 316 children attending private schools (BPS Kabupaten Samosir, 2022). The school-based survey was carried out in seven randomly selected government-run elementary schools in seven villages, representing 25% of the government-run schools in the sub-district. All students in the first, second, and third grades (representing children 6-11 years of age) (n=187) were invited to provide a fecal sample.

After obtaining informed consent, each child's parent or guardian was asked to complete a questionnaire on possible risk factors for STH infection. The questionnaire was adapted from

a survey previously used by the Indonesian Ministry of Health (Kementerian Kesehatan Republik Indonesia, 2017).

The school-based survey was approved by The National Research and Innovation Agency, Republic of Indonesia (No. 025, dated 30 March 2023). All fecal samples were examined microscopically using the Kato-Katz technique and all individuals diagnosed with *A. lumbricoides* and/or hookworm infections were treated with albendazole (400 mg) for one day. Individuals diagnosed with *T. trichiura* infection were treated with albendazole (400 mg) for three consecutive days. STH infection prevalence was defined as the number of participants with an STH infection divided by the total number of fecal samples x 100. STH infection prevalence was compared between populations and sub-groups using Pearson's chi-square or Fisher's exact test as appropriate. A *p*-value < 0.05 was considered statistically significant. Data analysis was conducted using SPSS v.21 (IBM).

3. RESULTS AND DISCUSSION

Table 2. Prevalence and cause of STH infection on the community and school children in the Simanindo sub-district of Samosir Island

Infecting parasite	Prevalence (%)		p-value
	Community 2015 (n=314)*	School children 2023 (n=187)	
STH infection	46.8 (147/314)	4.8 (9/187)	<0.0001
A. lumbricoides (Al)	35.4 (52/147)	0.0 (0/9)	0.0231
T. trichiura (Tt)	32.7 (48/147)	100(9/9)	<0.0001
Hookworms (HW)	17.7 (26/147)	0.0 (0/9)	0.1847
Al+Tt	6.8 (10/147)	0.0 (0/9)	0.5419
Al+Hw	6.1 (9/147)	0.0 (0/9)	0.5772
Tt+Hw	1.4 (2/147)	0.0 (0/9)	0.8876
Al+Tt+Hw	0.0 (0/147)	0.0 (0/9)	--

**Wandra et al., 2020*

Table 2 shows that the prevalence of STH infections in the community-based study was 46.8% (147/314). Infections were caused by *A. lumbricoides* (35.4%, 52/147), followed by *T. trichiura* (32.7%, 48/147), hookworms (17.7%, 26/147), *A. lumbricoides* + *T. trichiura* (6.8%, 10/147), *A. lumbricoides* + hookworms (6.1%, 9/147), and *T. trichiura* + hookworms (1.4%, 2/147) (data previously published in Wandra et al., (2020). The prevalence of STH infections in the school-based study was lower (4.8%, 9/187) compared to the prevalence found across all age groups in the community (46.8%) (p < 0.0001) (Table 1, 2).

Table 3. Prevalence of STH infections in children 11 years of age and younger in the community (2015) and in school children 6 to 11 years of age (2023) in the Simanindo sub-district of Samosir Island

Infecting parasite	Prevalence (%)		p-value
	Community (≤ 11 year old)	School children (≤ 11 year old)	
T. trichiura (Tt)	16.9 (27/160)	4.8 (9/187)	0.0002
Hookworms (Hw)	0.6 (1/160)	0.0 (0/187)	--
Al+Tt	5.6 (9/160)	0.0 (0/187)	--
Al + Hw	3.1 (5/160)	0.0 (0/187)	--
Tt + Hw	0.0 (0/160)	0.0 (0/187)	--

Table 3 shows that all STH infections in the school-based study were due to *T. trichiura*, with 5 cases in first graders (age group = 6 years) and 4 cases in second and third graders (age group = 7 - 11 years). There was a significant difference in the prevalence of trichuriaisis in the school-based study (4.8%, 9/187) and the prevalence of trichuriasis in participants less than 11 years of age (91% of whom were less than 6 years of age) in the community study (16.9%, 27/160) (p=0.0002).

Table 4. Prevalence of STH infections in the community and school children by sex in the Simanindo sub-district of Samosir Island

Infecting parasite	Prevalence (%)					
	Community		p-value	School children		p-value
	Male	Female		Male	Female	
STH infection	70.6 (60/85)	38.0 (87/229)	<0.0001	4.2 (4/95)	5.4 (5/92)	0.4798
A. lumbricoides (Al)	18.3(11/60)	47.1(41/87)	0.0003	0.0 (0/4)	0.0 (0/5)	--
T. trichiura (Tt)	58.3 (35/60)	14.9 (13/87)	<0.0001	100(4/4)	100(5/5)	--
Hookworms (Hw)	8.3 (5/60)	24.1 (21/87)	0.0136	0.0 (0/4)	0.0 (0/5)	--
Al+Tt	10.0 (6/60)	4.6 (4/87)	0.3175	0.0 (0/4)	0.0 (0/5)	--
Al + Hw	3.3 (2/60)	8.0 (7/87)	0.3103	--	--	--
Tt + Hw	1.7(1/60)	1.1(1/87)	0.6514	--	--	--

Table 4 shows that of the participants in the community-based study, 85 (27.1%) were male and 229 (72.9%) were female. There was a higher prevalence of STH infections in males (70.6%, 60/85) than in females (38.0%, 87/229) (p <0.0001). The most common single parasite infection in males was *T. trichiura* (58.3%, 35/60), followed by *A. lumbricoides* (18.3%, 11/60), and hookworms (8.3%, 5/60). In contrast, in females, the most common single parasite infection was *A. lumbricoides* (47.1%, 41/87), followed by hookworms (24.1%, 21/87), and *T. trichiura (*14.9%, 13/87). In the school-based study, 95 (50.8%) of the participants were male, and 92 (49.2%) were female. There was no statistically significant difference in STH infection prevalence between males (4.2%, 4/95) and females (5.4%, 5/92) (p=0.4798).

Table 5. Response to a questionnaire administered to parents or adult members of a student's household regarding possible risk factors for STH infection in the Simanindo sub-district of Samosir Island, 2023 (n=187).

Household sanitary facilities	n*	%
Source of drinking water at home		
Sufficient (1)	60/165	36.4
Insufficient (2)	105/165	63.6
Drinking water at home		
Boiled water	151/167	90.4
Un-boiled water	16/167	9.6
Having toilet facilities		
Yes	143/159	89.9
No	16/159	10.1

**Some questions have fewer responses due to participants being unwilling to answer.*

(1) Commercial water/water pipes.

(2) Borholes/open well (n=27), natural pond (n=34), rainwater (n=8), lake (n=36)

Table 5 show that the most common source of drinking water in the home was commercially supplied pipes (36.4%; 60/165). In addition, 90.4% (151/167) indicated that the family drank boiled water, and 89.9% (143/159) had a household toilet.

DISCUSSION

Risk factors previously linked to STH infections on Samosir Island include inadequate toilets, poor hand hygiene prior to eating, poor hand hygiene after defecation, and drinking unfiltered water (Yulfi at al., 2016). The prevalence of STH infections in children in elementary school was lower (4.8%) than in the community (46.8%), including all age groups ($p < 0.0001$). While only *T. trichiura* was found in children (aged 6-11 years) in the school-based study, other STH species were identified in the greater community. This finding is likely due to the impact of MDA that is performed in elementary schools on Samosir Island, with this practice now in place for more than 10 years (Kementerian Kesehatan Republik Indonesia, 2012; Kementerian Kesehatan Republik Indonesia, 2017). When evaluating infection prevalence in children 11 years of age or younger in the community study, the vast majority (91.0%, 147/160) were less than 6 years of age and, therefore, ineligible to participate in the MDA program.

The national MDA program aimed at elementary school children includes administration of a single dose of albendazole (400 mg) two times a year if the local prevalence is greater than 50%, one time a year if the local prevalence (20-50%), and selectively if the local prevalence is less than 20% (Kementerian Kesehatan Republik Indonesia, 2017). A single dose of albendazole can effectively control *A. lumbricoides* and hookworm (Moser et al., 2017; Montresor et al., 2020; WHO, 2023b). However, a three-dose albendazole regimen has been recommended to control *T. trichiura* (Namwanje et al., 2011; Tee et al., 2022). This need was illustrated in a 2006 study of students aged 9 to 15 years, where 59.6% of students were positive for *T. trichiura* eggs two weeks after the single-dose MDA protocol (Wandra et al., 2020).

In the community, males had a higher prevalence of STH infections (70.6%) than females (38.0%) ($p < 0.05$). However, hookworm infection was lower in males (8.3%) than in females (24.1%), which may be due to females (> 15 years of age) spending more time working in the fields and often doing so barefoot (Wandra et al., 2020). In contrast, there was no significant difference in STH infection prevalence between males (4.2%) and females (4.5%) in the school-based study, likely due to the impact of the MDA program.

Our study did have some limitations. Since participant selection was not random, we cannot exclude the possibility of bias in our sample population. However, we assumed that there has not been a substantial change in STH infection prevalence in the community since 2015. Although the MDA program has been active in schools for over a decade, an MDA program for other age groups is still unavailable in Indonesia.

4. CONCLUSION

The prevalence of STH infection in the community was 46.8% (147/314). Infections were caused by Ascaris lumbricoides (n=52), followed by Trichuris trichiura (n=48), and hookworms (n=26). The prevalence of STH infection in school-age children was 4.8% in 2023. All infections in this cohort were due to *T. trichiura*. Even though the MDA program effectively controls *A. lumbricoides* and hookworm infections in school children, the problem of controlling *T. trichiura* infection remains. Therefore, selective treatment after fecal sample examination is needed to prevent *T. trichiura* infection and the potential for infection-associated anemia. Health education focusing on personal hygiene and environmental sanitation is still important for preventing STH infections. The suggestion is a new community-based survey with random sampling is necessary to ensure the present prevalence of STH in the community.

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RESEARCH Open Access

Acute Toxicity and Antipyretic Test of Ethanol Extract of Sterculia Quadrifida. R. Br. Leaves as Traditional Medicine

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Abstract

Sterculia quadrifida (SQ) is a plant which is also known as "faloak" by the people of East Nusa Tenggara. The secondary metabolite content of this plant has sufficient potential to be developed. Taking the bark of SQ which is not balanced with its preservation can threaten its survival. The use of SQ leaves as a new traditional medicine needs to be tested for its efficacy and safety.The aim of the study was to provide information about the efficacy and safety of SQ leaves in the development of new traditional medicines. The acute toxicity test used the fix-dose combination method according to the BPOM recommendation. A single oral dose of 2000 mg/KgBw of extract was given to five male mice at 24 h intervals. Animals were observed individually for any clinical signs of toxicity or mortality for 24 hours and 14 days. DPT (difteri, pertussis, tetanus)-Hb (Hepatitis-B) was used as a fever inducer in the antipyretic test of infusion and ethanol extract of SQ leaves. For acute treatment, the ethanol extract of Sterculia quadrifida (EESQ) did not reveal any signs of toxicity or mortality in any animal, during the observation period. The LD50 of extract was estimated to be greater than 2000 mg/KgBw. A dose of 2000 mg/KgBw in mice for 14 days showed significant side effects on the liver and spleen which were marked by organ weights that were significantly different from the control group. Paracetamol as positive control, infusion of Sterculia quadrifida leaves (ISQ) 100%, and EESQ 400 mg/KgBw showed a significant difference ($p<0.05$) with the negative control group. The results showed that SQ leaf has potential as an antipyretic, but liver function must be monitored, even though the LD50 value is above 2000 mg/KgBw.

Keywords: Sterculia Quadrifida, Faloak, Extract, Acut Toxicity, Antipyretic

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1. INTRODUCTION

Traditional medicine is derived from plant materials that have been used for generations for treatment with efficacy and safety. The affectivity and safety of the plant must be proven through pre and clinical trials. This is because one of the requirements for a plant to be developed as a medicinal plant must be proven safe for consumption. This safeness is proven through oral acute toxicity testing (BPOM, 2022).

Data from the Central Statistics Agency shows that there has been an increase in the number of people who treat themselves from 2020 to 2022 by 22.74%, it shows that public awareness in treating diseases is increasing (Badan Pusat Statistika, 2022). Data from the central statistics agency also shows that the percentage of residents who experienced health complaints but did not seek outpatient treatment during the last month was 69.76% who chose to treat themselves, 16.52% were still worried about being exposed to Covid-19, 11.62% felt it was not necessary and 2.10% for other reasons (Badan Pusat Statistik Nusa Tenggara Timur, 2022).

Sterculia quadrifida (SQ) is a plant which is also known as "faloak" by the people of East Nusa Tenggara to treat several diseases. These diseases include ulcers, typhoid, anemia, liver disease, rheumatism, backache, diarrhea, increase stamina and clean the blood after childbirth (Dillak, Kristiani, & Kasmiyati, 2019), Kidney disorders, bladder disorders and blood boosters (Siswadi, et al., 2016). The bark of SQ is an endemic plant of NTT, especially on the island of Timor. There are several benefits of this plant, which has been proven through pre-clinical trials. These benefits include antibiotic (Ranta, Pribadi, & Nawawi, 2011; Tenda, Lenggu, & Ngale, 2017), immunomodulatory (Winanta & Hertiani, 2019) and antioxidant (Dillak, Kristiani, & Kasmiyati, 2019). This plant as traditional medicine is safe because it has been proven through toxicity testing (Siswadi& Saragih, 2018; SP3T Provinsi Nusa Tenggara Timur, 2016). Epicatechin compounds have been successfully isolated from the bark of SQ stems. This compound was reported to have hepatoprotective activity against hepatitis C virus (Dean, Handajani, & Khotib, 2019).

In addition to efficacy and safety, bioavailability must also be considered in the development of traditional medicine. The phenomenon found shows that taking bark that exceeds the carrying capacity of the tree can cause the death of the tree, thus threatening the availability of this plant. In addition, the success of SQ development vegetatively is still very low, only around 15 - 25% (Rianawati & Siswadi, 2020). The part of the plant that is interesting to study is the leaf, although it is not used by the people of NTT as a traditional medicine, some evidence of phytochemical screening shows that SQ leaves contain secondary metabolites of flavonoids, phenols (Saragih & Siswadi, 2019), steroid, terpenoids and tannin (Akter, et al., 2016). Toxicity tests are carried out on animals as evidence of the safety of a drug candidate so that it can provide an overview of the possible risk of exposure when used by humans (BPOM, 2022). Phytochemical screening results can be an indication of the efficacy of a medicinal plant even though empirically it is not used by the public.

The content of flavonoid compounds in plants is known to inhibit the cyclooxygenase pathway resulting in the inhibition of prostaglandin synthesis which is a mediator of fever, pain, and inflammation (Masula et al., 2018; Nijveldt, et al., 2020). A recent study has shown that plants containing flavonoids are thought to have antipyretic effects such as sapodilla leaves (Chrysophyllum albidum) (Onyegbule, et al., 2020), gotu kola leaves (Centella asiatica (L.) Urban) (Saptarini & Kartikawati, 2021), *tarum leaves* (*Indigofera argentea)* (Javed, et al., 2020) *artemisia (Artemisia judaica* L) (Moharram et al., 2021), Fever is a sign of something happening in the body such as typhus (Levani & Prastya, 2020), Virus infection (Alvinasyrah, 2021), bacteria infection (Alvinasyrah, 2021), autoimmunity (Fitriany & Annisa, 2019),

hepatitis (NSW Government, 2017) and Coronavirus infection (Ai et al., 2021; Asare-Boateng, et al., 2020).

Fever can be caused by abnormalities in the brain or by toxic substances that affect the temperature regulation center which ends in heat stroke. To prove the efficacy of a new plant, it must first be supported by safety data. Empirical evidence for the use of the leaves of SQ has not been found in Indonesia, it is recorded that aboriginal people have been using faloak leaves since 1983 (Lassak, 1983). The content of active compounds in the leaves suspected of being antipyretic needs to be ensured for their safety and activity. Empirically the people in NTT use the stem bark. The aim of this research is to provide information to the public regarding the safety and efficacy of SQ as an antipyretic.

2. RESEARCH METHOD

The plant material used for the study was leaves of SQ obtained from Liliba, Kupang East of Nusa Tenggara determined by Jatinangor Herbarium Plant Taxonomy Laboratory Department of Biology, FMIPA Padjajaran University with identification letter No. 38/HB/02/2022. Chemical and reagent used include: Pentabio (PT. Biofarma), ethanol 96% (PT. Bratachem, Indonesia), aqua dest (Bratacem, Indonesia), and Paracetamol (PT. Kimia Farma).

Fresh SQ leaves are taken and dried by air-drying. The dried simplicia is then divided for infusion and extraction using 96% ethanol. The infusion procedure is based on the BPOM Reference (BPOM, 2022) using 10% SQ leaf simplicia. The infusion process takes 15 minutes starting when the temperature reaches 90°C with occasional stirring. The extraction process are performed as follows 900g of the substance was weighed and placed in a maceration container before 9 L of 96% ethanol solvent was added. After that, the maceration container was sealed and kept for 24 hours away from direct sunlight while being intermittently stirred (Departemen Kesehatan Republik Indonesia, 2017). The materials were then filtered and separated between the dregs and the filtrate. After that, remaceration was performed by adding 4.5 L of 96% ethanol into the container containing the dregs. Then close and re- store the container during 24 hours. The ethanol filtrate obtained was collected and the liquid filter was evaporated using a rotary evaporator (Eyela N-1000) at a temperature of 50˚C to obtain a thick ethanol extract.

Identification of SQ leaf infusion (ISQ) and ethanol extract of SQ leaf (EESQ) were carried out by tube test and TLC (Thin Layer Chromatographty) test for alkaloids, flavonoids, tannins, saponins, and steroids. Alkaloid Test: Reaction with Mayer's reagent will form a white precipitate, Dragendorff's reagent will form an orange-red precipitate and Wagner's reagent will form a brown precipitate. Flavonoid Test: A positive test is indicated by the formation of a red, yellow, or orange color. Steroid Test: Steroid positive test if it produces a blue or green color. Saponin Test: If the foam formed remains stable for approximately 7 minutes, then the extract is positive for saponins. Tannin Test: Positive extract contains tannin when it produces a blackish green or blackish blue color (Harborne, 1996).

Extract characterization includes testing specific parameters (extract identity, organoleptics, water and ethanol soluble compound content using the gravimetric method) and non-specific parameters (determination of water content, ash content, and acid insoluble ash content) (Departemen Kesehatan Republik Indonesia, 2017).

Adult male Swiss webster albino mice were used for this study. They weighed 20 to 40 g and were all 6 to 12 weeks of age. The animals were obtained from the animal house of the Department of Pharmacology, Faculty of Pharmacy, Kupang Health Polytechnic Ministry of Health. They were housed in cages with soft wood shavings as beddings with 5 mice per cage. They were kept at room temperature and were allowed free access to clean water and food. They were acclimatized to normal laboratory conditions for 7 days. The animals were fed with Pellets and water ad libitum. All experimental procedures were conducted with the approval of

the Institutional Animal Ethics Health Polytechnic Ministry of Health Kupang (No.LB.02.03/1/0178/2022) for the care and use of animals and their guidelines were strictly followed throughout the study. The animals were starved for 18 h before the study and were only allowed access to water.

The toxicity test was carried out using the fixed dose method, the dose chosen was the dose that did not cause death, severe pain, or irritating/corrosive. The test animals used were 5 mice each for the test and control groups. Test animals were given multilevel doses using the fixed dose method, including doses of 300 and 2000 mg/KgBw orally. signs of toxicity and death were observed intensively for 24 hours. Observation of animal body weight and mortality was then monitored from the first day to the 14th day after administration. After 14 days, the animals were euthanized and observed for symptoms of toxicity in their vital organs by calculating the organ index based on the ratio of the weight of the organs of the brain, lungs, liver, heart, kidneys, stomach, and spleen to body weight (BPOM, 2022).

Antipyretic activity in mice was studied with fever induced by DPT-Hb (difteri, pertussis, tetanus)-Hb (Hepatitis-B) Vaccine. After measuring the rectal temperature of the mice by introducing a 1.5 cm of digital thermometer in the rectum, pyrexia was induced by injecting intra-muscular, 0.2 mL/20gBw DPT-Hb. After 60 minutes of pyrexia injection, mice that showed a rise in temperature of at least 0.6°C were taken for the study. The animals were divided into five treatment groups labeled ‘1ab to 5ab.

Group 1a,b: 1% aqueous suspension of CMC
Group 2a,b: Paracetamol (PCT) 65 mg/KgBw with 1% aqueous suspension of CMC
Group 3a: EESQ 100 mg/Kg with 1% aqueous suspension of CMC
3b: ISQ 50% (0.2 mL/20gBw)
Group 4a: EESQ 200 mg/KgBw with 1% aqueous suspension of CMC
4b: ISQ 75% (0.2 mL/20gBw)
Group 5a: EESQ 400 mg/KgBw with 1% aqueous suspension of CMC
5b: ISQ 100% (0.2 mL/20gBw)
(a: ISQ; b: EESQ)
All treatments were administered orally (0.2 mL/20gBw)

Rectal temperature was recorded every 30 minutes for 120 minutes after administration of drugs. The data were analyzed by Analysis of variance (ANOVA) to find differences between the test groups and to determine the LD50 value based on the fixed dose method.

3. RESULTS AND DISCUSSION

Based on identification letter No. 38/HB/02/2022, it shows that the Latin name of the Faloak leaf is *Sterculia quadrifida* R.Br. With family Sterculiaceae. The determination of Faloak was carried out at Jatinangor Herbarium, Plant Taxonomy Laboratory, Department of Biology, FMIPA Padjajaran University. Determination aims to ensure the identity of the plants used.

The results of the dry extract of SQleaves with 96% ethanol solvent were obtained as much as 68.43 grams, with an extract yield of 7.6%. The yield of the extract complies with the standards set by the Indonesian Herbal Pharmacopoeia, which is not less than 7.2% (Departemen Kesehatan Republik Indonesia, 2017). The habit of taking stem bark continuously and not accompanied by cultivation will be a threat to the extinction of a plant, prevention efforts that can be done are cultivation and identifying other plant parts that contain secondary metabolites that are qualitatively the same as SQ stem bark which is empirically used by the community NTT as a medicine for liver disease. SQ plants are also known to have been clinically tested to contain epicatechin compounds which can inhibit the replication of VHC JFH1 in the liver (Dean et al., 2019).

Table 1. Identification of ISQ and EESQ

Identifiction	ISQ		EESQ	
	Test Tube	TLC Test	Test Tube	TLC Test
Alkaloid	+	+	+	+
Flavonoid	+	+	+	+
Tannin	+	+	+	+
Saponin	-	-	+	+
Steroid	+	+	+	+

note: (+) detected ; (-) not detected

Rf value in EESQ aims to calculate the speed of transfer from the mobile phase to the stationary phase. Compounds with the same or close Rf values can show that both have the same or similar characteristics (Rizki & Ferdinand, 2021).

Table 2. RF Value of EESQ

Identifiction	RF Value	Standard
Alkaloid	0.56	0.07 – 0.62 (Harborne, 1996)
Flavonoid	0.97; 0.81; 0.61; 0.5	0.31 - 0.98 (Harborne, 1996)
Tannin	0.5	0.29 – 0.85 (Harborne, 1996)
Steroid	0.71	0,71 (Forestryana & Arnida, 2020)

The identification of alkaloids obtained an Rf value of 0.56, this value is known to meet the standard Rf alkaloids with a value of 0.07 – 0.62. As well as flavonoids Rf values obtained consecutively 0.97; 0.81; 0.61; 0.5. All these Rf values meet the standard Rf values of flavonoids 0.31 - 0.98 (Harborne, 1996). The tannin Rf value is 0.5, this value also meets the standard Rf tannin value of 0.29 – 0.85. In the results, the Rf value of saponin compounds, which is suspected to be a saponin compound is an Rf value of 0.63 when compared to the reference standard for saponins, which is 0.66. In the steroid test, a spot was found with an Rf value of 0.71. This data is similar to previous research which produced the same Rf value of 0.71 and produced the same color (Blue-green) (Forestryana & Arnida, 2020). A good Rf value is 0.2 - 0.8 so the Rf value obtained is in the range of a good Rf value. Slightly different from the TLC test on leaf infusion, the RF value cannot be determined because there are no clear spots, this could be due to the secondary metabolite content being too small, a positive test result is stated based on the color change on the TLC plate after being sprayed using a stain spotter and observed below 254 nm UV light. Where the TLC on the flavonoid test showed brown-yellow spots, steroids appeared blue spots, and tannins appeared purple spots.

Extract characteristics test includes specific and non-specific parameters. Reference is needed as a standard to assess the feasibility of extracts. However, there is no official reference in standardizing the ethanol extract of SQ leaves published by the Ministry of Health or from other sources, so the research reference used is with general extract requirements which include non-specific parameters. Specific parameter testing includes extract identity, extract organoleptic, and soluble compounds in certain solvents (water and ethanol).

Table 3. Specific parameters of EESQ (*Sterculia quadrifida* R.Br)

Paremeter	Result
Extract name	Ethanolic extract of SQ
Latin Name	*Sterculia quadrifida* R.Br
Plant parts	Leaf
Indonesian Name	Faloak
Organoleptic	Form : Dry extract Colour : Dark green Odor : not rancit, not specific

	Taste : Chelate; bit bitter
Water soluble compounds	4,6 %
Ethanol soluble compounds	11,26%

The content of ethanol-soluble compounds is greater than the levels of water soluble compounds because ethanol is a universal solvent that can dissolve almost all substances that are polar to nonpolar. Determination of levels of soluble compounds in water and ethanol is carried out to provide an initial description of the number of chemical compounds that are polar (water-soluble) and semi-polar to non-polar (ethanol soluble) compounds (Saifudin, Tahayu, & Teruna, 2011). Determination of the content of the extract is very important, because it can provide an overview of the number of dissolved materials and is the part that is used as a medicinal ingredient.

Determination of water content in the extract of SQ was carried out using a Moisture Analyzer at a temperature of 105°C for 15 minutes. This test aims to ensure that the extract used meets the requirements (less than 5%). Determination of water content is carried out to determine the residual water after the drying process. Moisture content is a quality parameter related to the microbiological, enzymatic, and chemical processes of the extract. The high water content will affect the stability of the extract or preparation due to the growth of microbes.

Tabel 4. Non-spesifik Parameter of EESQ *(Sterculia quadrifida* R.Br)

Parameter	**Result**
Water level	0.42%
Total ash content	3.1%
acid soluble ash content	0.5%

The total ash content aims to determine the internal and external mineral content of the extract, the higher the ash content of a material indicates the high content of toxic minerals such as mercury, lead, copper, cadmium, and strontium that can cause harmful effects to the body, the worse the quality of the material. The ash content should have a small value because this parameter indicates the presence of heavy metal contamination that is resistant to high temperatures. Heavy metals can accumulate and react directly to the body, causing toxic effects in various organs (Borowska & Brzóska, 2015).

Determination of acid insoluble ash content is done by dissolving the total ash with an acid solvent in the form of 10% dilute HCl acid insoluble minerals will be detected in the amount. The acid insoluble ash content test is related to the purity of the material, it is also a measure of the mineral content in a material. The presence of silicate contamination such as soil and sand is also interpreted as the value of acid-insoluble ash content.

The acute toxicity test used the fix-dose combination method according to the BPOM recommendation, the initial dose was started from 300mg/KgBw, and no toxic effects were found, so it was continued with a test dose of 2000mg/KgBw in 5 test animals (BPOM, 2022). In This study, the acute toxicity test used adult animals which is in the process of growth so that it can be seen the effect of the extract based on body weight parameters.

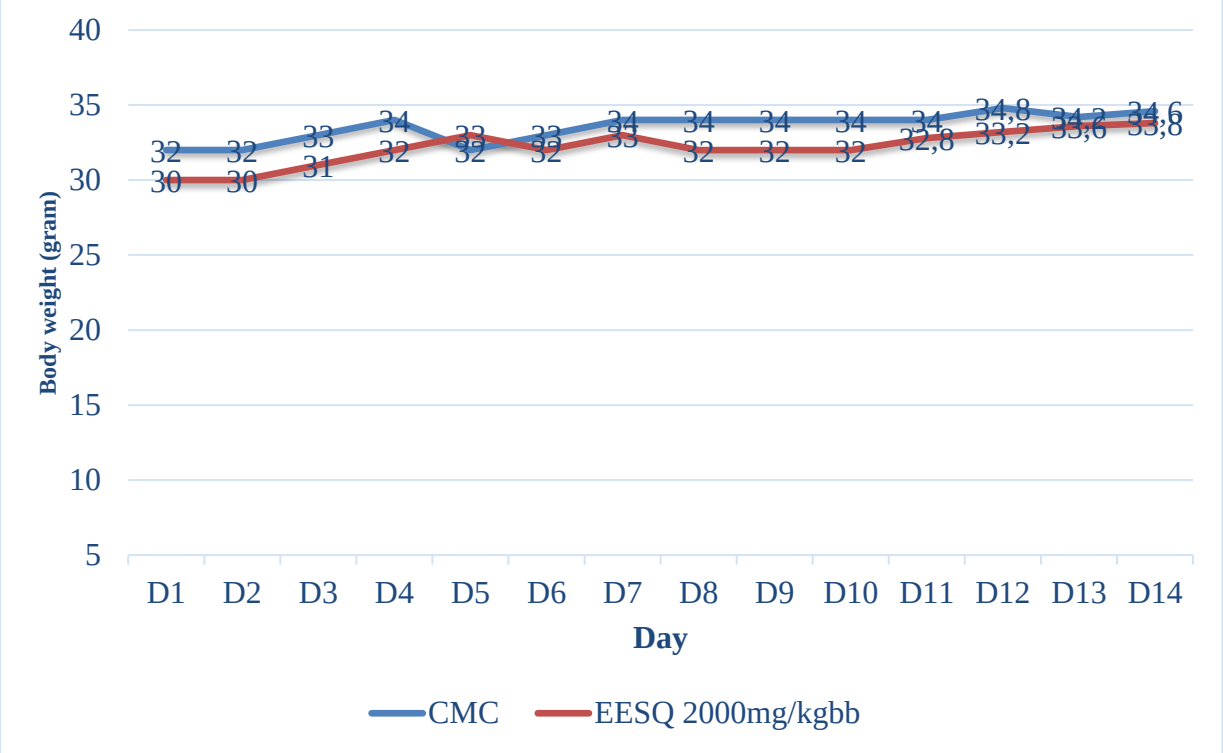

Figure 1. Body weight of test animals on day 1 to day -14

The results showed that the body weight of the test animals that received EESQ 2000mg/KgBw and CMC both showed a significant difference in body weight ($p<0.05$) between days 1 and 14. An increase in animal body weight is a normal process that commonly occurs when animals are in the process of growth (Haraguchi et al., 2022). Mice were observed individually for 24 hours after administration of EESQ 2000mg/KgBw and CMC 1%. No signs of toxicity were found based on observations of motor activity, straub, piloerection, ptosis, pineal reflex, corneal reflex, lacrimation, posture, retablishment, flexion, hafner, grooming, gastrointestinal effects, defecation, urination, salivation, vocalization and breathing at 4 hours first. No deaths occurred in any of the groups during the entire period of treatment of extract as well as 24h after treatment. Observations were continued until the 14th day, there were no signs of toxicity indicating that the test animals were in good health, but a chronic toxicity test was necessary to assess the safety of long-term use as well as histopathological tests to find the cause of weight gain in the liver and spleen organs of the test animals (Burgos-Pino et al., 2023).

In addition to the number of dead animals and symptoms of toxicity, macropathological data of vital organs on the 14th day can also be considered as a consideration for the level of toxicity of a preparation.

Table 5. Organ index of test animals on day 14

Organ index (%)	CMC Group	EESQ 2000 mg/Kg BB
Brain	1.1 ± 0.09	1.2 ± 0.06
Heart	0.6 ± 0.10	0.6 ± 0.01
Lungs	1.2 ± 0.17	1.1 ± 0.26
Liver *	6.0 ± 0.78	9.5 ± 2.30
Spleen*	0.8 ± 0.09	1.8 ± 0.63
Stomach	1.9 ± 0.42	1.4 ± 0.37
Kidney	1.6 ± 0.16	1.7 ± 0.14

*Significantly different from negative control ($P < 0.05$)

The purpose of the acute oral toxicity test is that in addition to detecting the intrinsic toxicity of a substance, it can also determine target organs, species sensitivity, and obtain hazard information after acute exposure of a substance, obtaining initial information that can be used to determine dose levels. Based on the results of the acute toxicity test, the antipyretic activity test was chosen at a dose below 2000mg/KgBw.

In this study, several parameters are thought to provide an important description of the conditions in the toxicity of a substance (Alkahtani, et al., 2022; Asare et al., 2012). Acute administration of SQ leaf does not showed death in a single dose of 2000 mg/KgBw, however these data could not yet describe indications of toxicity or mortality in the long term, but could suggest that the lethal dose of SQ leaves (LD50) was greater than 2000 mg/KgBw. Determination of relative organ weight is very important to know possible organ damage through exposure to the substance toxic properties. The level of toxicity of a substance can affect the organ weight of the test animals (Rosidah et al., 2009). In this study doses up to 2000 mg/KgBw caused weight changes in the spleen and liver when compared to controls. The use of SQ leaves may not be toxic to other organs, but it needs to be reviewed on the liver and spleen.

The results of the acute toxicity test of SQ leaves can give an idea to the public that traditional medicines with good pharmacological activity must still be tested for safety, this means that even traditional medicines can show side effects when used for a certain period of time and certain organs.

The infusion method is the most commonly used by the community. Empirical use in the community is limited to the bark, this action can threaten the extinction of the SQ tree. The infusion activity test is carried out as an initial stage of the antipyretic test, because fever is a symptom of a viral/bacterial infection or as a sign of illness in the body.

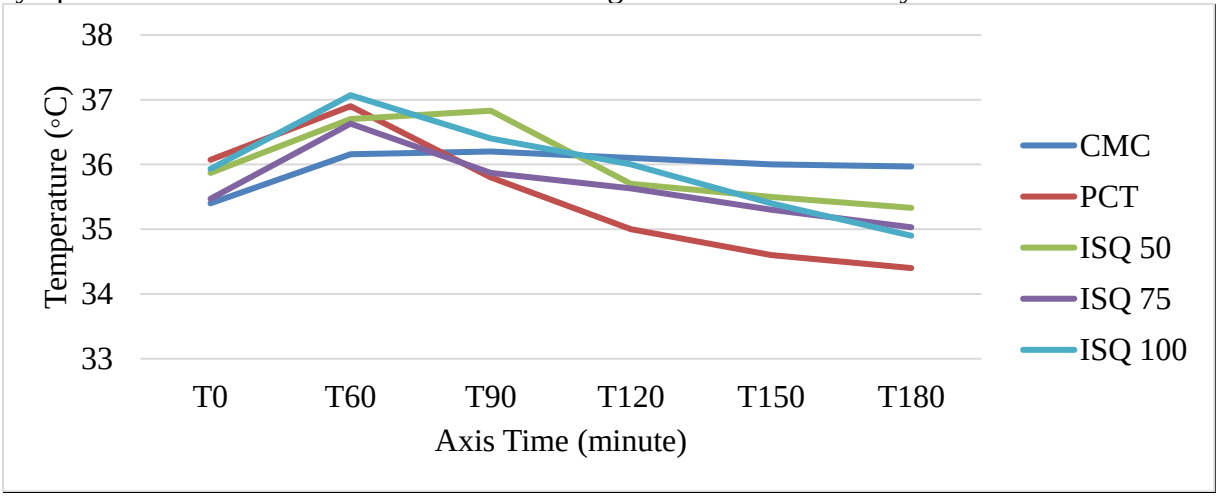

Figure 2. Changes in animal body temperature on ISQ administration

Figure 2 and 3 shows the temperature change every 30 minutes. DPT-Hb induction succeeded in increasing the body temperature of the test animals at 60 minutes with an average temperature increase of above 0.6°C (Quartey et al., 2020). Antipyretic activity was shown at 30 minutes after administration of the preparation, except for the CMC and ISQ groups at the lowest concentrations. It is known that the content of active substances in the infusion is directly proportional to the concentration of the infusion. One hour after administration of paracetamol has shown maximum antipyretic effect, followed by ISQ concentration of 100%, 75% and 50%. These results are in line with the data in table 5, where based on the results of statistical tests, ISQ concentration of 100% and Paracetamol group showed a significant difference ($p<0.05$) with the negative control group. Phytochemicals such as flavonoids (Nijveldt et al., 2020) and

tannins have been found to be responsible for many of the biological properties exhibited by plant extracts one of which is the antipyretic effect (Quartey et al., 2020).

Table 6. Antipyretic effect of ISQ

Groups	ΔT (°C)
CMC	1.6 ± 0.94
PCT*	7.5 ± 1.20
ISQ 50	4.1 ± 0.18
ISQ 75	4.8 ± 0.65
ISQ 100*	6.5 ± 0.24

*significantly different from negative control ($p < 0.05$)

There was no significant difference between the paracetamol and ISQ groups at 100% concentration. This shows that ISQ at a concentration of 100% has an antipyretic effect which is thought to be the same as paracetamol. The greater the value of ΔT , the higher the antipyretic effect.

The greatest value was in the paracetamol group, in accordance with the mechanism of action against prostaglandin synthesis inhibition in the central nervous system. ISQ and EESQ can significantly reduce body temperature in test animals induced by pyrexia when given the highest dose. The possible reason behind this mechanism is that it can block the prostaglandins in tissues, such as aspirin (Zhou et al., 2021).

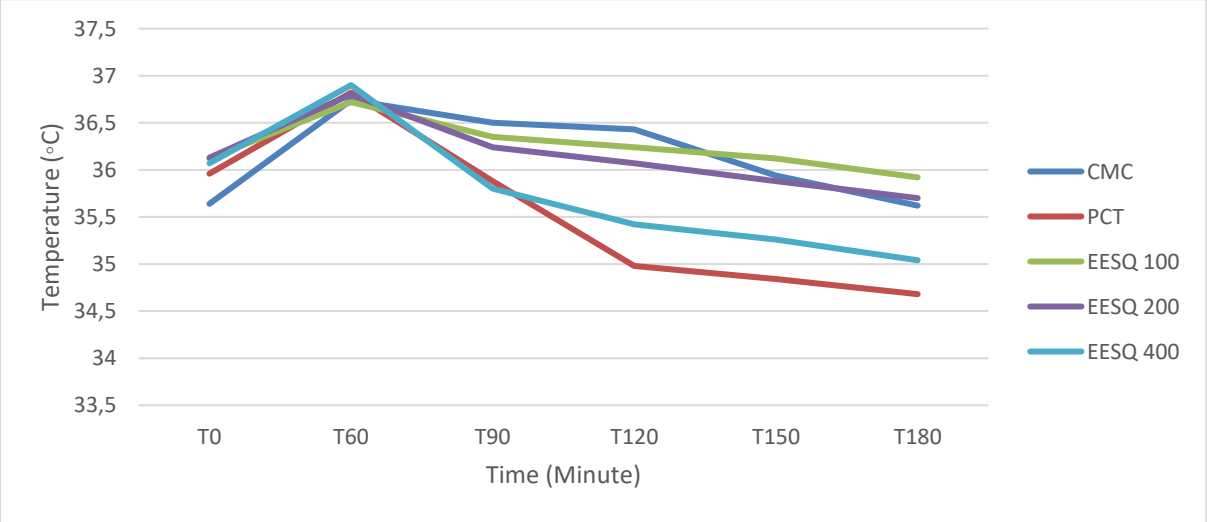

Figure 3. Changes in animal body temperature on EESQ administration

The statistical test showed that the preparations that were significantly different from CMC were only positive control and the test dosage form was 400mg/KgBw.

Table 7. Antipyretic effect of EESQ

Groups	ΔT (°C)
CMC	5.6 ± 0.74
PCT*	10.7 ± 0.81
EESQ 100	6.2 ± 0.62
EESQ 200	6.4 ± 0.51
EESQ 400*	9.3 ± 0.85

*significantly different from negative control ($p < 0.05$)

The graph of the decrease in temperature of 400 mg/KgBw EESQ in Figure 3 works quickly at 30 minutes after administration of the preparation, in contrast to ISQ at a

concentration of 100% which tends to show an antipyretic effect longer although it is not significantly different from paracetamol.

Considering that the use of leaves is not common in society, even though acute toxicity testing has been carried out, chronic toxicity tests must also be carried out to see the effect on long-term use.

4. CONCLUSION

The research results show that SQ leaves have the potential to be an antipyretic, but liver function must still be monitored even if the LD50 value is above 2000mg/KgBw. Sub-chronic toxicity tests are needed to prove the safety of using leaves as an alternative treatment to SQ bark.

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RESEARCH Open Access

The Implementation of Telepharmacy in Bangka Belitung Islands Province

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Abstract

Telepharmacy is a telemedicine health service in the pharmaceutical sector that uses telecommunications to assist patients located far away during the Covid-19 pandemic. Furthermore, professional organizations are responsible for continuously providing information to pharmacists, ensuring they stay updated with the latest developments in the field. Mobile applications have emerged as the primary medium through which information can be accessed. Therefore, this research aimed to determine the implementation of telepharmacy in the Bangka Belitung Islands Province using observational research with a qualitative approach. The participants comprised a total of 11 individuals and the technique employed was purposive sampling. Subsequently, the collected data were subjected to analysis using the Miles and Huberman model. The results showed that the utilization of telepharmacy commenced within Bangka Belitung Islands Province and the community pharmacy service implemented the concept in the form of Drug Information Services, drug consultation or patient counseling, and prescription services through e-prescribing. Additionally, field observations highlighted the presence of services such as home delivery of medicines, patient education, and online non-cash payments. The implementation of telepharmacy within hospitals remains absent, despite the widespread adoption of digital services facilitated by the SIMRAS application. Pharmacists also ensured the administrative compliance of their colleagues through the utilization of the SIAP application. The preliminary stages of the implementation commenced in the Bangka Belitung Islands Province.

Keywords: Telepharmacy, The Bangka Belitung Islands

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1. INTRODUCTION

The Covid-19 pandemic was accompanied by conspiracy theories, rumors, and infodemics, exacerbated by the availability of social media access, and the development of mental health problems due to lockdown (Hua & Shaw, 2020; Yanes et al, 2021). Graviria-Mendoza, et al., (2021) state a substantial portion of drug-related information originates from pharmacists, while the majority is sourced from social media, internet networks, and WhatsApp as well as personal or family drug use experiences (Pariyana, Mariana & Liana, 2021).

During the Covid-19 pandemic, there was a significant percentage of self-medication including drugs without sufficient scientific evidence (Quispe-Canari et al, 2021). This phenomenon was driven by a perception that the illness was merely minor and did not necessitate consultation with a healthcare professional (Susilo & Muslim, 2022). Commonly employed drugs for self-medication encompass acetaminophen (Graviria-Mendoza, et al., 2021), ibuprofen, azithromycin, penicillin, antiretrovirals, and hydroxychloroquine (Yanez et al, 2021; Quispe-Canari, 2021; Yazdany & Kim, 2022; Gras et al, 2021; Mashuri et al, 2022). Regrettably, many individuals opt to engage in self-medication practices with potent drugs without seeking guidance from pharmacists at community pharmacies (Susilo & Muslim, 2022). A significant proportion of these medications are procured from community pharmacies and drugstores (Mashuri et al, 2022).

The widespread use of off-label and irrational drugs for the Covid-19 causes morbidity and mortality, especially the incidence of infection (Paumgartten & Oliveira, 2020) and resistance due to the increased use of inappropriate antibiotics by the public (Mashuri et al, 2022; Kurniawan, Wardiyah & Tadashi, 2020).

Research in Indonesia on pharmaceutical staff showed that approximately 1/3 (37.7% of 4716) of respondents had given antibiotics to patients suspected of having the Covid-19 (Mashuri et al, 2022).

The patient obtains these medicines from the pharmacy because they do not receive information on drug use. In reality, pharmacy visitors require drug information, and there exists a noteworthy relationship between attitudes and the need for drug information (Abdullah, Andrajati & Supardi, 2010).

During a pandemic, it is crucial for professional organizations to consistently provide information, and pharmacists should utilize mobile devices as well as applications as the primary means of accessing information (Hoti et al, 2020). The community expresses the hope that pharmacists can offer services to extend their profession to a larger audience, enhance the presence of pharmacists, and provide comprehensive pharmaceutical services (Subadio, Wiyono & Mpila, 2022). Furthermore, public readiness and acceptance of telepharmacy services are at a high level (Rahma, 2021) with patient satisfaction (Hartani, 2021).

Telepharmacy is a telemedicine health service within the pharmaceutical sector that utilizes telecommunications to cater to patients in remote (Kementerian Kesehatan Republik Indonesia, 2021; Win, 2017) and rural areas (Poudel & Nissen, 2016; Le, Toscani & Colaizzi, 2020) during the Covid-19 pandemic (Iftinan, Wathoni & Lestari, 2021; Lubis, 2021; Putri & Wicaksono, 2021). Furthermore, it has been implemented since 2012 as an effective form of telepharmacy services (Baldoni, Amenta & Ricci, 2019; Sarkar et al, 2018) and its adoption has been increasing worldwide (Asseri et al, 2020). The results of other research show that most services such as drug counseling, prescription review, Drug Information Service, drug therapy monitoring, and pharmaceutical homecare are carried out offline/manually (Mansyur et al, 2019; Kementerian Kesehatan Republik Indonesia, 2020; Djuria & Sinulingga, 2021).

There is a need for initial information despite the Covid-19 pandemic serving as an opportunity for the implementation of telepharmacy, particularly in the archipelago of the Bangka Belitung Islands Province, which necessitates remote healthcare services. These

surveys will help assess the current state of telepharmacy implementation in the Bangka Belitung Islands, allowing for the conduction of evaluation, improvement, and service development.

2. RESEARCH METHOD

The method employed was observational research with a qualitative phenomenological approach. Data collection was conducted in the Bangka Belitung Islands Province from February to August 2022. The research included a total of 11 respondents, selected through purposive sampling. The respondents consisted of the heads of regional and branch organizations of the Indonesian Pharmacist Association in the Bangka Belitung Islands Province. Additionally, the heads of the regional health center pharmacy association and the Bangka Belitung Islands Province Hospital Pharmacy Association were also included as respondents.

In this qualitative research, primary data collection was conducted using triangulation techniques. This involved employing in-depth interviews, observing activities at health centers, pharmacies, and hospitals randomly, as well as using documentation. The collected data were then analyzed through the Miles and Huberman model, which consists of data reduction, display, and conclusion drawing/verification. Data reduction involved the simplification, classification, and elimination of unnecessary parts without contributing to the results. Furthermore, data display entailed presenting the data in a systematic and easily understandable manner. It involved organizing and compiling the data to facilitate meaningful interpretation and identification of patterns or themes. Conclusion drawing/verification is the final step in the data analysis process drawn based on the analyzed results. It remains subject to change when additional supporting evidence is discovered during subsequent data collection stages.

3. RESULTS AND DISCUSSION

The data processing shows that telepharmacy has indeed been implemented in the Bangka Belitung Islands Province. The findings from in-depth interviews indicate that the services, such as Drug Information Services, drug consultation or patient counseling, and prescription services (e-prescribing), have been adopted in community pharmacy services at health centers and pharmacy drug stores. Additionally, field observations demonstrate the existence of home delivery of medicines, patient education, and online non-cash payments.

Telepharmacy services, including Drug Information Services, drug consultation or patient counseling, and patient education, are conducted through telephone communication and different social media platforms, such as WhatsApp, Instagram, and video call applications. Prescription services employ e-prescribing methods, and home delivery of medicines is facilitated. In addition, online non-cash payments are made possible through diverse electronic prescription systems utilized in pharmacies.

These findings align with previous research indicating that virtual consultations, home delivery of medicines, and patient education are commonly employed telepharmacy services in numerous countries (Unni et al, 2021; Deloitte Indonesia, Bahar Law Firm & Chapter Indonesia, 2021). In addition, online non-cash payments, virtual self-medication (Fathony et al, 2021), and Drug Information Service activities are carried out online through email and WhatsApp (Arrang et al, 2021) as well as video calls during patient education and counseling (Koster, Philbert & Bouvy, 2021).

Research about pharmaceutical services shows that a total of 69 pharmacies (71.88%) have used technology-based pharmaceutical services. Telecounseling is conducted by providing self-medication services and drug information to customers online (59.4%). The online prescription and self-medication services use chat applications (WhatsApp, Telegram, Line), email, other online applications (Halodoc, Klikdokter), and video call applications

(Skype, Zoom, Google Meet). Chat applications are most often used both in online prescription services (50%) and self-medication (87%) (Fathony et al, 2021).

Pharmacists employ telepharmacy as a means to deliver clinical pharmacy services encompassing communication, information dissemination, education, drug therapy monitoring, drug information services, and drug dispensation. Telepharmacy media used are varied including telephone, WhatsApp, Instagram, SMS, website, TikTok, and Youtube (Sasanti, Maharani & Sholihat, 2021).

In Public health centers in Indonesia, the Electronic Prescription System served to provide pharmacological information about every available drug. In addition, the e-Health system for Tuberculosis Disease Management in the form of a software module was developed with one of the main functions of a short message delivery system through a cellular telephone network as a reminder of the patient's six-month treatment schedule (Santoso et al, 2015).

Telepharmacy in hospitals has not yet been implemented due to the digitization of services through the SIMRAS application. The findings differ from research conducted in other areas of Indonesia, which indicate the implementation of telepharmacy in hospitals. Telepharmacy has not been implemented in the districts of the Bangka and South Bangka. However, pharmacists have diligently completed the administrative legalities by using the SIAP application.

Several factors hinder the implementation of telepharmacy in the Bangka Belitung Islands Province. These include the availability and preparedness of pharmacists and other pharmaceutical personnel. Furthermore, some pharmacists, particularly senior ones, remain unaware of the convenience offered by telepharmacy services. Challenges such as limited internet network coverage, inadequate service hours, insufficient facilities and infrastructure, and a lack of familiarity among the community contribute to these obstacles. Additionally, regulatory frameworks and management mindsets also play a role in impeding the implementation of telepharmacy. The factors that become obstacles in the implementation are limited human resources and time (Arrang et al, 2021 ; Sasanti, Maharani & Sholihat, 2021), facilities and infrastructure (Santoso et al, 2015 ; Krisnadi & Laili, n.d), legal regulation (Krisnadi & Laili, n.d), technology signal, access to internet (Sasanti, Maharani & Sholihat, 2021; Hariyanti, 2022), patient’s economy (Sasanti, Maharani & Sholihat, 2021) and collaboration between system developers and the government (Santoso et al, 2015).

The respondents expressed their desire for pharmacists to demonstrate willingness and capability in using telepharmacy services for patients. Consequently, there is a need to further develop telepharmacy services to enhance convenience for both patients and pharmacists. It is essential to conduct effective socialization campaigns to promote the proper utilization of telepharmacy among stakeholders.

4. CONCLUSION

In conclusion, telepharmacy was implemented in Bangka Belitung Islands Province but required development and improvement to enhance its effectiveness and efficiency. Therefore, it is necessary to carry out further research on the development of telepharmacy service models in the Bangka Belitung Islands Province.

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RESEARCH **Open Access**

Aloe Vera: Potential to Reduce Fasting Blood Sugar Levels in Prediabetes

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Abstract

Prediabetes is a continuous spectrum of developmental stages before a person is diagnosed with diabetes mellitus. Considering the long-term effects of pharmacological treatment, other natural-based methods are needed. The purpose of this study was to analyze the effect of Aloe Vera Juice on the reduction of fasting blood glucose levels in patients with prediabetes in Pontianak City. A pre and post-test design study was conducted between March and July 2021 at Alianyang Public Health Center. A total of 12 subjects were identified as prediabetic at the beginning of the study through screening involved in this study. The included subjects were asked to consume 175 ml of Aloe Vera Juice for 15 consecutive days and measured their fasting blood glucose (FBG) levels on the 16th day. A paired t-test was performed to determine the difference in FBG levels before and after the treatment. Present findings revealed that the mean FBG level before intervention was 107.4 mg / dL and 92.1 mg/dL after the intervention. A statistically different FBG reduction significance was found between groups ($p<0.001$). Consuming Aloe vera juice regularly for 15 days has proven to lower FBG levels among prediabetics. Future studies with better adherence monitor and larger sample sizes might have resulted in better determination of the intervention's effect.

Keywords: Prediabetes, Fasting Blood Sugar Levels, Aloe Vera Juice

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1. INTRODUCTION

Diabetes mellitus is a chronic disease characterized by the body's inability to metabolize carbohydrates, fats, and proteins. It is estimated around 422 million people worldwide have diabetes and 1.5 million deaths are directly attributed to diabetes each year (WHO, 2023). Additionally, WHO also predicts that there will be an increase in cases of type 2 diabetes mellitus, reaching 21.3 million in 2030 (PERKENI, 2015). In Indonesia, the average prevalence of diabetes mellitus reached 2.0% at the age of >15 years, while particularly in West Kalimantan Province reached 1.62% for ages > 15 years (Kementerian Kesehatan Republik Indonesian, 2018). These figures are posing a significant global challenge.

Epidemiological studies have shown that genetic inheritance and epigenetic mechanisms, nutritional factors, and sedentary lifestyle influence the risk and complications differently in both sexes (American Diabetes Association, 2018; Ciarambino et al., 2022). A wide variety of lifestyle contributors are a sedentary lifestyle, physical inactivity, smoking, and alcohol consumption (Lee et al., 2018). In most cases, blood glucose levels increase with age, and lead to other complications. Therefore, self-management of glycemic control may be prioritized.

Recently, the majority of the treatment for diabetes is a pharmacological approach (Taylor et al., 2021). The wide range of this treatment prioritizes drug therapy. However, those medications may have dangerous long-term effects, including the risk of liver dysfunction and cardiovascular disease (McMillan et al., 2018; Tziomalos et al., 2011). Thus, other alternative methods with fewer side effects, such as consuming herbal plants are a better method.

Among several herbal preparations, Aloe vera is a plant with medicinal properties and has been scientifically studied in modern medicine (Kurniawaty, & Yanita, 2016). Its biological activities and chemical components, including flavonoids, saccharides, polyphenols, anthraquinones, chromone, phytosterols, proteins, and trace minerals contributed significantly to reducing blood glucose (Babu et al., 2021). Flavonoids have been linked to anti-diabetic potential. These also supported the claim of a previous systematic review study that consuming Aloe vera as a supplement significantly lowered blood glucose (46.6 mg/dL) and reduced HbA1c at 1.05% (Dick et al., 2016).

Aloe vera is widely planted in Kalimantan and constitutes one of Pontianak's leading commodities having the uniqueness and characteristics of West Kalimantan Province. Considering the abundance of this plant and its positive impact on glycemic control, this study aims to reduce blood glucose by consuming a healthy beverage made of Aloe vera. Numerous studies have investigated the potential effect of Aloe vera on blood glucose reduction in various forms, however, few studies have been published for the treatment of prediabetics by producing standardized Aloe vera juice collaborated with the Aloe Vera Center. Therefore, this study focused on the effect of Aloe vera juice consumed for a 15-day program on reducing fasting blood glucose.

2. RESEARCH METHOD

This pretest-posttest study design was conducted at Alianyang Public Health Center, Pontianak, West Kalimantan. Patients who visited between March and July 2021 were enrolled in this study. A total of 57 patients were screened through fasting blood glucose (FBG) measurement. Those aged ≥25 years old living in Pontianak City and identified with prediabetes (FBG between 100-125 mg/dL) (CDC, 2023) from the screening examination were included. Informed consent was provided by the included subjects. Exclusion criteria were subjects with chronic diseases, such as heart disease, stroke, or kidney disease, and pregnant women who consume blood glucose-lowering drugs. The study was approved by the Health Research Ethics Commission of Diponegoro University (Approval No. 226/EA/KEPK-FKM/2020). The investigators had no influence on possible changes in glucose-lowering medication.

A 15-day program of 1 bottle of Aloe vera juice was developed with the aim of helping subjects reduce their blood glucose by consuming developed juice. Aloe vera was taken from the Agricultural Center located in Siantan, Pontianak City. The standardized manufacturing process was produced in Aloe Vera Center by using the following ingredients: 100 grams of aloe vera gel, 100 ml of water, 2 ml of Kafir lime, and 2 drops of zero-calorie stevia as a natural sweetener for people with prediabetes, 35 kilograms of washed and cleaned fronds of Aloe vera, stripped by filleting to separate the Aloe vera flesh from the outer skin, and washed four times and boiled in a pot with some water for 5–10 minutes at the temperature of 60–70 °C so as not to remove the nutrients. Then it was removed and put into ice water with a temperature of 0–5 °C. Next, it was drained and blended or crushed with a blender. After weighing, the crushed aloe vera gel was boiled again for 5 minutes and mixed with water, stevia, and Kasturi lime to make the aroma fresh. Overall, the composition of the juice consisted of 100 grams of Aloe vera, 2 ml of Kasturi orange, 2 drops of stevia, and 75 ml of water.

In this intervention, subjects with prediabetes are empowered to consume a bottle of 175 ml of Aloe vera juice every day for 15 days consecutively. After 15 days, subjects were invited for a follow-up meeting and measured the fasting blood glucose level using a glucometer with the Accu Check brand, a blood pressure measurement instrument with the Omron brand, an anthropometric measuring instrument to calculate the BMI, and a stadiometer to measure body height and weight. The subjects were asked to do an overnight fast (not eating) for around 8-10 hours before taking the blood.

The analyses presented in this study included patients identified with prediabetes, who completed the 15-day program and completed both baseline and follow-up FBG examinations that were measured by a healthcare professional such as a doctor or nurse practitioner at the location study. The intervention adherence was ensured by asking the subjects. A day prior to the start of the program and 1 week before the final meeting, subjects received a notification to complete the program.

SPSS was used for conducting the statistical analyses. First, descriptive analyses were performed to describe the sociodemographic characteristics of the participants. Data were described as mean ± SD, as they were normally distributed, or percentage. The paired sample t-tests were performed on changes in FBG parameters (follow-up minus baseline). Results were interpreted as statistically significant when $p<0.05$ (two-sided).

3. RESULTS AND DISCUSSION

A total of 12 subjects met the inclusion criteria and started the program and completed both before and after intervention. Of these 12 subjects, 66.7% were aged 26-45 years and female (75.0%). The majority had higher education or university (66.7%) and housewives (25%). Referring to the results of BMI calculations, 50% of the study participants experienced overweight.

Table 1. Demographic Characteristics of Subjects at Baseline

Characteristics	Category	Frequency (N= 12)	Percentage
Age	Adult (26-45)	8	66.7
	Elderly (46-70)	4	33.3
Sex	Male	3	25.0
	Female	9	75.0
Education	Basic education	1	8.3
	High School	3	25.0
	University	8	66.7
Occupation	Entrepreneur	5	41.7
	Retiree	2	16.7
	Housewives	3	25.0
	Civil worker	2	16.7
BMI	Normal 18,5-24,9 kg/m3	4	33.3
	Overweight 25-29,9 kg/m3	6	50.0
	Obesity ≥ 30 kg/m3	2	16.7

This study found a significant mean difference in FBG levels before and after the intervention by consuming Aloe vera juice for 15 days (p-value <0.05). The mean of FBG after intervention was lower than prior among prediabetic patients.

Table 2. The Mean Difference of Fasting Blood Glucose Levels

Intervention Group	Mean	Standard Deviation	Standard Error	p- value
Pre-test	107.42	7.76	2.24	<0.001
Post-test	93.75	9.44	2.73	

The present findings show that a 15-day Aloe vera juice consumption led to a reduction of blood glucose reflected by lower FBG. Additionally, statistical analysis strengthens this result through the significant reduction of blood glucose from 107.42 to 93.75 after the intervention (p<0.001). These results are consistent with the previous study, a reduction of blood glucose after consuming aloe vera juice for 14 days (Pertiwi, & Rahayuningsih et al., 2012), and an average of 22 mg/dL reduction (Istiana, 2019).

The most noticeable implication was the reduction of glucose may lower medication. In this study, the highest reduction of 21 mg/dL, was considered a similar effect compared to previous findings within the 15 days of the program. Numerous studies have demonstrated the effect of Aloe vera on decreasing blood glucose, however, limited sources explain exactly the period for the mechanism of Aloe vera to work effectively in the body. Other similar studies intervened in the subjects for 10 consecutive days (Sari, 2010), 14 days (Pertiwi, & Rahayuningsih et al., 2012), and 4 weeks (Alinejad-Mofrad et al., 2015). Nevertheless, those findings supported the effect of consuming Aloe vera in reducing blood glucose among prediabetes patients (Istiana, 2019; Kabosu, Adu, & Hinga, 2019).

Aloe vera is known as a member of the Liliceae family, a perennial plant with turgid green leaves joined at the stem (Minjares-Fuentes & Femenia, 2019). Aloe vera components, such as minerals and polyphenols are reported to have insulinotropic effects, contributing a direct and indirect major role in insulin secretion (Deora & Venkatraman, 2022; Hamman, 2008). A reduction of fasting and postprandial blood glucose levels after nutrition intervention using Aloe vera was higher as compared to the earlier treatment in which only supplementation was done (Choudhary et al., 2014; Rahoui et al., 2018). The reduction of blood glucose is

affected by chromium, fiber, inositol, and vitamins which function as anti-hypoglycemics and lower blood sugar levels (Kusnanto, Sriyono, & Astuti, 2008). Therefore, Aloe vera has the potential to decrease blood glucose through pancreatic cell protection and improve insulin sensitivity.

An earlier meta-analysis study claimed that Aloe vera significantly lowered fasting blood glucose in the intervention group compared to controls (Budiastutik et al., 2022). Some studies use Aloe vera in capsules, gels, and juice (Soni et al., 2014; Surya et al., 2020). Intervened subjects by giving 300 mg capsules and 100 mg Aloe vera gels have supported positive results (Alinejad-Mofrad et al., 2015; Malinti & Jael, 2019). In India, a 500 mg dose of aloe vera given to rats had a more effective effect compared to 300 mg (Chaudhary et al., 2019). Dose at 100 and 200 grams statistically reduces fasting blood glucose levels among prediabetic patients (Bansal, 2015; Zhang et al., 2016).

However, it is also well-known that the factors for reducing blood sugar are complex and can be caused by other factors, including demographic characteristics and lifestyle (Alhassan et al., 2022). In this current study which involved prediabetic patients, the majority of subjects were adults aged 16-45 years and 75% were women. These proportions supported the current data, as it has been observed that women have more years of disease on average than their male counterparts (Ciarambino et al., 2022; Kirkman et al., 2012). Females tend to be more at risk of developing diabetes mellitus with a large body mass index related to the menstrual cycle and during menopause, resulting in easy accumulation of fat that causes delays in the transport of glucose into cells (Trisnawati, & Setyorogo, 2013). Post-menopause, body fat very easily accumulates as a result of hormonal processes, increasing the risk of prediabetes and diabetes mellitus in women, while married women are at risk for prediabetes 2.7 times (Liberty, 2016). It seems to be related to the fact that sex hormones have a great impact on energy metabolism, body composition, vascular function, and inflammatory responses (Ciarambino et al., 2022).

In addition, age is one of the non-modifiable risk factors for prediabetes and diabetes mellitus, hence, the prevalence of prediabetes will increase due to age (PERKENI, 2019). Increasing age will indirectly reduce the function of several organs that will affect the body's systems, including the function of the pancreas in producing the insulin hormone. Consequently, these are impactful in increasing the risk of prediabetes and diabetes mellitus (Khalid, Samia, & Muneera, 2018). Furthermore, age 20–44 years is associated with prediabetes with a value of $p<0.001$ (Astuti, 2019). Being older means there will be a decrease in body functions, including pancreatic function and pancreatic beta cells, which are unable to produce insulin to control blood sugar levels (CDC, 2020).

Body Mass Index (BMI) cannot be ignored as the contributor factor of higher blood glucose. This study estimated that 50.0% of respondents with prediabetes are categorized as overweight. Biologically, if obesity occurs, it will be a risk factor because the pancreas will work harder to optimize high blood sugar levels due to excessive food by increasing insulin production until the beta cells of the pancreas are unable to produce enough insulin to balance the excessive input of calories, resulting in impaired glucose tolerance, which will eventually cause diabetes mellitus (Lee et al., 2018).

While most previous studies use more or equal to 200 ml juice of Aloe vera to reduce blood glucose (Istiana, 2019), nonetheless, the present study proves a significant reduction reaching 21 mg/dL by consuming 175 ml for 15 consecutive days. Over a 15-day trial, the impact of Aloe vera juice on prediabetics showed a significant decrease in blood glucose. However, it is well-acknowledged that this study's lack of subjects' adherence concerns. The investigators did not consider the scenario of controlling or supervising subjects to regularly consume the juice provided. In addition, not specifying the time at which subjects should drink the juice could influence the possibility of biasing the study results. Other potential factors,

such as physical activity and diet may be confounded these findings. Furthermore, a small sample size may not be representative of the population of interest.

4. CONCLUSION

This evidence strongly suggests that consuming 175 ml of Aloe vera juice for 15 days may be effective in reducing fasting blood glucose (FBG) among 12 adult prediabetics. However, this study is associated with some limitations, such as subjects' adherence monitoring, other potential confounders, and a small sample size. The lack of adherence monitoring is perhaps the most crucial to ensure the effect of the intervention. Therefore, future studies should focus on the subjects' adherence and consider the other confounders to minimize the bias.

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Analysis of Nurse Care Behavior and Patient Satisfaction in X Hospital

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Abstract

The service that most affects patient satisfaction is nursing services. Whether or not patients are satisfied with health services is an indicator and one of the determining factors for the good and bad quality of professional nursing care. For this reason, this study aims to analyze nurses' caring behavior and patient satisfaction at the X Hospital. This type of research is quantitative with a cross sectional approach. The sample selection technique used purposive sampling and calculations were carried out using the slovin formula so that a sample of 119 patient respondents was found, both BPJS patients and general patients. Data collection was carried out in October-December 2022. The analysis used in this study included the chi square test, as well as multivariate analysis using MANOVA. The processing of this research data uses the help of SPSS software. The results showed that the patient age was a variable that was not related to the Principles of Nursing Care Caring Behavior, Leadership and Management of Caring Behavior, and Inpatient Satisfaction of X Hospital. While the variables related to the Principles of Nursing Care Caring Behavior, Leadership and Management of Nursing Care Caring Behavior, and Inpatient Satisfaction of X Hospital are variables of patient gender, patient education level, patient payment type is expected that there will be an increase in Caring leadership attitude between nurses to improve a good work environment between nurses. For hospitals, management improvement is needed to evaluate the provision of health services to BPJS patients and general patients.

Keywords: Hospital, Nurse, Behavioral Caring, Patient Satisfaction

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1. INTRODUCTION

The importance of the hospital lies in the role of the hospital as a place of quality medical services according to the hospital class and as a place of education, and the development of science and technology in the field of medicine which is an important means in efforts to improve the quality of media services (Kementrian Kesehatan Republik Indonesia, 2022). If the role of the hospital is really implemented, criticism and criticism from various levels of society against the health service system that is less quality and unprofessional, or lack of empathy in conducting health service programs, especially in hospitals, is expected to be minimized. For this reason, understanding the needs and desires of consumers in this case patients is an important thing that affects patient satisfaction. To create patient satisfaction, a company or hospital must create and manage a system to obtain more patients and the ability to retain patients (Rahmayanti, 2019). Service in a hospital is one of the important factors, especially for hospital management because the impact of service determines the life and death of a hospital. For hospitals, the existence of good service certainly makes hospitals able to compete and remain in the minds of the community. For patients, this can be used as a factor to choose a good hospital. Satisfied patients are a valuable asset because if patients are satisfied they will continue to use the service of choice, but if they are dissatisfied they will tell others about their bad experience (Ula & Hayat., 2021).

Nursalam (2012) said the form of service that most affects patient satisfaction is nursing services. Nurses are the spearhead of health services. Whether or not patients are satisfied with health services is an indicator and one of the determining factors for the good and bad quality of nursing services. This is because nurses are health workers who have more time to interact with patients. Patient needs for increasingly complex health services will demand professional health services in overcoming health problems. One of the health services in Indonesia is nursing services. The success of hospital services is highly dependent on the performance of hospital nurses in carrying out nursing services in hospitals (Mellawani, 2017). They are patient-focused and goal-oriented, and each stage is interdependent and interconnected.

Nursing services are reflected in the implementation of professional nursing care. Professional and qualified nurses must have hard skills and soft skills, because a person's success in the world of work is influenced by soft skills (80%) and hard skills (20%) (Aisyah et al., 2022). *Soft skills* include the ability to communicate, build relationships with others, the ability to understand others, responsibility, cooperation, empathy and *caring*. The quality of nursing services is reflected in the implementation of professional nursing care. Professional is a combination of intellectual, technical and interpersonal knowledge and skills which in its implementation reflect *caring* behavior (Ariani, & Aini, 2018).

X Hospital is one of the class IV State Hospitals managed by the Tentara Nasional Indonesia Angkatan Darat (TNI AD). This hospital is a patient shelter for the Tentara Nasional Indonesia Angkatan Darat (TNI AD) and also accepts general patients and referral patients who come from puskesmas and have joined the Social Security Organizing Agency (BPJS). The expected pattern of health services is quality service to reduce morbidity and death rates and create a healthy and prosperous society (Manengal et al., 2022).

Jean Watson first put forward the theory of caring. Caring is an action used by nurses to provide health services to their patients. Caring is an attitude of caring, respect and respect for others. Watson in the Theory of Human Care, revealed that caring is needed between the giver and recipient of nursing care to improve and protect the patient, which in turn will affect the patient's ability to heal. Ten carative factors can reflect the caring behavior of a nurse. Caring behavior raised by nurses correctly will later affect patient satisfaction (Belladona et al., 2020). This will show that there is a direction in line from caring behavior to patient satisfaction, so this study aims to analyze caring behavior on patient satisfaction based on the characteristics of respondents (patients).

2. RESEARCH METHOD

This type of research is quantitative with a correlation study design and a *cross sectional* approach. The population of this study was all inpatients at the X Hospital amounting to 459 patients. The calculation of the sample size in this study used the slovin formula with a confidence level of 5% so that 119 patient respondents obtained the number of samples, both BPJS patients and general patients. Inclusion criteria in this study include: 1) Patients who have been treated for at least 3 days, 2) Patients who are able to communicate, 3) Patients who are willing to be respondents. Moderate Exclusion criteria in this study were inpatients in the VIP room. Data collection was carried out in October-December 2022 at the X Hospital. The dependent variables in this study were the principles of nursing care in caring behavior, leadership and management in nurse caring behavior, and inpatient satisfaction at X Hospital. The independent variables in the study were age, sex, education level, Patient Payment Type (BPJS patients and general patients). Data collection was carried out by distributing questionnaires that had been tested for validity and reliability. Validity and reliability tests were carried out on patients at Hospital X with a total of 30 samples. The validity test assessment uses the Pearson product moment formula, then the interpretation is seen from the calculated r value compared to the r table. Meanwhile, the reliability test uses the Cronbach Alpha (α) test, where the Cronbach's Alpha value is accepted if the α calculation is >0.60. The test results show that 25 statements in the Caring behavior variable and 19 statements in the patient satisfaction variable are valid and reliable. The stages of data analysis include *editing, coding, processing, cleaning,* and *tabulating*. The analysis used in this research includes univariate analysis to determine the characteristics of respondents, bivariate analysis using the chi square test to test the relationship between variables (If the Sig value. or significance < 0.05 then the relationship between variables is related (significant)), and multivariate analysis using the MANOVA test to determine the variables that have the most influence on the dependent variable (If the Sig value. or significance < 0.05, then the relationship between variables is related (significant) and the lower the relationship test value, the independent variable has the most influence on the dependent variable). The processing of this research data uses the help of SPSS software. The analyzed data is presented in the form of narrated tables. This research has received ethical approval from the KEPK Faculty of Public Health, Diponegoro University with No: 385/EA/KEPK-FKM/2022

3. RESULTS AND DISCUSSION

Table 1. General description of respondent characteristics

Characteristics of Respondents	Number of Respondents	
	f	%
Age		
≤36	35	42,7
>36	47	57,3
Gender		
Man	39	47,6
Woman	43	52,4
Education Level		
Low	37	45,1
High	45	54,9
Work		
Wiraswasta	19	23,2

Characteristics of Respondents	Number of Respondents	
	f	%
Civil Servants (PNS)	8	9,8
Farmer	11	13,4
Ibu Household	20	24,4
Teacher	6	7,3
Student	10	12,2
Private Employees	8	9,8
Types of Patient Payments		
General	19	23,2
BPJS	63	76,8
Treatment Room		
Anggrek	12	14,6
Aster	11	13,4
Cempaka	8	9,8
Dahlia	11	13,4
Flamboyan	12	14,6
Mawar	9	11,0
Melati	13	15,9
Teratai	6	7,3
Caring Behavior of Nurses		
Bad	55	67,1
Good	27	32,9
Patient Satisfaction		
Bad	54	65,9
Good	28	34,1

Table 1 shows that the majority of respondents have an age range of >36 years, this is shown by a percentage value of 57.3%. Male respondents have a percentage value of 47.6% with a total of 39 respondents, the majority of respondents have a high level of education with a percentage value of 54.9%, the majority of respondents work as entrepreneurs with a percentage value of 23.2%, the majority of respondents are BPJS patients with a percentage value of 76.8%, the majority of respondents are in Melati treatment room with a percentage value of 15.9%, the majority of respondents have poor Nursing Care Principles in caring behavior, this is shown by a percentage value of 67.1%. The majority of respondents have poor patient satisfaction, this is shown by a percentage value of 65.9%. Patient satisfaction with health services varies and is influenced by culture, socio-economic status, and patient characteristics. Patients or customers have different characteristics. These differences in characteristics will result in different perceptions regarding the assessment of health services, thus ultimately providing different levels of satisfaction (Lestari et al., 2019), (Aulia et al., 2022).

Table 2. Frequency Distribution of Respondents based on Independent Variables and Bivariate Analysis Results

Independent Variable	Dependent Variable Principles of Nursing Care in Caring Behavior		Bivariate Analysis p-Value	Independent Variable	Dependent Variable Patient Satisfaction		Bivariate Analysis p-Value
	Bad	Good			Bad	Good	
Age			0,481	**Age**			0,074
≤36	32 (50,8)	31 (49,2)		≤36	28 (44,4)	35 (55,6)	

Independent Variable	Dependent Variable Principles of Nursing Care in Caring Behavior		Bivariate Analysis p-Value	Independent Variable	Dependent Variable Patient Satisfaction		Bivariate Analysis p-Value
	Bad	Good			Bad	Good	
>36	33 (58,9)	23 (41,1)		>36	35 (62,5)	21 (37,5)	
Gender				**Gender**			
Male	31 (55,4)	25 (44,6)	0,045	Male	36 (30,3)	20 (16,8)	0,031
Female	34 (54,0)	29 (46,0)		Female	27 (22,7)	36 (30,3)	
Education				**Education**			
Low	26 (65,0)	14 (35,0)	0,015	Low	29 (24,4)	11 (9,2)	0,004
High	39 (49,4)	40 (50,6)		High	34 (28,6)	45 (37,8)	
Patient Payment Type				**Patient Payment Type**			0,008
General	13 (36,1)	23 (63,9)	0,013	General	6 (5,0)	17 (14,3)	
BPJS	52 (62,7)	31 (37,3)		BPJS	57 (47,9)	39 (32,8)	

Independent Variable	Dependent Variable Leadership and Management in Caring Behavior		Bivariate Analysis p-Value	Independent Variable	Dependent Variable Patient Satisfaction		Bivariate Analysis p-Value
	Bad	Good			Bad	Good	
Age				**Age**			
≤36	31 (49,2)	32 (50,8)	0,134	≤36	28 (44,4)	35 (55,6)	0,074
>36	33 (58,9)	23 (41,1)		>36	35 (62,5)	21 (37,5)	
Gender				**Gender**			
Male	33 (58,9)	23 (41,1)	0,038	Male	36 (30,3)	20 (16,8)	0,031
Female	31 (49,2)	32 (50,8)		Female	27 (22,7)	36 (30,3)	
Education				**Education**			
Low	24 (69,0)	16 (40,0)	0,043	Low	29 (24,4)	11 (9,2)	0,004
High	40 (50,6)	39 (49,4)		High	34 (28,6)	45 (37,8)	
Patient Payment Type				**Patient Payment Type**			0,008
General	13 (56,5)	10 (43,5)	0,011	General	6 (5,0)	17 (14,3)	
BPJS	51 (53,1)	45 (46,9)		BPJS	57 (47,9)	39 (32,8)	

Table 2 shows that the patient's age variablesignificance with the principle of nursing care caring behavior (0.481 > 0.050), with leadership and management of caring behavior (0.134 > 0.05), with patient satisfaction (0.074 > 0.050). This shows that the significance value between the Age Variable and Patient Satisfaction is greater than 0.05 so that it can be concluded that "There is no significant relationship between Age and Nursing Care Principles, Caring Behavior, Leadership and Management of Caring Behavior,and Patient Satisfaction at X Hospital". The results of the study support Mapiare's content, that increasing age is followed by physical, psychological, and intellectual development. Maturity in these factors makes a person have a better ability to judge things (Setiawan, 2007). The older a person gets, the ability of a person to analyze something, including in this case assessing the satisfaction or absence of services provided by the hospital will also increase (Nursalam, 2016). The results of Alrubaiee's research showed that age affects patient satisfaction (Alrubaiee & Alkaa'ida, 2011). Patient age was found to be the most frequent predictor of satisfaction of all socio-demographic factors considered (Muzer, 2020). Older patients tend to have higher satisfaction ratings than younger patients. The study conducted by Naidu also proves, that age shows a positive relationship with patient satisfaction (Naidu, 2009).

Based on table 2, it can be seen that the significance value of sex with the principle of nursing care caring behavior (0.045 < 0.050), with leadership and management of caring

behavior (0.038 > 0.05), with patient satisfaction (0.031 < 0.050). This shows that the significance value between the Sex Variable and Patient Satisfaction is smaller than 0.05 so that it can be concluded that " There is a significant relationship between patient gender and the principles of nursing care, caring behavior, leadership and management of caring behavior and patient satisfaction at Pematangsiantar Regional Hospital". This is related to the results of research previously conducted at the Sukanto Central Police Hospital and Sialolo Research whose results are in line with the results of this study (Setiawan et al., 2021). The results of Kotler and Keller's theory state that consumer satisfaction with a product of goods and services is strongly influenced by the characteristics of the consumers themselves. One of the characteristics in question is gender that the male gender tends to feel quickly satisfied with a product or service compared to women (Kotler & Keller, 2012). The difference between men and women lies in the nature of secundarity, emotionality, activity of psychological functions and the nature of women being more emotional than men. Women are more dissatisfied because they use their emotional feelings to assess their level of satisfaction. It can be concluded that viewing patients as human beings who are disturbed by their health so that they need the help of nurses is appropriate. Providing nursing services paying attention to the gender of the patient in order to achieve satisfaction (Setiawan et al., 2021).

Based on table 2, it can be seen that the significance value of the level of education with the principle of nursing care caring behavior (0.015 < 0.050), with leadership and management of caring behavior (0.043 > 0.05), with patient satisfaction (0.004 < 0.050). This shows that the significance value between the Education Level Variable and Patient Satisfaction is smaller than 0.05 so that it can be concluded that "There is a significant relationship between Patient Education Level and Nursing Care Principles Behavioral Caring, Leadership and Management, and Patient Satisfaction at X Hospital". The results of this study are also in line with Sihaloho and Herliana's research saying there is a relationship between the level of education and patient satisfaction (Sihaloho & Herliana, 2017). The level of education is one of the factors that influence patients' expectations and perceptions of health services. A person who is knowledgeable and less educated, requires more special attention to medical services. A person with low education thinks things that are beyond his reasoning power, while people with higher education tend to meet their needs according to the power of reason they have because of the influence of the level or type of education so that people with higher education are more quickly satisfied than those with low education. Someone who has high knowledge and education has various desires for goods and services, so they try to fulfill according to the knowledge they have in achieving satisfaction (Sihaloho & Herliana, 2017).

Librianty (2018) found that there is a meaningful relationship between nurses' competence in providing nursing services with BPJS patient satisfaction in the inpatient room of Bangkinang Hospital. Based on the researcher's assumption that the competence of nurses in providing nursing services will underlie a person in getting a sense of satisfaction with hospital services, especially nursing. Nurse competence related to the ability to take action with the ability to provide nursing services to patients who need care is a very important domain. In this study, nurse competence is very important, because with the competence of nurses in providing nursing services to patients, it will certainly provide a sense of satisfaction for patients (Librianty, 2018). The competence possessed by nurses can also be described in the *Assurance* given by nurses to patients. Assurance is a competency possessed by service personnel that makes a sense of security and free of risk or danger, certainty that includes broad knowledge, attitudes and polite behavior towards patients so as to foster patient trust and confidence (Triwardani, 2017). The results showed 33.6% of respondents said they were rarely given guarantees regarding clinical procedures by nurses. Please note that a good guarantee will increase patient satisfaction with hospital services, thus making patients tend to trust the services carried out by the hospital (Mahmud, 2022).

Based on table 2, it can be seen that the significance value of the type of patient with the principle of caring behavior nursing care (0.013 < 0.050), with leadership and management of caring behavior (0.011 > 0.05), with patient satisfaction (0.008 < 0.050) . This shows that the significance value between the Education Level Variable and Patient Satisfaction is smaller than 0.05 so that it can be concluded that "There is a significant relationship between Patient Payment Type and Nursing Care Principles Caring Behavior, Leadership and Management of C Caring Behavior,and Patient Satisfaction in X Hospital". The results of this study are in line with Hakim & Suryawati (2019) who said that there is a meaningful relationship between BPJS membership status and satisfaction. There are several reasons that cause differences in patient satisfaction between general Patient Payment Types and BPJS (Hakim & Suryawati, 2019). Romaji and Nasihah's (2018) research which states that the reason for BPJS patient satisfaction is different is patients who feel that BPJS patients sometimes seem long in certain services, for example the surgery schedule for BPJS patients is often postponed so that it gives the impression that BPJS patients are often made long, in contrast to Non-BPJS patients who are always on time (Romaji & Nasihah, 2018). This result is in contrast to Hadiati's research, which shows that the insurer is dissatisfied than the insured and this is because the insurer has an obligation to pay and tends to demand better service (Hakim & Suryawati, 2019).

Based on the results of the distribution of respondents' answers, it can be seen that 26.1% of respondents said they were rarely told by nurses that care services were continued by other nurses on duty. Handover activities in caring services show the existence of *caring leadership* activities between nurses (Wati, Ardani, & Dwiantoro, 2018). Results from research conducted by Solbakken *et al*., (2018) show that caring in nursing leadership means nurturing and cultivating relationships to maintain the best care (Solbakken et al., 2018). Good cooperation will certainly produce optimal performance regardless of the type of work it does. Cooperation can arise if there is good management from the leader. The leader's concern for nurses who carry out their duties is the basis for creating a conducive work atmosphere. The responsibility of nurses will also be done well if the leader is able to apply *caring leadership* to nurses. The optimal implementation of responsibilities must primarily be shown at the time of handover, because the records and events that occur in the space must be explained so that they are well understood by the officer who will be on duty next (Anggoro et al., 2019), (Mirayani et al., 2021). *Caring leadership* affects the burnout of implementing nurses as much as 66.17% (Indrayanti et al., 2022). *Caring leadership* in nurse management produces maximum nurse performance and nurses will be more calm, focused on work (Dewi, 2022).

Table 3. Results of Simultaneous (Multivariate) MANOVA Comparison Test Analysis of Research Variables at X Hospital

Independent Variable	**Dependent Variable**	***Sum of Square***	***Mean Square***	**F**	**Sig.**
Gender	Principles of Nursing Care	16,238	16,238	1,275	0,026
	Leadership and Management	403,347	403,347	3,158	0,007
	Patient Satisfaction	1087,150	1087,150	8,351	0,005
Education	Principles of Nursing Care	56,320	56,320	4,546	0,035
	Leadership and Management	623,572	623,572	4,955	0,028
	Patient Satisfaction	789,655	789,655	5,949	0,016
Patient Payment Type	Principles of Nursing Care	82,069	82,069	6,744	0,011
	Leadership and Management	197,874	197,874	1,528	0,021
	Patient Satisfaction	1435,811	1435,811	11,287	0,001

Table 3 shows that the significance value of Gender to the Principle of Nursing Care = 0.026 (<0.050), the significance value of Gender to Leadership and Management of Caring Behavior = 0.007 (<0.050), the significance value of Gender to Patient Satisfaction = 0.005

(<0.050); significance value of Education Level to Nursing Care Principles = 0.035 (<0.050), significance value of Education Level to Leadership and Management of Caring Behavior = 0.028 (<0.050), significance value of Education Level to Patient Satisfaction = 0.016 (<0.050); significance value of Patient Payment Type to Nursing Care Principles = 0.035 (<0.050), significance value of Patient Payment Type to Leadership and Management of Caring Behavior = 0.028 (<0.050), significance value of Patient Patient Payment Types Satisfaction = 0.016 (<0.050). Based on table 3, it can be seen that there are three independent variables that simultaneously affect the three dependent variables in the X Hospital, namely the variables Gender, Patient Payment Types, Caring Behavior.

There are various studies that show factors that influence the caring behavior of nurses. Characteristics of age, gender, length of service, education, training, work stress, nurse reward have no effect on nurses' caring behavior. In addition, employment status and motivation influence nurses' caring behavior. Nurse employment status is a determinant factor that influences nurses' caring behavior (Aty et al., 2020). A person's psychology at work will affect the physical aspect of the person. A nurse who works with pressure from superiors will tire more easily and have an impact on the performance she produces. Therefore, the psychological atmosphere that supports nurses' performance must be conditioned by leaders through *caring leadership*. Through leaders who show concern for nurses, it will create a psychological atmosphere that supports nurses at work, so that the nurse's physical and stamina will be maintained, which will further have an impact on optimal performance consistently. How to organize work through *caring* leadership by paying attention to important factors that contribute to the nurse's personality, namely needs, organization, and leadership will produce the best care for patients (Solbakken et al., 2018). Research by Octavia *et al*., (2022) suggests research on nurse burnout by using various variables such as mental workload on nurses, hospital physical environment, distance of residence, and marital or family status to support the performance of hospital nurses (Octavia et al., 2022).

4. CONCLUSION

The patient age variable is variables that are not related to the Principles of Nursing Care Caring Behavior, Leadership and Management, and Inpatient Satisfaction of X Hospital. While the variables related to the Principles of Nursing Care Caring Behavior, Leadership and Management, and Inpatient Satisfaction of X Hospital are variables of patient gender, patient education level, patient payment type. It is expected for the nurses of the X Hospital to be more responsive to communicate and offer assistance to patients, as well as the need for an increase in caring leadership attitudes between nurses to improve a good work environment between nurses. In this study, there were limitations in the characteristics of the respondents who did not provide information on the type of disease for each research respondent. Suggestions for future researchers are to conduct research using more complete instruments of caring behavior and patient satisfaction, besides that the characteristics of respondents can also be more varied. For X Hospital, there is a need for management improvements in evaluating the provision of health services to BPJS patients and general patients as well as the need for regular improvement and evaluation of patient satisfaction using instruments that can be sharpened on caring behavior.

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RESEARCH Open Access

The Factors Associated with Outpatient Re-Visits at RSJ Dr. Radjiman Wediodiningrat Lawang

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Abstract

The number of people with disorders is gradually increasing from one year to the next. In Indonesia, the estimated number of people with mental illness is around 450,000 with a severe mental illness where 31.5% of people with mental illness are shackled by their families and 15% do not seek any medical treatment. Patients with mental disorders are in a state of mindset and emotions that are unstable, so the role of the family is needed to help people with self-care activities. According to Andersen, there are three factors that impact health service utilization. Factors that influence include predisposing factors, enabling factors, and need factors. The purpose of this study was to determine the factors that are associated with re-visiting outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. The research method is quantitative research with a cross-sectional study approach. The research sample was the family who accompanied the patient to make an outpatient re-visit with a total of 400 respondents. The sampling technique used was accidental sampling. The data analysis used in this study was the Chi-Square test. The results indicated that there was a significant relationship between knowledge (p-value: 0.006), attitude (p-value: 0.000), income (p-value: 0.032), family support (p-value: 0.00), and information support (p-value: 0.003) with the re-visit of outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Predisposing factors and enabling factors are both associated with re-visiting outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Future researchers are hoped to study other aspects such as hospital health service system components and need factors that may be associated to recurrent visits of mental illness patients by utilizing a more comprehensive questionnaire to acquire better information.

Keywords: Mental Disorders, Psychiatric Hospital, Patient Re-Visits.

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1. INTRODUCTION

The number of persons suffering from mental disorders rises year after year. According to the World Health Organization (WHO), there were around 970 million human beings struggling with mental disorders in 2019. Based on the World Health Organization, 31% of people with mental disorders (ODGJ) suffer anxiety, 28.9% have depression, and 11.1% have OCD (Obsessive compulsive disorder). Globally, cardiovascular disease contributes to 31.8% of the disease burden (DALYs) and is one of the biggest causes of death. However, when it comes to years lost due to illness or disability, mental problems account for 14.4% (World Health Organization, 2022)(Kementerian Kesehatan Republik Indonesia, 2019). In Indonesia, the prevalence of mental diseases has risen. Cardiovascular disease is the leading cause of sickness and mortality in Indonesia, accounting for 36.4% of the total. When it comes to the causes of disability, mental diseases account for 13.4% of all deaths in Indonesia (Kementerian Kesehatan Republik Indonesia, 2019). The prevalence of families with people with mental disorders is 7 per million households in Indonesia. This implies that there are 7 people with mental disorders households for every 1000 families, for a total of approximately 450 thousand severely people with mental disorders. 31.5% of people with mental disorders were chained by their family, and 15% were not treated. 48.9% of patients with mental problems receive routine treatment, whereas the remaining 51.1% are not treated (Rudianto, 2019).

Recovery or healing from mental disorders is dependent on those around them, particularly close family or people who care about them. The involvement of the family has a significant impact on the recovery of people suffering from mental disorders. This is due to the fact that people with mental disorders have unpredictable cognitive patterns and emotions. The patient's thinking has changed from previously suffering from mental problems; therefore he is less able to make life decisions and even carry out self-care activities (Arman, M., & Hök, J. (2016)). A preliminary survey of five families that sent patients for follow-up appointments indicated that two people did not use health insurance while undergoing treatment. Aside from that, one person stated that the family who took the patient back to the RSJ did not follow the doctor's recommendations because the distance was long and there was no money for regular treatment; they only took the patient back if they felt they were experiencing a serious problem. Three people indicated that they received family support, where other families accompanied them on the patient's return visit and showed support to the patient so that the patient was motivated to recover.

The family is the nearest person to the patient who has an important role in the patient's recovery. Information support is the most important thing for families in helping patients recover. Information support is the provision of disease knowledge, problem solutions, therapeutic advice, actions for patients to fight stressors (causes of stress), or improve patient coping strategies (how to reduce tension and the right way to communicate). This type of information support includes communication networks and shared responsibilities which include providing solutions to problems, giving advice, direction, suggestions or feedback on what someone is doing. The family is also a provider of information for regular consultations to the hospital and therapies that are good for themselves and specific actions for patients to fight stressors (Copel, 2011).

Research conducted by Siagian et.al. states that the factors that influence the compliance of patients with mental disorders to carry out routine treatment include family attitudes, family support, distance to health services, and support from health workers. Samudro et.al., stated that the role of family has a strong relationship with recovery in outpatients with schizophrenia. Research by Yundari and Dewi states that there is a relationship between knowledge and attitudes with the role of family as caregivers of schizophrenia patients and there is no relationship between health facilities and the role of family as caregivers of schizophrenia

patients. In line with research conducted by Maromon states that there is a relationship between knowledge and compliance with treatment control. Research conducted by Netha found that as many as 58.3% were not compliant with control, of which 50% of respondents had good knowledge and 50% percent of respondents had poor knowledge (Damayantie & Rusmimpong, 2019; Siagian, Manalu, & Batubara, et al., 2020; Samudro, Mustaqim, & Fuadi, et al., 2020; Yundari & Dewi, 2018).

The study conducted by Anggraini states that one of the factors associated with treatment compliance in schizophrenia patients is family income. Income is very influential on the family, especially when the distance to the hospital has to travel long distances and costs a lot, causing the majority of patients to be lazy to go for treatment. According to Okatarisa many patients relapse because they are not controlled, this is due to the distance between homes and health facilities, especially mental hospitals, which are far away so that families have difficulty bringing patients for control. Families who have income above the minimum wage tend to be obedient in visiting health care facilities (Anggraini, 2019; Oktarisa, 2018).

Good family support will rapidly support healing. Feelings of shame, burden, and indifference are still the main factors for the recurrence of people with mental disorders. The number of mentally ill people increases from year to year due to lack of family support and family burden with sufferers. The impact of non-compliance to visit a mental hospital for the family is that the family will feel the loss of good relationships and communication with the patient (Nurjamil & Rokayah, 2017; Nurmalisyah et al., 2018).

In accordance with Andersen's theory, there are three parts related to the factors that influence health service utilization. The first factor is influenced by predisposing factors consisting of demographics, social structure, and beliefs. The second factor is the enabling factor which consists of family resources and community resources. Some important things that families need in adjusting to the presence of patients are information/psychoeducation, the right attitude, support groups, and family therapy. The third factor is the need for one's services which consists of two categories, namely perceived and evaluted (Andersen & Newman, 2005; Arif, 2006; Notoadmodjo, 2012). Based on the background of that the purpose of this study was to determine the factors that are associated with re-visiting outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital.

2. RESEARCH METHOD

This research is a quantitative research with cross sectional study method. The sample of this study is a family who is delivering mental patients to do outpatient re-visits at Dr. Radjiman Wedidodiningrat Lawang Mental Hospital. The number of samples in this study were 400 respondents using the accidental sampling method. Accidental sampling is a method of selecting respondents who happen to meet with researchers and are willing to be involved in research (Sharp, 2018).

This research uses primary data. The instruments used are instruments with closed statements. The instrument used was previously tested for validity and reliability first to 30 respondents. The validity test technique used is the Pearson bivariate correlation test (Pearson Moment Product), with the decision if rcount ≥ rtable on the total score, the statement / question item is said to be valid. Valid statement / question items will be tested for reliability by comparing Cronbach's alpha with a significance level of 0.6, if the Cronbach's Alpha result is more than the significance level (0.6) then it is said to be reliable. Data processing in this study consists of several steps including editing, coding, and data tabulation. The variables are classified according to the median value, because the normalcy test did not work. The analysis test used in this study used the Chi-Square test. This study has passed an ethical review and received Ethical Approval from the Ethics Committee for Health Research at Lawang Mental Hospital, Number: LB.02.02/ XXVII.5.7/9238/2022.

3. RESULTS AND DISCUSSION

From the research that has been carried out, a description of the characteristics of the respondents is obtained as follows.

Table 1. Characteristics of Respondent

Respondent Characteristics		n (percentage)
Age	Early adulthood	166 (41,5%)
	Late adulthood	234 (58,5%)
Gender	Male	214 (53,5%)
	Female	186 (46,5%)
Occupation	Not working	64 (16%)
	Working	336 (84%)
Education	Elementary Secondary	369 (92,3%)
	Higher	31 (7,7 %)

Table 1 shows that it can be seen that the characteristics of the respondents are described. The majority of respondents were late adulthood at 58.5%. Most of the respondents who delivered outpatient re-visit patients were male at 53.5%. The majority of respondents worked by 84%. The majority of respondents' education took secondary education by 92.3%.

Table 2. Distribution the answer of respondent

Variable		n (percentage)
Knowledge	Less	218 (54,5%)
	Good	182 (45,5%)
Attitude	Negative	210 (52,5%)
	Positive	190 (47,5%)
Income	Low	214 (53,5%)
	High	186 (46,5%)
Family Support	Not Supportive	214 (53,5%)
	Support	186 (46,5%)
Information Support	Less	201 (50,2%)
	Good	199 (49,8%)
Patient Re-visits	Not Routine	194 (48,5%)
	Routine	206 (51,5%)

Table 2 shows that it can be seen that the majority of respondents have less knowledge as many as 218 (54.5%), negative attitudes as many as 210 (52.5%), low income as many as 242 (53.5%), not getting family support as many as 214 (53.5%), get less information support as many as 201 (50.2%), and routine patient re-visits as many as 206 (51,5%). Furthermore, bivariate tests were conducted on the variables of knowledge, attitude, income, family support, and information support to obtain the following results.

Table 3. Relationship between knowledge, attitude, income, family support, and information support with patient re-visits

Variable		Patient Re-visits				p-value
		Not Routine		Routine		
		n	%	n	%	
Knowledge	Less	120	55	98	45	0,006
	Good	74	40,7	108	59,3	
Attitude	Negative	132	62,9	78	37,1	0,000
	Positive	62	32,6	128	67,4	

Income	Low	115	53,7	99	46,3	0,032
	High	79	42,5	107	57,5	
Family Support	Not Supportive	130	60,7	84	34,4	0,000
	Support	64	39,3	122	65,6	
Information Support	Less	113	56,2	88	43,8	0,003
	Good	81	40,7	118	59,3	

Table 3 shows that there is a relationship between knowledge, attitudes, income, family support, and information support for outpatient re-visits at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Factors that influence patient revisits according to Andersen are predisposing factors, enabling factors, and need factors. The predisposing factors included in this study include knowledge and attitudes. The enabling factors included in this study include income, family support, and information support.

The results of research that have been carried out show that there is a relationship between knowledge and repeat visits of outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Knowledge possessed by a person about health and health services can have an effect on their perceptions of the need for and use of health services (Andersen et al., 2007). Research conducted by Avelina and Angelina that there is a relationship between knowledge and family ability to care for people in mental disorders (Avelina & Angelina, 2020).

The respondents' low knowledge can occur due to the lack of information obtained or the low level of education of the respondents so that it is difficult to accept the information that has been conveyed (Ramadia et al., 2022). Lack of family knowledge will have an impact on family responses that tend to respond negatively to mental illness patients. Families who have better knowledge tend to be more able to maintain in dealing with family members who experience mental disorders compared to families who have less knowledge (Alifariki, 2019).

Insufficient knowledge and lack of access to information about illness complicate the caregiving process, and hinder family well-being. Families who have good knowledge and have poor knowledge will have differences in dealing with family members who have mental disorders (Alifariki, 2019). Families who have good knowledge have a positive effect in the form of accepting family members who experience mental disorders well (Pradivta et al., 2020).

The family's lack of knowledge about early detection and treatment results in people with mental disorders not receiving optimal care at home. Confinement and neglect become one of the family's choices because the family is still unable or even does not have the ability to handle people with mental disorders either materially or mentally. The family should be the source of strength or mode of healing or handling people with mental disorders as the closest person to people with mental disorders (Marsitadewi et al., 2019).

In the same way, attitudes also influence a person's utilization of health services at a mental hospital. Negative attitudes of caregivers cause relatives who have mental health disorders not to utilize mental hospital health services. The majority of them go to alternative medicine to get treatment assistance (Alluhaibi & Awadalla, 2022; Gabra et al., 2020; Devi, Ahmed, & Roy et al., 2020).

According to the results of the research conducted, it shows that there is a relationship between attitude and re-visiting outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Attitude contributes to the formation of family support. This is influenced by the understanding of the family in dealing with relatives who experience mental disorders. Families who have a positive attitude in accepting family members who experience mental disorders reflect the family's readiness to provide care for family members who experience mental disorders. This can accelerate the healing process and provide positive feelings for family members who experience mental disorders (Kusumawaty et al., 2021; Rahman & Permana, 2020).

The deterioration of people with mental disorders treatment is supported by the stigma against people with mental disorders. So that the family will refuse if a family member is known to have symptoms of mental illness. So that the prognosis of people with mental disorders will be worse because they are considered disturbing and endangering themselves and the surrounding environment (Marsitadewi et al., 2019). Attitudes held by families will have an impact on mental disorders and treatment will have an impact on treatment compliance to varying degrees (Deng et al., 2022).

The results of the research conducted show that there is a relationship between income and repeat visits of outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Income will affect a person's health status. The income factor of a person acts as a risk factor for the patient's low willingness to seek health services because their average income is still low from the population per capita income. In addition, income also affects the ability to finance in the health sector because it is still focused on its basic needs (Nurrohmah, 2021).

In accordance with Anggraini's research , there is a significant relationship between income and treatment compliance in schizophrenia patients. The vast majority of income earned is less than the minimum wage so that many patients are lazy to come for outpatient treatment because of the cost of treatment (Anggraini, 2019). Pratiwi's study states that there is a significant relationship between income and compliance in undergoing treatment. This can occur because people who experience mental disorders must be controlled continuously to prevent relapse (Pratiwi, & Harfiani, et al., 2020).

The results of a study conducted in Sudan stated that 60% of respondents experienced financial difficulties. In line with research conducted in Kenya, 55.6% of respondents missed scheduled visits due to medical expenses, and 5.6% of respondents stated that they missed more than 4 visits due to lack of medical expenses. Family finances affect the utilization of services to mental hospitals. Families who have low finances affect compliance with visits to outpatient clinics (Ali & Agyapong, 2015; Seid, Wordofa, & Tesfaye et al., 2021; Victor et al., 2022).

The family support is one of the factors of the family resources model which is included in the enabling factors. Family support can be defined as attitudes, actions and acceptance of sick families and this support can come from husbands, wives, children, or other families. Family support has a significant role, because the family can provide physical and mental encouragement. Family has several support functions, namely informational support, assessment support, instrumental support, and emotional support. Family support refers to social support that is seen by the family as something that can be accessed or held for the family (Ayuni, 2020).

The result of the research that has been done indicates that there is a relationship between family support and the re-visit of outpatients at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. In line with Suliyanti's research there is a relationship between family support and compliance with outpatient control visits. Family support is categorized as good support because the family is very concerned and responsible for pasirn. This is indicated by the family always taking the patient to the hospital to make outpatient control visits. Recurrence cannot be prevented only by medical treatment, but also psychosocial treatment support from the family (Suliyanti et al., 2021).

Ernia's study states that there is a significant relationship between family instrumental support and compliance with patient control of people with mental disorders, with. Family instrumental support includes preparing the patient's drinking medicine, preparing outpatient administrative needs, and accompanying control to the hospital . An unsupportive family makes it difficult for someone to make visits for fear of the perception of the family itself (Ernia et al., 2020).

Informational support is a form of support that provides advice, suggestions, and information that can be used to express or solve problems. Types of information support include advice, suggestions, suggestions, instructions, and providing information. Enough information can produce knowledge related to how to prevent or care for sick families, so that individuals can recognize existing problems (Fajarini, 2022).

The findings of this study indicate that there is a relationship between information support and outpatient revisits at Dr. Radjiman Wediodiningrat Lawang Mental Hospital. Information support that can be provided to family members is helping clients understand something such as explaining how to take the correct medication according to procedures and carry out daily activities. The objective of information support is to be able to understand and manage the information provided (Etriyuna, 2022). In line with Anggraini's research that there is a significant relationship between income and treatment compliance in schizophrenia patients, with a p-value of 0.034 (Anggraini, 2019).

The family is the closest person to the patient so that it plays an important role in seeking information about patient treatment compliance so that patients are more compliant in carrying out treatment to reduce the occurrence of relapse rates. Families who are well informed will increase patient treatment compliance, this is because the family is the main support system that has a big role in the patient's recovery process.

Providing information support is of utmost importance to the family in assisting the patient's recovery. Information about the disease, the role of medication in controlling symptoms, side effects of medication, types of treatment, and support strategies should be provided. This type of information can ease the family in dealing with the behavior of relatives who have mental disorders (Nabi & Rizvi, 2022). Families are also information providers for regular hospital consultations and therapies that are good for themselves and patient-specific measures to combat stressors (Copel, 2011).

Family support are the most essential factor in re-visits outpatient . Caregivers for patients with mental disorders require a lot of family support. Emotional support from the family is one of the supports required, and this emotional support can assist carers in the treatment and rehabilitation process. Caregivers' emotional support serves as an adequate protective element to promote caregivers' mental health and reduce caregivers' mental stress (Amini et al., 2023). When carers receive help, they feel supported, comfortable, and loved, which provides good strength for the caregiver in dealing with obstacles that arise (Wulandari et al., 2016).

Aside from that, patients who receive family support have a better chance of developing in a favorable direction, so the patient will have a positive attitude, both towards himself and his environment, because the family is the first known social environment (Adianta & Putra, 2017). Family involvement in patient care may lead to better patient outcomes, such as fewer recurrences, shorter hospital stays, and better commitment to therapy and care plans. Family participation can minimize family hardship and caregiver stress, as well as the emotions exhibited by family members and caregivers (Ong et al., 2021).

4. CONCLUSION

Outpatient re-visits at Dr. Radjiman Wediodiningrat Lawang Mental Hospital are affected by predisposing factors and enabling factors. Predisposing factors that influence include knowledge and attitudes. While enabling factors that influence include income, family support, and information support. The need for health education for families of people with mental disorders is intended to increase the family's knowledge and skills in caring for people with mental disorders. With health education, the family gets the right information so that they can optimally care for people with mental disorders. The problem of this research is the method in which the data was acquired, which can produce prejudice in the research outcomes. Family assistance for caregiver is not described by instrument limitations. Future researchers are hoped

to study other aspects such as hospital health service system components and need factors that may be associated to recurrent visits of mental illness patients by utilizing a more comprehensive questionnaire to acquire better information.

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RESEARCH **Open Access**

Factors Affecting the Meaning of Life in Breast Cancer Patients at Malang City, Indonesia

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Abstract

The meaning of life is considered to affect breast cancer patients positively. Finding meaning in life is key to improving well-being during and after experiencing a traumatic event such as cancer. Previous research was still rare to explore the factors affecting the meaning of life in breast cancer patients. The study aimed to analyze the factors influencing the meaning of life of breast cancer patients. This study was an analytical observational method with a cross-sectional design. The inclusion criteria of the respondents were breast cancer patients who had obtained at least one cycle of chemotherapy. We used purposive sampling, and the total sample in this study was 135 respondents. Questionnaires were used to collect the data. Data were analysed by multivariate test, namely a linear regression test with a significance level of $p \leq 0,05$. The result showed only two variables affect the meaning of life, communication of health workers and spirituality, respectively. The strongest variable was the communication of health workers. The equation from the analysis showed that 11 % explained the phenomenon. The spirituality and communication of health workers positively affected the meaning of life. Application of therapeutic communication as well as spiritual support are needed in nurses to patients while undergoing therapy. Therefore, nurses must pay attention to spirituality and good therapeutic communication when providing patient services.

Keywords: Spirituality, Communication, Breast Cancer, Meaning of Life.

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1. INTRODUCTION

Breast cancer is the most common cancer in women worldwide (Aflakseir, Soltani, & Mollazadeh, 2018). It has become 2nd most common type of cancer among women in the world, including in Turkey (Ozdemir & Tas Arslan, 2018) and the Unites State (Reiser, et al., 2019). In Indonesia, breast cancer is a cancer that is most often treated in hospitals (Komite Nasional Penanggulangan Kanker (KPKN), Kementerian Kesehatan Republik Indonesia, 2015). Global Cancer Observatory (2018), data from the World Health Organization showed that the most common cancer cases in Indonesia are breast cancer, which is 58,256 cases or 16.7% of the total 348,809 cancer cases (World Health Organization, 2018). Experiencing breast cancer is a traumatic experience that interferes with women's lives in many aspects, including the context of their role as women and changes in their bodies (Martino & Freda, 2016). The trauma they experience interferes with their representation of the past and plans for the future. Breast cancer requires process of psychosocial adjustment to long cancer therapy and the. In the face of such a serious illness, things may lose their former meaning, and sense of stability (Loeffler, Poehlmann, & Hornemann, 2018).

Chronic diseases such as cancer can trigger a person to find out the meaning life (Xia, et al., 2018). The reason someone with cancer is looking for the meaning of life is because cancer is a serious disease with a high mortality rate and causes uncertainty in the patient's life. The meaning life is considered to have many positive effects for breast cancer patients. By finding the meaning of life, sufferers will be more enthusiastic about undergoing treatment and able to solve emotional problems and the uncertainty they feel (Martino & Freda, 2016). Patients must have good coping skills to overcome problems and achieve new life goals even living with breast cancer (Wang et al., 2020). The meaning of life will determine individual motivation to achieve life goals (Sajjadi, et al., 2016). Patients who find a positive meaning of illness will have higher psychological well-being and lower signs of anxiety and depression, and are more satisfied with life despite suffering from cancer.

The discovery of meaning life is a key element in improving well-being during and after experiencing a traumatic event such as cancer (Martino & Freda, 2016). Patients who are able to identify the benefits or meaning of the experience of cancer or believe cancer's contribution to personal growth will show a better quality of life, exhibit lower depressive symptoms and higher well-being status (Guerrero-Torrelles, et al., 2017; Shin & Park, 2017).

Strong sensitivity to the meaning life is assumed to be a protective factor in fighting psychological distress and improving the well-being of cancer patients (Loeffler, Poehlmann, & Hornemann, 2018). Frakl's theory says that the meaning of life is a basic human need that motivates in life. In cancer patients, individuals seek a certain meaning after experiencing a traumatic event to help overcome the difficulties caused by cancer. The meaning of life encourages individuals to achieve their life goals and fulfil personal values that will determine the patient's coping behaviour in overcoming problems due to suffering from cancer. Patients who have a positive meaning in life will have good psychological well-being and lower fatigue, depression and anxiety. Although the relationship of factors that influence meaning in life is still uncertain. However, the importance of the meaning of life is definitely a must for patients (Pintado, 2018). Many factors, such as individual character, severity of illness and aspects of spirituality influence the process of making meaning in life. Although previous research considers that there is no clarity about the process of finding meaning (Pintado, 2018). Research is still few to explore the factors that affect the meaning of life in breast cancer patients . This study aimed to analyse the factors influencing the meaning of life of breast cancer patients. They were age, spirituality, communication of health workers and the distance from the patient's home to chemotherapy services.

2. RESEARCH METHOD

This study used a cross-sectional design with an observational approach. Data were collected from October – December 2021. Total sample were 135 breast cancer patients who undergoing chemotherapy at the Army Hospital dr. Soepraeon Malang and Baptis Hospital, East Java, Indonesia. We used purposive sampling in accordance with the inclusion criteria. Inclusion criteria in this research were least had chemotherapy for 1 cycle, conscious, and does not have a mental disorder.

This study obtained ethical clearance number 2386-KEPK by the Institutional Review Board (IRB) Faculty of Nursing, Universitas Airlangga. This study begins with obtaining ethical clearance by complying with the strict Covid control protocol at the hospital. The study provided informed consent to each respondent who agreed to join in this study. Data were collected offline using self-report questionnaires that filled out by the respondents.

The demographic questionnaire asked the respondents in term of marital status, family history of cancer, symptom severity, and health insurance ownership. The questionnaire used was a modified questionnaire from *Health Care Communication Questionnare*. This questionnaire was used to measure the health worker communication. It has 8 Items, using Likert scale consisting of : 1: strongly disagree, 2: disagree, 3: agree, 4: strongly agree. *Spiritual Transcendence Scale* for measuring spirituality which have 8 item questions. The data was analyzed using a multivariate test, namely linear regression test. The quality of the model equation, used ANOVA criteria. Statistically significant level was used with p value < 0.05. In addition, the correlation was more than 0.2 was satisfaction (Kline, 2015).

3. RESULTS AND DISCUSSION

Table 1 show the characteristics of the respondents. Table 1, it shows that the majority of respondents have no family history of cancer (73,3%); most of them have normal activity without hindrance (47,4); Majority do not work (50,4%), have level knowledge in moderate level (65,9%); have married (85,9%); and most of patients have low economic status (58,5%).

Table 1. Distribution of Characteristics Patients

Characteristic	Respondents (N)	%
Family history of cancer		
Yes	36	26.7
No	99	73.3
Symptom severity		
Normal activity without hindrance	64	47.4
Light activity. limited to strenuous activity. but ambulatory	52	38.5
Can do activities for himself	12	8.9
Can do activities for himself but certain activities	6	4.4
Really just lying in bed	1	0.7
Occupational		
Employed	67	49.6
Unemployed	68	50.4
Level of knowledge		
Moderate	89	65.9
High	46	34.1
Marital Status		
Married	116	85.9

Not married	19	14.1
Economic status		
High	56	41.5
Low	79	58.5

Table 2 shows that most of respondents have high level meaning life score which all of indicators in high level category. Age of respondents was mostly in the adult category, spirituality in the moderate category, mean of communication from health worker were on the high level and most of respondents have distance from their home to hospital was 33,83 kilometres. It can be seen from bivariate analysis that the variables which significantly related to meaning of life were spirituality, health worker communication and distance from patient's home to chemotherapy services which *p*-value < 0,05. Spirituality and health worker communication can positively predict meaning life. It means that higher spirituality and higher health worker communication, higher meaning life in breast cancer woman. They were continued to multivariate analysed to determine the power of influence of factors.

Table 2. Analysis of Variables

Variable	**Indicator**	**n**	**Mean (SD)**	**Min- Max**
Meaning life	Belief in disease	135	12.72 (1.26)	8-16
	Motivation to be healthy	135	12.86 (1.24)	9-16
	Desire to meaningful	135	12.87 (1.34)	8-17
Meaning life score		135	38.53 (3.07)	26-45

	Meaning Life			
	Mean (SD)	**Min- Max**	**r**	***p-value***
Age	47.14 (6.36)	27-60	0.069	0.426
Spirituality	26.86 (5.80)	11-35	0.226	0.008
Health worker communication	27.52 (3.42)	15-34	0.207	0.016
Distance from patient's home to chemotherapy services	33.83 (26.35)	4-100	0.198	0.022

Table 3 shows that factor affecting meaning life were spirituality *p*-value 0. 014 and health worker communication which *p*-value 0.015, so it can be concluded that spirituality and health worker communication have significantly influence to meaning life in breast cancer patients. The greatest factor related to meaning life was spirituality with power (B) = 0.199, from the results of multivariate analysis, the equation can be arranged meaning life = 29.521 + 0.108 health worker communication + 0,199 spirituality. The quality of the model equation, used ANOVA criteria that showed the result *p* value 0.002 < 0.05 so it can be concluded that the equation is eligible to used. Test showed the value of R square is 0.11, it means that the equation obtained is able to explain meaning life 11 % after controlled by others factors.

Table 3. Multivariate Analysis Test Results for Meaning Life in Breast Cancer Woman

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**R Square**	**ANOVA test**
	B	**Std. Error**	**Beta**				
(Constant)	29.521	2.405		12.276	.000	0.11	0.002

Health worker communication	.108	.044	.203	2.466	.015
Spirituality	.199	.080	.222	2.493	.014
Distance	.362	.382	.084	.948	.345

a. Dependent Variable: Meaning Life

Based on the results of the analysis, it is known that there are two factors related meaning life of breast cancer patient. They are spirituality and health worker community. The results of this study indicate that the most affecting meaning life in breast cancer woman was spirituality. The average spiritual value of respondents in the moderate or fairly high category. The findings in line with previous research in Iran that showed the breast cancer patients under study had average levels of spiritual health and quality of life (Mohebbifar et al., 2015). This is accordance with other research which says that patients with breast cancer have a tendency to change the spiritual aspect better when they are sick (Park, Waddington, & Abraham, 2018). There have been many studies in literature suggesting that spirituality is one additional key factor that have a positive effect on those suffering from diseases, and facilitate easier coping. Spirituality has been shown to be important for many people in dealing with their cancer that may provide intrapersonal and interpersonal resources to manage distress and enhance adaptation skill. Spirituality also provide a meaning system that helps people cope with cancer and make the patients have a new goal n hope while undergoing cancer therapy (Park Waddington, & Abraham, 2018).

The broad conviction that one is performing a special function or purpose in life, in which one is able to live to his or her full potential as a human being, could be considered a more fundamental definition of meaning (Vos, 2015). People can change, create, or discover meaning. Cancer forces patients to face their physical limitations, such as a lack of energy and impending death. They suddenly discover that being alive actually entails being vulnerable and frequently out of control and that the universe is not always understandable, benign, or just, which may shatter the core assumptions they typically have about life (Vos, 2015). Spirituality, including religious beliefs or other spiritual practices, often serves as a source of emotional support for cancer patients. This can help them deal with feelings of anxiety, fear and stress that are often associated with cancer diagnosis and treatment. Previous research also proved that there was significant correlation between spiritual well – being and psychological adjustment especially in the context of a serious illness such as breast cancer (Rabitti et al., 2020). Spirituality can provide someone to make sense of her lives and feel whole, hopeful and feel peace event she has challenges. Spiritual well-being can be defined as feeling of having relationship with the others, having meaning and purpose in living and having belief and relation with exalted power (Chen et al., 2018).

All respondents in this study have been chemotherapy in hospital. 75% respondents said that one of big stressor was chemotherapy. The common systemic treatment for breast cancer is chemotherapy. It can increase the cure rate and decrease the risk of recurrence and metastasis. However, chemotherapy- also have serious side effects on the patient's body and mind, which are not conducive to the outcome of illness. Long-term of breast cancer chemotherapy make the patients must have high motivation, courage, and endurance (Li et al., 2021). This can be obtained by increasing their spirituality. Most of the respondents have tried to accept their illness, accept God's destiny, live more sincerely, forgiving and improving his relationship with God as well as human beings.

Hope among breast cancer patients can be effective coping strategy to increase motivation, overcome difficulties and helps to accept the reality of the disease, actively participate in treatment and improve the prognosis. A more inclusive definition of hope is a person's perceived likelihood of a positive result, and spirituality is a key facilitating component

of hope development. Significant correlations were reported between scores spirituality and life satisfaction (Mohebbifar et al., 2015). Hope also can trigger strength that keeps the patient full of energy to face adversity. It also establish positive goals and create resources that can assist them to respond the challenges. The results of this study showed that the most significant factor affecting meaning life in breast cancer was spirituality. It was in accordance with according to theorists, human beings have a will to. Meaning has been equated with purpose in life, life satisfaction, and positively valued life goals. meaning is the belief in a purposeful pattern of the universe, which, in turn, can be derived from religion and/or spirituality (Jim, et al., 2006). Spirituality provides a useful illustration in many ways of the global significance of influencing health in general. Spirituality includes belief in all aspects of global meaning such as (the nature of God, humanity, control, destiny and karma) and provides motivation and the main purpose for staying alive and making individual guidelines to achieve their life goals (Park Waddington, & Abraham, 2018).

Finding meaning in life will make individuals believe in their ability to achieve goals and be better prepared to face the healing process after medical procedures (Rush et al., 2021). The difficulties faced with breast cancer will usually make the patient experience an increase in post-traumatic well-being and growth when the patient is able to appreciate his life by finding positive meaning (Aflakseir et al., 2018; Kelly, et al., 2015; Lan, et al., 2019). Meaning life is important basis for adapting, integrating trauma, reducing symptoms and improving the well-being of breast cancer patients (Martino & Freda, 2016). This is in line with research in USA that showed additionally connected to enhanced quality of life, reduced burden disease when they have good making meaning (Ellis et al., 2017).

Meanings including beliefs, a sense of order, fairness and purpose, and the pursuit and fulfilment of worthwhile objectives in the realization of one's life goals (Guerrero-Torrelles et al., 2017). In this study used 3 indicators of meaning life, they were believing in disease, motivation to be healthy and desire to meaningful. Believe in disease is the perception of the patient's perspective on breast cancer, the average score of them were in the good category. The patient's view of breast cancer is very important in helping well-being. respondents mostly based on the items in the questionnaire that were asked, they answered that breast cancer is not a punishment from God, but is a destiny that must be accepted gracefully. Other research also said that the meaning of life interpreted by patient's cancer as a challenge, punishment and enemy will will determine how their wellbeing (Xia et al., 2018). There is a correlation between psychological well-being and meaning in cancer patients, breast cancer patients who can find positive meaning from cancer will show better emotional well-being.

Motivation to be healthy was other indicator of meaning life. The biggest challenge for nurses and health professionals is how to provide care in conditions of life-threatening illness, chronic conditions that require a search to stay healthy is to find the key to the motivation of the individual from giving up to fighting, and from despair to better behaviour (Büssing, Starck, & van Treeck, 2021). Most of respondents said that the biggest motivation of them was family, especially the children. They hope to be healthier so that they can always accompany their children to grow up and get married, see them succeed. This is line with other qualitative research that said "Almost all participating women reported gains in different aspects of meaning in life, often emphasising rather small changes such as the intensified ability to enjoy and appreciate small things in life that they used to take for granted, spending more time with family and "true" friends" (Loeffler, Poehlmann, & Hornemann, 2018). Goal-focused hope has been found to be an independent predictor of well-being (Iddon et al., 2019).

Results in this study on aspect of desire as meaning life indicator in this case most of them showed that they want to live better and useful life for others, want to be more obedient to worship, closer to God and try to become a better life every day. This was in line with

research in Italia that said the most important values from patients was orient their life to emerge values to be love for the family, be creative in work, and deal with disease in participate in positive changed and respect to others people (Buonaccorso, et al., 2019).

Second factor affecting the meaning life in breast cancer woman was communication from health worker, including doctor, nurse and dietician. Result showed that communication has average score in high category. It means from item questionnaire, health workers showed empathy communication consist of verbal and non-verbal which respecting and listening for patient complaints and problems. They also provide information and give support for them. It was line with other research in Chinese breast cancer woman that showed All the survivors said the support from their family was the main source of meaning in life. Physicians and nurses also the main source of support for breast cancer survivors especially to provide emotional support (Xia et al., 2018). Support from health care workers motivated them to fight against cancer, and they in return experienced more meaning in life when doing their best to help the patients (Xia et al., 2018). Breast cancer patients needs for relationship with the health care provider. It emphasizes how patient to be actively involved in carrying out the role of managing self-confidence in overcoming the problem of breast cancer after completing treatment. Patients need detailed information that must be done in managing physical, psychological and emotional problems after undergoing treatment (Kim et al., 2020). Other studies in Young African American breast cancer survivors also said that peer support was important to participants who needed assistance from multiple sources. In addition, some participants also reported that healthcare workers give positive support for them. Lack of information is form of lack of support and it was described as a barrier. Healthcare providers need to better understand and respond to individual survivorship concerns (Nolan, et al., 2018).

Breast cancer patient's emotional reactions especially related to effect of chemotherapy involved pain on both a physical and a mental level. They needed to change their perspective on cancer utilizing various using healthy coping mechanisms like exercise to get through the pain resulting from chemotherapy. They also needed assistance from friends, medical professionals, and religion to adjust themselves to withstand the cancer treatment (Chen et al., 2016). They had to follow the guidelines provided by the medical professionals for treating their illness. This research show that nearly all of the participants stated that receiving support from others not only care from family and friends, but also the most important is support from medical professional (Chen et al., 2016)

4. CONCLUSION

Spirituality and communication of health workers contribute positively to the meaning of life, which means the higher the spirituality and the better the communication of health workers, the better the meaning of life for breast cancer patients. Therefore, it is important for nurses to provide spiritual support of breast cancer patients by always encouraging and reminding patients to always accept themselves, get closer to God and increase positive beliefs about their illness. Nurses should also always carry out therapeutic communication and involve good verbal and non-verbal, and involve emotional support when interacting with breast cancer patients. The research limitation was this study ignored treatments that patients had already received, such as mastectomy and radiotherapy, which can affect emotional responses and meaning of life.

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RESEARCH **Open Access**

Individual Health History, Body Mass Index, and Behavior as Causative Factors of Non-Communicable Diseases

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Abstract

Microorganisms do not cause non-communicable diseases (NCDs) but tend to change in modern lifestyles that do not apply CERDIK. In past research, the risk of suffering from non-communicable diseases was influenced by behavior, which consisted of three domains, namely knowledge, attitudes, and actions, without considering other individual factors. This study aims to assess the influence of individual health history factors, BMI, and behavior. The design used is cross-sectional. A sample of 302 people aged 15-59 are at risk of NCD and often visit fast food restaurants. Sampling using cluster random sampling. The variables collected are individual health history, BMI, and behavior. Data collection was carried out from April to June 2023. The analysis carried out was descriptive and structural equation modeling using PLS (Partial Least Square) software. The influence of the individual health history factor is 0.116, the BMI factor is 0.277, and the behavioral factor is -0.107. The resulting formula is $\Pi(Y) = \frac{e^{(0.116*X_1)+(0.277*X_2)-(0.107*X_3)}}{1+ e^{(0.116*X_1)+(0.277*X_2)-(0.107*X_3)}}$ x 100%. This formula can be used as a method to calculate the individual risk of suffering from NCDs.

Keywords: NCDs, Individual Health History, BMI, Behavior.

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1. INTRODUCTION

Non-communicable diseases (NCDs), also known as chronic diseases, are not spread through infection. A combination of genetic, physiological, and behavioral factors causes NCDs. NCDs are of long duration and can have significant health consequences. Types of NCDs include cancers, chronic respiratory diseases, diabetes mellitus, and cardiovascular disease (IFRC, 2018; Tulchinsky & Varavikova, 2014; WHO, 2023). Causative factors of non-communicable diseases are as follows (1) Unhealthy behavior includes harmful alcohol use, physical inactivity, unhealthy diet, and tobacco use; (2) Metabolic changes in the body include overweight, blood glucose, cholesterol, and blood pressure; (3) Genetic factors as the risk for cancer, diabetes, and cardiovascular disease; (4) Environmental factors as exposure to toxins, healthy food, and air pollution as a predisposition of NCDs; and (5) Socioeconomic factors as limited access to healthcare, poverty, and education can increase the risk of NCDs (Kementerian Kesehatan Republik Indonesia, 2019a; Kishorbhai & Masharu, 2021; WHO, 2022b).

Research in Australia describes children who suffer from type 2 diabetes and hypertension have a family history of non-communicable diseases (Downing et al., 2020). The causes of non-communicable diseases in Indonesia are identified as being influenced by family and individual health history, namely diabetes mellitus, hypertension, heart disease and stroke, asthma, cancer, and chronic obstructive pulmonary disease as surveillance material (Kementerian Kesehatan Republik Indonesia, 2014). Existing research only behavior considers knowledge, attitudes, and actions (Suprajitno & Mugianti, 2020).

This study aimed to identify the influence of behavioral factors and family and individual health history as causes of non-communicable diseases.

2. RESEARCH METHOD

Research design using cross-sectional. A sample of 302 people aged between 15 to 59 years, at risk of suffering from NCDs, and often visiting fast food and beverage restaurants were selected by cluster sampling based on the restaurant's location. The confidence level is 95% and the error is 10%. Data collection was carried out from April to June 2023 in Blitar. The variables studied were individual health history, weight, height, knowledge, attitudes, and actions. Individual health history data were obtained by questionnaire (Kementerian Kesehatan Republik Indonesia, 2014). Body weight and height were measured directly using a body weight and height meter. Knowledge, attitudes, and actions are measured using a questionnaire (Suprajitno et al., 2023). Analysis used PLS (Partial Least Square). Ethical eligibility was obtained from the Health Research Ethics Committee of the Poltekkes Kemenkes Malang, Number: 160/III/KEPK POLKESMA/2023 dated March 30, 2023.

3. RESULTS AND DISCUSSION

The data collection results on research variables are presented in Tables 1 and 2, while the result of the regression using PLS is shown in Figure 1.

Table 1. Data on individual variables at risk of suffering from non-communicable diseases

No.	Variable	Min	Max	Mean	SD
1	Height	93.00	185.00	160.80	9.56
2	Weight	38.00	120.00	63.01	13.44
3	BMI	15.03	90.18	24.51	6.13
4	Knowledge score	9.00	21.00	19.10	2.33
5	Attitude score	17.00	28.00	22.79	2.51
6	Action score	6.00	15.00	11.16	1.92

Note: SD: Standard deviation; BMI: Body Mass Index

Based on body weight in Table 1, it is illustrated that there are individuals who are very at risk of suffering from non-communicable diseases. This condition is consistent with the fact that the lifestyle of urban or rural communities is already changing into a modern lifestyle that tends to consume fast food and drinks.

Table 2. BMI category and number of individual risks

No.	Variable	f	%
1	**BMI categories:**		
	Thin	26	8.6
	Normal	108	35.8
	Overweight	135	44.7
	Obese	33	10.9
2	**A number of individual health risks:**		
	No risk	79	26.2
	One risk	87	28.8
	Two risks	56	18.5
	Three risks	52	17.2
	Four risks	20	6.6
	Five risks	6	2.0
	Six risks	2	0.7

In Table 2, the individual BMI categories are classified as fat and obese as much as 55.6%, supported by the number of risks according to the individual's health history.

The results of the analysis of the influence of individual medical history, BMI, and behavior (knowledge, attitudes, and actions) on the risk of suffering from non-communicable diseases using PLS are shown in Figure 1.

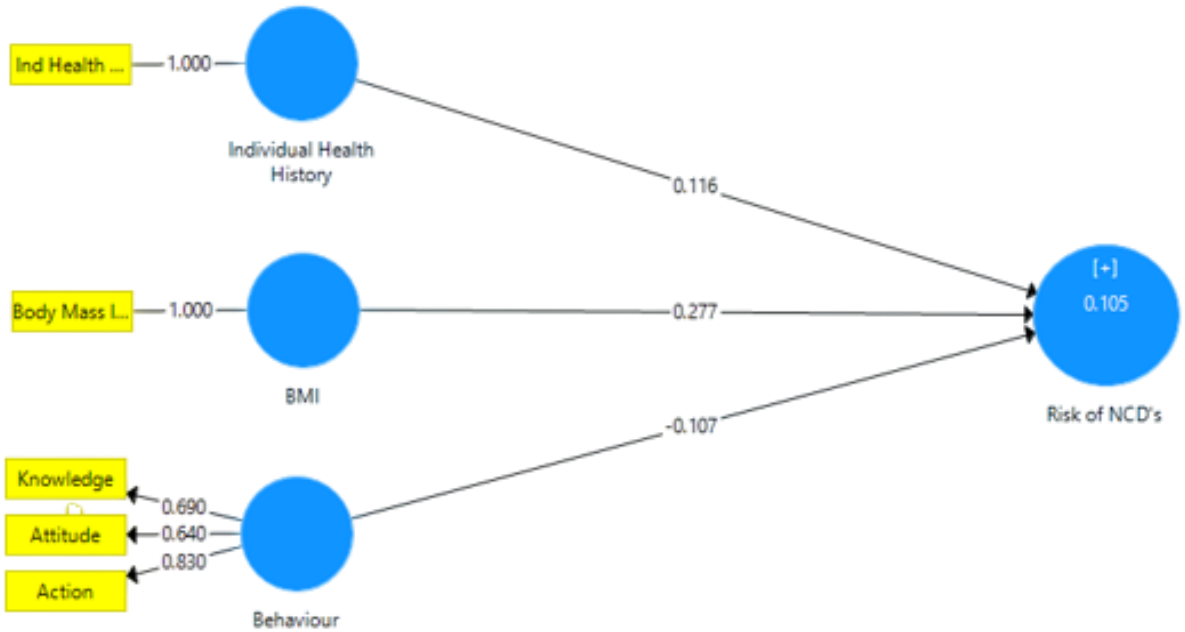

Figure 1 The results of the influence analysis using PLS

The convergent validity of behavioral factors is measured by AVE (Average Variance Extracted) of 0.525 and CR (Composite Reliability) of 0.766. The model suitability is measured from the value of SRMR (Standardized Root Mean Square Residual) obtained 0.08.

Based on Figure 1, the formula for calculating an individual's risk of suffering from non-communicable diseases is obtained:

$$\Pi(Y) = \frac{e^{(0.116*X_1)+(0.277*X_2)-(0.107*X_3)}}{1+e^{(0.116*X_1)+(0.277*X_2)-(0.107*X_3)}} x\ 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

Y : Risk of suffering from NCDs

X_1 : Number of individual health history as a factor risk

X_2 : Body Mass Index, where: $BMI = \frac{Weight\ (kg)}{(Height\ (m))^2}$

X_3 : Behaviors, where: $X_3 = (0.690 * X_{3.1}) + (0.640 * X_{3.2}) + (0.830 * X_{3.3})$

$X_{3.1}$: Knowledge score

$X_{3.2}$: Attitude score

$X_{3.3}$: Actions score

Furthermore, the risk of suffering from NCDs is categorized as follows:

$\leq 80\%$: No risk of NCDs

$81 - 90\%$: Low risk of NCDs

$\geq 91\%$: High risk of NCDs

The body mass index can describe the condition of individual fat accumulation, which can cause health problems (Nuttall, 2015) and the risk of suffering from non-communicable diseases. Body mass index measurements are based on height (m) and weight (kg). The body mass index category according to WHO in 1997 there are four categories, namely < 18.5 is called thin, 18.5 to 24.9 is called normal, 25 to 29.9 is called overweight, and > 30 is called obesity (Flegal, 2023). Whereas in Indonesia there are four categories, namely < 18.5 is called thin, 18.5 to 25.0 is called normal, > 25 to 27.0 is called overweight, and > 27.0 is called obesity (Kementerian Kesehatan Republik Indonesia, 2021). The grouping of BMI categories in Indonesia is also different from that in Asia Pacific (Lim et al., 2017).

Indonesian and WHO BMI categories differ between normal, overweight, and obesity. The influencing factor is that Indonesians tend to consume foods low in fiber and high in calories and fat compared to fruits and vegetables (WFP, 2018), and also consume rice or a high number of calories (Ariani et al., 2022; Arifin et al., 2019). Based on Table 1, some individuals have a very high BMI and are dangerous, also supported by their height, which can be categorized as low. Carbohydrate Calories are the main contributor to obesity if not balanced with adequate physical activity.

More than 50% of respondents are classified as overweight and obese (Table 2) and prone to non-communicable diseases. Vulnerability can be triggered by food consumption and unhealthy lifestyles every day. Excessive consumption of carbohydrate foods as the main trigger comes from foods and drinks containing glucose, which can be obtained at restaurants providing fast food and drinks. It is also supported by unhealthy lifestyle changes and not doing physical activity as a way to break down glucose in the blood, which, if not metabolized, will be stored as glycogen and fat (Aronoff et al., 2004; Han et al., 2016; Kowalski & Bruce, 2014).

The risk of suffering from non-communicable diseases is influenced by three factors, namely predisposing, enabling, and reinforcing factors. Individual health history can be categorized as a predisposing factor (Rachmawati, 2019) because it is influenced by knowledge, attitudes, and actions that have been held for a long time. The individual's health history studied included six diseases, including Diabetes Mellitus, Hypertension, Heart disease, Stroke, Cancer, or Chronic Lung (Kementerian Kesehatan Republik Indonesia, 2014). Table 2 illustrates that almost 50% of the respondents had a history of suffering from the disease, which made it possible for unhealthy behavior to be carried out. This condition is in line with more than 50% of respondents who have the overweight and obese BMI category. Individual health history, BMI, and behavior (knowledge, attitudes, and actions) together influence the risk of suffering from non-communicable diseases (Figure 1).

Diabetes mellitus, hypertension, heart disease, stroke, cancer, or chronic lung disease are chronic diseases identified as non-communicable diseases and common in low- and middle-income countries (WHO, 2022a). Metabolic risk factors that can increase the risk of non-communicable diseases are increased blood pressure, overweight, hyperglycemia, and hyperlipemia. Meanwhile, the factors of smoking habits, lack of physical activity, unhealthy eating patterns, and alcohol consumption need to be changed or stopped to reduce the risk.

Behavior is a habit that is entrenched and carried out at any time. Behavior is an internally coordinated response (action or inaction) of all living organisms to internal and/or external stimuli (Baum, 2013). An action taken based on sufficient knowledge and good attitude of an individual. Bloom's taxonomy based on a person's behavior has three domains: knowledge, attitudes, and actions (Adams, 2015; Nafiati, 2021; Pujawan et al., 2022). The behavior of preventing non-communicable diseases for individuals is important to do, in Indonesia it is known as Clean and Healthy Behavior (PHBS / *Perilaku Hidup Bersih dan Sehat*) by implementing of CERDIK (*Cek kesehatan berkala, Enyahkan rokok, Rajin olah raga, Diet sehat seimbang, Istirahat cukup*, and *Kelola Stress* / Periodical health checks, Stop of cigarettes, Exercise routinely, Balanced health diet, Get enough rest, and Manage stress) (Kementerian Kesehatan Republik Indonesia, 2019a; Kementerian Kesehatan Republik Indonesia, 2019b).

The influence of individual risk factors for non-communicable diseases (Figure 1) is 0.116 for individual health history; 0.277 for BMI, and -0.107 for behavior. Individual health history calculated the number of risks that are owned. BMI is measured from body weight and height; and behavior is measured from the scores of knowledge, attitudes, and actions. AVE (Average Variance Extracted) and CR (Composite Reliability) do not assess individual health history factors and BMI because they are a single factor without indicators. While behavior has three indicators that are measured, AVE and CR must be assessed.

The factors value of individual risk from non-communicable diseases (Figure 1) is 0.116 for individual health history, 0.277 for BMI, and -0.107 for behavior. Individual health history calculates the number of risks owned, BMI is measured from weight and height, and behavior is measured from the scores of knowledge, attitudes, and actions. AVE (Average Variance Extracted) and CR (Composite Reliability) do not assess individual health history and BMI factors because they are a single factor without indicators. While behavior has three indicators that are measured, AVE and CR must be assessed.

Behavioral factors that have indicators of knowledge, attitudes, and actions have an AVE value of 0.525, which is in the range ($0.50 < AVE < 1.00$) describing the internal consistency value of a factor with a sample of more than 100 (Dos Santos & Cirillo, 2021). Also, the behavior factor CR of 0.766 is the combined reliability of the three indicators, which is declared reliable if it is greater than or equal to 0.70. The model's suitability was assessed using SRMR (Standardized Root Mean Square Residual), which means that the model can be used as a method for measurement based on the factors that influence it. SRMR as an absolute measure of model fit. The SRMR value of models of 0.08 (Pavlov et al., 2021; Shi et al., 2019) is a suitable model to be applied in the model found.

4. CONCLUSION

Factors that influence individuals at risk of suffering from non-communicable diseases are the individual's medical history, which is calculated by the number of diseases experienced. BMI, which is measured by weight and height, and behavior based on scores of knowledge, attitudes, and actions. The formula for calculating the risk of suffering from non-communicable diseases is $\Pi\,(Y) = \frac{e^{(0.116*X_1)+(0.277*X_2)-(0.107*X_3)}}{1+e^{(0.116*X_1)+(0.277*X_2)-(0.107*X_3)}}\ x\ 100\%$.

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RESEARCH **Open Access**

Attitude Factor in Increasing Intention to Come to The Integrated Service Post

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Abstract

Integrated Healthcare Center (integrated service post) is the government's effort to make it easier for the Indonesian people to obtain maternal and child health services. The main problem of this research is the low number of visits by toddlers to Integrated Healthcare Center service posts. This study analyses the relationship between attitudes about the Integrated Healthcare Center and intention to come to the Integrated Healthcare Center. The researcher wants to apply the theory of planned behaviour that intentions influence behaviour while attitudes towards an object, subjective norms and behavioural control influence intentions. Rangacanga correlation research, with a cross-sectional approach. The population of mothers under five is 135 people, and the sample size is 101 people. The sampling technique used is simple random sampling. The data collection instrument was in the form of attitude and intention questionnaires. The independent variable is attitude, and the dependent variable is the intention to visit the Integrated Healthcare Center. In statistical analysis with the Pearson product-moment statistical test, the error rate is set at 0.05. The results showed that 51.28% of mothers under five had a positive attitude, and 51.28% had positive intentions. Statistical test results obtained p: 0.00 < α 0.05 concluded that there is a relationship with the correlation coefficient value of 0.670. This study concludes that the mother's positive attitude positively impacts Integrated Healthcare Center visits by mothers of toddlers. So, it is suggested that community leaders or health workers motivate and empower the community to participate in Integrated Healthcare Center activities.

Keywords: Attitude, Intention, Integrated Service Post.

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1. INTRODUCTION

Integrated Service Post is a form of community-based Health Efforts Services are managed and organised from, by, for and with the community for the implementation of health development. The goal is to empower the community and provide convenience in obtaining basic health services to accelerate the reduction in maternal and infant mortality (Hartono, Indah, & Qariati, 2015). Efforts to develop the quality of human resources that optimise the growth and development potential of children can be carried out evenly if community-based health service systems such as Integrated Healthcare Centers can be carried out effectively and efficiently and can reach all targets who need services (Departemen Kesehatan Republik Indonesia, 2011).

The success of the Integrated Healthcare Center can be seen from the coverage of all toddlers who have an MCH book all children whose weight and weight gain, in particular, can be measured by the proportion of attendance of all targets. High or low D/S is inseparable from the community's participation, especially mothers' role in coming to the Integrated Healthcare Center (Ridzkyanto, 2020). Community participation in the health sector is a situation in which individuals or families and the general public take responsibility for their health, their families, or their environment (Jalpi, & Rizal, 2020). Based on the health profile of Magetan Regency in 2020, the Ngujung Health Center area has the lowest D/S coverage. It is hoped that the attendance of toddlers at Integrated Healthcare Center will be at least 80%. In fact the average achievement in 2020 is only 67.2%. Achievement and increase in D/S coverage of the seven villages in the Ngujung Health Center area, namely Gambiran Village, the lowest average in 2020 was only 73.5% and in 2021 in January 76% (Puskesmas Ngujung, 2021).

D/S coverage is influenced by many factors, one of which is the activity of the mother. According to Ajzen, in the theory of planned behaviour, behaviour is influenced by behavioural intention, while behavioural intention is influenced by three factors, namely attitudes towards behaviour, subjective norms and internalized behavioural controls (Damayanti, Afrika, & Riski, 2022). Low D/S coverage can result in not being able to know the growth and development of these toddlers, because it is to the objectives of the Integrated Healthcare Center program, namely having strategic value for developing human resources from an early age (Noeralim, Laenggeng, & Yusuf, 2018). If the deviation is detected late, the intervention will be more difficult and this will affect the child's development services (Departemen Kesehatan Republik Indonesia, 2011).

Based on a preliminary study on ten mothers with toddlers, six people were reluctant to take their children to the Integrated Healthcare Center if their children had received complete basic immunization even though they often received counseling about the Integrated Healthcare Center from both cadres and health workers, besides that they had often seen advertisements containing appeals and invite them to come to Integrated Healthcare Center. They think that Integrated Healthcare Center activities are just weighing and are not useful, especially when the harvest season arrives so they are more concerned with their work than taking their children to the Integrated Healthcare Center (Lesli, et al., 2018).

Increasing the scope of D/S can be done by issuing a Circular Letter of the Minister of Home Affairs and Regions no. 140.05/292 of 2011 concerning guidelines for forming operational working groups for villages and villages as a whole for central level active alert (Departemen Kesehatan Republik Indonesia, 2011). One other alternative that can be done is to increase the mother's intention to come to the Integrated Healthcare Center. The determinants of intention or intention are attitudes towards behaviour, subjective norms and internalized behavioural control which in turn will determine whether the behaviour in question will be carried out or not (Rosadi, Sulaeman, & Prasetya, 2019). Ajzen hypothesized that intention indicates the degree of planning that a person plans for future behaviour and describes how

hard a person wants to try and how much effort they expect to expend in performing the behavior (Damayanti, Afrika, & Riski, 2022).

Based on the background of the problems above, the author tries to conduct research on the attitudes and intentions of the community in participating in integrated service post activities. The aim of this research is to determine the relationship between attitudes and mothers' intentions to come to the Integrated Healthcare Center.

2. RESEARCH METHOD

This type of research is survey research. The research design used was cross-sectional (Pangestuti, Dewi, & Sulaeman, 2020). The research was conducted in Gambiran village, Ngujung Health Center, Maospati District, Magetan Regency, East Java Province, Indonesia in 2021.

The population of this study were all mothers who had toddlers in Gambiran village in January 2021 (n=135) spread across five Integrated Healthcare Center posts. The sample size is determined based on the sample size calculation formula according to Slovin. From the results of calculating the minimum sample size, 101 results were obtained spread across five Integrated Healthcare Centers. Sampling technique with proportional simple random sampling (Sugiyono. 2010). The proportion of sample sizes from the five Integrated Healthcare Centers (Integrated Healthcare Center 1=27, Integrated Healthcare Center 2=16, Integrated Healthcare Center 3=17, Integrated Healthcare Center 4=23 and Integrated Healthcare Center 5=18).

There are two variables in this study, namely the independent variable in this study is the attitude towards the Integrated Healthcare Center, and the dependent variable in this study is the intention to come to the Integrated Healthcare Center.

Research data collection was carried out after obtaining ethical approval from the Health Polytechnic of the Surabaya Ministry of Health. The steps for collecting data include: 1) Data collection was carried out at five Integrated Healthcare Centers during the Integrated Healthcare, Center's schedule on the same day as the other Integrated Healthcare Centers, 2) Give questionnaires to respondents, 3) Researchers explain how to fill out the questionnaire. 4) Submit a statement of willingness to become a respondent (informed consent), 5) Fill in the questionnaire by respondents, and 6) Questionnaires that have been filled out by respondents are returned to researchers.

The data collection instrument in this study was a questionnaire. Likert scale (Azwar, 2011), both attitude variable and intention variable. The attitude measurement tool is a closed questionnaire in the form of a statement with five answer choices which is a modification of the Likert scale (Azwar, 2011). In a favourable statement, a score of 0 is given to a strongly disagree answer, a score of 1 is given to a disagree answer, a score of 2 is given to a neutral answer, a score of 3 is given to an agreed answer and a score of 4 is given to a very agree answer. For unfavourable statements a score of 0 is given to the answer that strongly agrees, a score of 1 is given to the answer that agrees, a score of 2 is given to a neutral answer, a score of 3 is given to the answer that does not agree and a score of 4 is given to the answer that strongly disagrees. The measurement results obtained are on an interval scale with the highest score of 44 and the lowest score of 0.

The instrument for measuring intention is a closed questionnaire in the form of a statement with five answer choices which is a modification of the Likert scale (Azwar, 2011). In a favourable statement, a score of 0 is given to a strongly disagree answer, a score of 1 is given to a disagree answer, a score of 2 is given to a neutral answer, a score of 3 is given to an agree answer and a score of 4 is given to a very agree answer. For unfavourable statements a score of 0 is given to the answer that strongly agrees, a score of 1 is given to the answer that agrees, a score of 2 is given to a neutral answer, a score of 3 is given to the answer that does

not agree and a score of 4 is given to the answer that strongly disagrees. The measurement results obtained are on an interval scale with the highest score of 60 and the lowest score of 0.

Data analysis used in this study used a descriptive analysis of concentration (mean, median, mode) and distribution (variance, standard deviation, range) then continued with bivariable analysis with a product-moment correlation test (Soekidjo, 2010). Product moment correlation is a correlation technique used to find relationships and prove the hypothesis that there are two variables if the data from the two variables are in the form of intervals or ratios, and the data sources of the two or more variables are the same (Sugiyono. 2010). The error rate set is $\alpha < 0.05$.

This research has been declared to have passed Health Research Ethics, Health Polytechnic of the Ministry of Health Surabaya, number: No.EA/658/KEPK-Poltekkes_Sby/V/2021.

3. RESULTS AND DISCUSSION

The results of the research on mothers' attitudes towards toddlers' at Integrated Healthcare Center are shown in Figure 1, as follows;

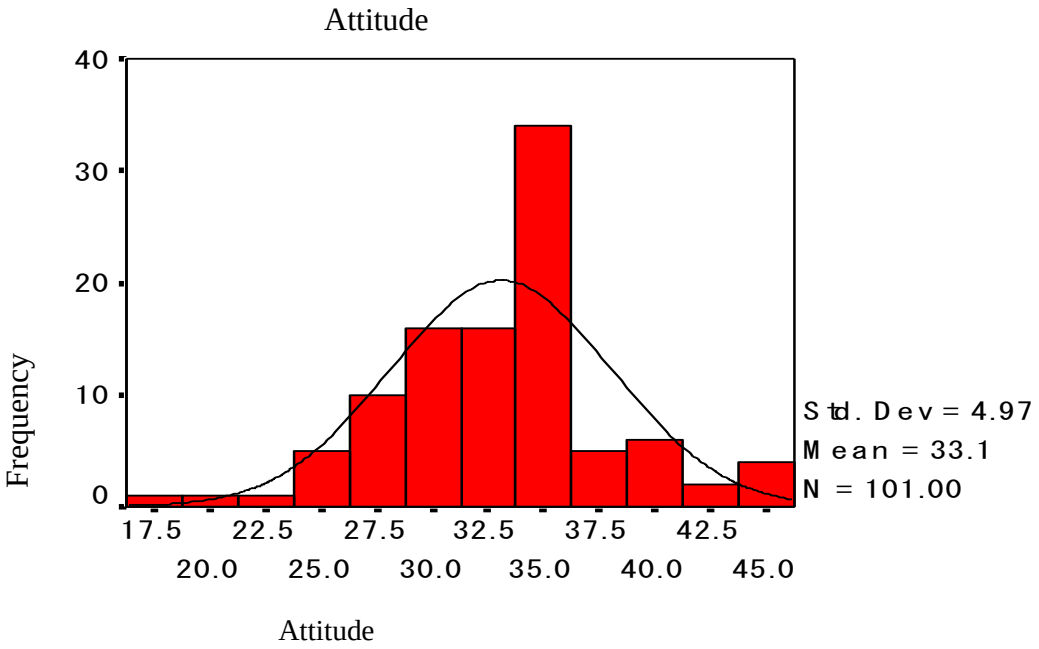

Figure 1. Attitudes towards Integrated Healthcare Center in Gambiran Village

Figure 1. The results of the research centered data in this study were mean = 33.08, median = 34 and mode 34, while the data distribution included variance = 24.734, standard deviation = 4.93, range = 26, minimum = 18 and maximum score = 44. The mode is in a positive area, so the attitude towards Integrated Healthcare Center in this study is positive.

Based on the histogram, the curve is still considered normal even though it is slightly left-sided or in terms of plety kurtic. The skewness value of -0.99 means that it is still close to the standard value, which is zero, while the kurtosis value is 0.764 below the standard value, which is three. If the value is positive, it will tend to be high or leptokurtic.

The results of the study illustrate that the mean is in the positive area, indicating that the attitude towards Integrated Healthcare Center is positive. A positive attitude is a good assessment of the Integrated Healthcare Center. Having a positive attitude means agreeing or supporting the Integrated Healthcare Center program. Mothers of toddlers are happy with the

Integrated Healthcare Center program so the presence of Integrated Healthcare Center is important for both mothers and toddlers.

With a positive attitude, it is likely that toddler mothers will have high intentions. This is reinforced by the theory of planned behavior that attitude is the first antecedent of intention. Intention depends on the results of attitude measurement. If the measurement results are positive, it indicates that the intention is high (Noeralim, Laenggeng, & Yusuf, 2018).

The positive attitude of mothers with toddlers about Integrated Healthcare Center is based on beliefs or ideas and concepts towards Integrated Healthcare Center, emotional life or evaluation of Integrated Healthcare Center and the tendency to come to Integrated Healthcare Center. This can be shown by agreeing answers to Integrated Healthcare Center items not just weighing activities so they have to come every month even though they have received complete basic immunization, toddlers' weight always increases, but Integrated Healthcare Center activities are activities to monitor toddler growth and development, sources of information, feel a loss if did not come to Integrated Healthcare Center. This is probably because the mother has received health information, especially from the Integrated Healthcare Center, which is delivered by the local midwife or Integrated Healthcare Center cadres at every opportunity, for example, *arisan*, *yasinan* and so on (Satriani, Yusuf, & Rusman, 2019).

Increasing a positive attitude can be done with counseling. Because counseling can increase information about the Integrated Healthcare Center. Apart from that, it also adds to the mother's knowledge about the Integrated Healthcare Center. This is supported by the theory that knowledge influences the formation of attitudes (Atik & Susanti, 2020).

In addition, community leaders (village heads), Integrated Healthcare Center cadres and health workers should motivate mothers with toddlers in the hope that they will have a positive attitude. The theory reinforces that a positive attitude is formed due to the influence of other people considered important. In general, individuals tend to have attitudes that confirm or are in line with the attitudes of people who are considered important. This tendency is partly motivated by the desire to avoid conflict with people who are considered important (Satriani, Yusuf, & Rusman, 2019).

In addition to counseling, another way is by having advertisements on TV or the mass media that can influence attitudes. The theory reinforces that attitudes are formed because of the mass media. As a means of communication, various forms of mass media such as television, radio, newspapers, magazines and others have a major influence in shaping people's opinions and beliefs. In conveying information as its main task, the mass media also carries messages containing suggestions that can direct one's opinion. The existence of new information about something provides a new cognitive foundation for the formation of attitudes towards it. Suggestive messages carried by this information, if it is strong enough, will provide an affective basis for judging something so that a certain attitude is formed (Amirah , Nasution, & Tambunan, 2022).

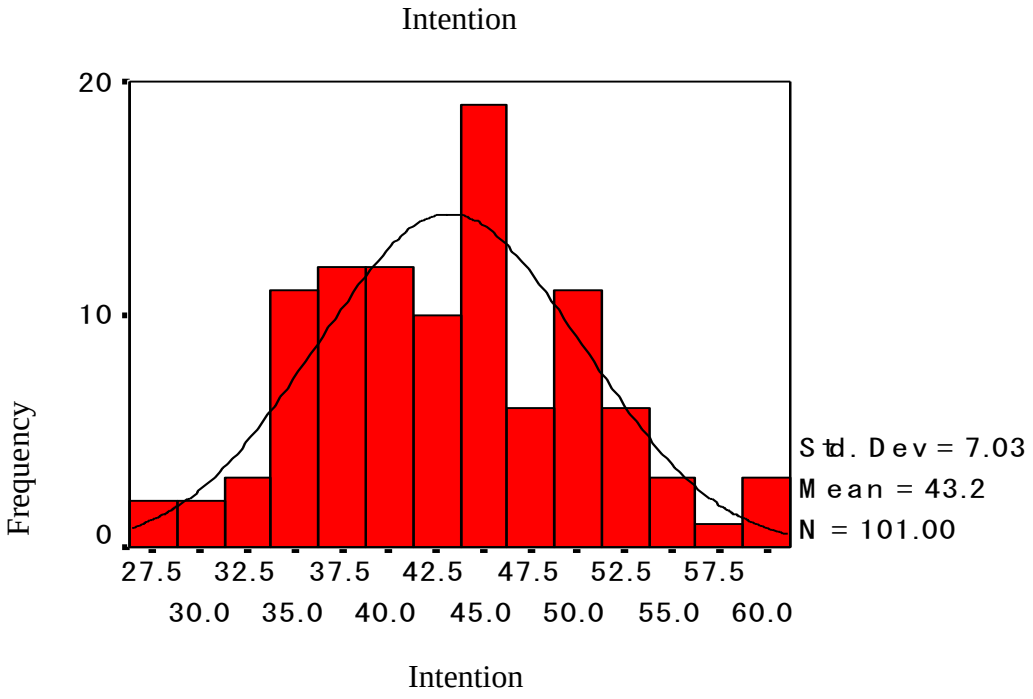

Figure 2. Mother's intention to come to Integrated Healthcare Center in Gambiran Village

The results of the research in Figure 2, are the concentration data in the study including mean = 43.20, median = 43 and mode 45, while the distribution data includes variance = 49.380 standard deviation = 7.027, range = 32, minimum = 28, and maximum score 60. The mode is in a positive area, so the intention regarding Integrated Healthcare Center in this study is positive.

Based on figure 2 histogram, the data is still considered normal with a skewness value of 0.194, meaning that it is still close to the standard value, which is zero and the kurtosis value of -0.327 is still considered normal because it is below the standard value, which is three.

The results of the study illustrate that the intention regarding Integrated Healthcare Center is positive. Having a positive intention means that the mother has the intention to take action, namely coming to the Integrated Healthcare Center. Because having the intention means that the mother has a business to try to come to the Integrated Healthcare Center and there is an effort to plan to come to the Integrated Healthcare Center.

Mothers under five who have positive intentions about Integrated Healthcare Center will tend to manifest behaviour to come to Integrated Healthcare Center. This is in accordance with the Theory of Planned Behavior that intention is the closest antecedent of a behaviour (Seran, Wilopo, & Sudargo, 2014). It is believed that the stronger a person's intention to display a particular behaviour, the more successful he is expected to be. So a positive intention will have a tendency that it will be easier to display in behaviour (Fuady, Prasanti, & Indriani, 2020).

This is because the toddler's mother wants to prove whether the information she has received is correct. In addition, they hope that the Integrated Healthcare Center can learn about toddlers' health, growth and development, get free immunisation, and so on. With all the possible risks they have to bear, they hope to get the same results as the effort they have made (Agustina, & Betan, 2017; Susanto, et al., 2022). Intention is a term related to action and is an important element in a number of actions (Rababa, Al Ali, & Alshaman, 2021). Intention refers to a person's state of mind directed at present action or future action. Here, intention is an element before a person or individual carries out a behavior, such as coming to the Integrated

Healthcare Center (Arum, & Mangkunegara, 2010). Intention, of course, has a distinctive role in directing action, namely connecting between deep considerations that are believed and desired by someone in certain actions (Nurhayati, 2013).

To increase the mother's intention to come to the Integrated Healthcare Center, one thing that can be done is for health workers or community leaders (people who are considered important) to motivate mothers to come to the Integrated Healthcare Center. People who are considered important will positively influence mothers of toddlers, which, in the end will act in the direction of those considered important.

In addition, the mother's intention to come to the Integrated Healthcare Center can be increased by health workers improving the quality of services at the Integrated Healthcare Center, for example in the Integrated Healthcare Center they are often given counseling, monitoring the development of toddlers. So the perceptions of mothers of toddlers about Integrated Healthcare Center are only weigh-in, and less useful activities will change.

Table 1. Results of Pearson correlation analysis of attitudes and intentions to come to Integrated Healthcare Center

Variable	N	Pearson Correlation	Sig. (2-tailed)
Attitudes- Intention	101	0.670(**)	0.000

Table 1 is the result of the Pearson product-moment correlation test, with a significance value (p) = 0.000. Because $p < 0.05$, H0 is rejected, it can be concluded that there is a relationship between attitudes and the mother's intention to come to the Integrated Healthcare Center. Based on the correlation coefficient value, a value of 0.670 was obtained, and it was concluded that there was a strong relationship between attitudes and the mother's intention to come to the Integrated Healthcare Center.

The study results concluded a strong relationship between attitude and the mother's intention to come to the Integrated Healthcare Center. The positive attitude of mothers with toddlers about Integrated Healthcare Center indicates a positive intention to come to Integrated Healthcare Center with the hope that they will get many benefits such as knowing about their toddler's health, growth and development, and getting immunizations.

The results of this study illustrate theoretically that attitude affects the intention to display a behaviour depending on the results of attitude measurement. Positive attitude measurement results indicate behavioral intentions (Maryati, & Sinaga, 2023). Attitude is the first antecedent of behavioural intention (Rababa, Al Ali, & Alshaman, 2021; Win, et al., 2020). Attitude is a positive or negative belief to display a certain behaviour (Fuady, Prasanti, & Indriani, 2020).

Because attitudes affect intentions, to increase intentions, you have to change attitudes. Changes in attitude can be made by changing people's perceptions of the Integrated Healthcare Center. In addition, as health workers, they should provide good motivation and also empower the community to participate in Integrated Healthcare Center activities on the basis of research results that the community has a positive attitude and positive intentions (Golsanamloo, et al., 2022; Suryanda, Iryani, & Rustati, 2023).

Improve attitudes can be done with community leaders and health workers to provide motivation to mothers of toddlers (Saputra, Rosita, & Sureni, 2019). Giving motivation can be through counseling and advertising from the mass media with the hope that the community will have a positive attitude so that it will be followed with high intention (Tabelak, & Serlyansie, 2017). It will be easier to manifest into action or behaviour with a high intention. The theory reinforces that a positive attitude will lead to high intentions while a negative attitude will lead to low ones (Batubara, Nasution, & Dalimunthe, 2018). Intention can accurately predict behaviour appropriateness (Fuady, Prasanti, & Indriani, 2020).

The low number of Integrated Healthcare Center visits in Gambiran village was influenced by attitude and other factors. These other factors are subjective norms regarding Integrated Healthcare Center and also behavioural control regarding Integrated Healthcare Center. This is reinforced by the theory that intentions are influenced by attitudes, subjective norms and behavioral control (Azwar, 2011).

4. CONCLUSION

The results of this study conclude that people's attitudes have a strong influence on the intention to participate in the toddler integrated service post. To increase community participation in Integrated Healthcare Center activities, it is recommended to increase education to increase community motivation through counseling and the existence of advertisements from the mass media with the hope that the community will have a positive attitude so that high intentions towards the use of Integrated Healthcare Center will follow it.

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RESEARCH **Open Access**

Factors Associated with Early Child Development: A Pre-Screening Study

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Abstract

Early child development is a critical phase for lifelong health, resulting from the influence of various factors. The present study assessed the factors associated with children's deviant development. This cross-sectional study was conducted on 88 infants aged 6-12 months in six Public Health Centres in East Pontianak, West Kalimantan. Breastfeeding duration at each session, the frequency in a day and the length of breastfeeding in months, mothers' knowledge, behavior, and the habit of squeezing in children were the risk factors for early development. A chi-square analysis of the relationship between risk factors and children's development. Overall, the results indicated that shorter breastfeeding duration at each session (p=0.027), non-exclusive breastfeeding (p=0.050), and low mothers' knowledge (p=0.032) significantly affected children's development. These results suggested that exclusive breastfeeding and enough knowledge enhance infant development.

Keywords: Child Development, Exclusive Breastfeeding, Breastfeeding Duration, Mothers' Knowledge.

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1. INTRODUCTION

Early childhood development provides a critical phase for lifetime physical and mental health. It is estimated that over 31 million children under five in low and middle-income countries have developmental problems. There is an increasing prevalence worldwide, from 4.8% in 1990 to 6.1% in 2014.1 The same trend is also experienced in Indonesia, the fourth most populous country, which has growth and development disorders among children from 16.5% to 21.6% from 2007 to 2013 (Budiman et al., 2013).

Many variables influence child development and have multifactorial causes. It can be affected by economic, environmental, nutritional, and social factors during pregnancy and postnatal (Donald et al., 2019; Pem, 2016; Peni et al., 2020). Other factors that compromise overall development are parents' behavioral and dietary deficiencies, exclusive breastfeeding, inadequate feeding practices, and lack of stimulation (Rocha et al., 2021; Sania et al., 2019). The importance of those exposed to the growth and child developmental outcomes in low-middle-income countries is poorly understood (Fitriyah et al., 2021). Parents' knowledge also contributed to the child's developmental outcomes.

To determine the magnitude of the correlation linking early life exposures with children's development aged 6-12 months, we investigated six public health centers in East Pontianak, West Kalimantan. Although many studies have assessed the factors associated with early child development outcomes, to our knowledge, no study focuses on breastfeeding duration at each session. The present study addresses this factor as one of the independent variables to prove whether it affects an infant's development. We then examined the associations of early life risk factors on development among children aged 6-12 months, such as breastfeeding details (the length of each breastfeeding, breastfeeding duration in months, the frequency of breastfeeding in a day, and exclusive breastfeeding), mothers' knowledge and behavior, and the habit of squeezing in infants.

2. RESEARCH METHOD

A cross-sectional study was carried out from September until December 2019. The study was conducted in six Public Health Centres (Parit Mayor, Banjar Serasan, Tanjung Hulu, Tambilan Sampit, Saigon, and Kampung Dalam) located in East Pontianak, West Kalimantan, Indonesia. Before enrolment, all participants (mothers) provided written informed consent.

All infants aged 6-12 months and their mothers willing to be interviewed were included. Exception for infants with anomaly congenital or genetic syndrome (congenital heart disease), low birth weight, congenital physical defects, and premature less than 36 weeks. We calculated the minimum sample required in this study using the different proportion sampling formula for cross-sectional design (Patrick & Halcyon, 2016). A sample size of 88 was required to achieve a minimum of 95% statistical power.

The trained investigator interviewed each infant's mother using a detailed questionnaire. The independent variable of this study was breastfeeding (exclusive breastfeeding, duration, and frequency of breastfeeding), knowledge, and behavior. Child development was the outcome of the study. All the information was obtained from the mothers.

The average breastfeeding session was the mother feeding their babies every episode for one breast (in minutes). We categorized it into three groups: good if 15 minutes or longer, moderate 5-15 minutes, and less under than 5 minutes. Breastfeeding duration was the length of the infants breastfed from born until the data collection (Win et al., 2006). We also asked about the average daily breastfeeding frequency and whether the participants got exclusive breastfeeding (Kent et al., 2006).

Knowledge of the mother was assessed by asking a series of questions about complementary food. A lack of knowledge was identified for those with scores under 80—their

responses to giving complementary food determined mothers' behavior. A score of 80-100 identified as good behavior, 60-79 as moderate, and less than 60 meant less behavior.

Child development was assessed using the Child Development Pre-Screening Questionnaire10, a screening tool for child development aged 0 to 6 years, validated in Indonesia (Windiani et al., 2020; Simangunsong, Machfudz, & Sitaresmi, 2012). The interviewers were trained on the use of the questionnaire. In terms of scoring, the score was considered abnormal development of six to eight items answered yes.

Univariate analysis was conducted on the data description about the frequency distribution of various characteristics of studied variables, independent and dependent variables. Using Chi-Square, bivariate analysis was performed on the factors associated with the deviant's development.

The study was reviewed and approved by the Ethical Committee of the Faculty of Medicine, University of Tanjungpura (Approval Number No. 1712/UN22.9/DL/2019). The participants were informed about the study and could ask questions to provide informed decisions if they wished to participate before signing a consent.

3. RESULTS AND DISCUSSION

In this study, we involved 88 infants. Table 1 below describes the characteristics of infants, including sex, age, and child's order in the family.

Table 1. Characteristics of study participants.

Characteristics	**Category**	**Frequency (n= 88)**	**%**
Sex	Male	57	64.77
	Female	31	35.2
Age (months)	6	14	15.91
	7	12	13.63
	8	15	15.91
	9	17	19.32
	10	15	18.18
	11	5	5.68
	12	10	11.36
Childs' order in the family	First	45	51.14
	Second	25	28.41
	Third	14	14.77
	Fourth	4	5.68

Table 1 showed that most infants were males (64.77%), aged 9 months (19.32%), and the first child in their families (51.14%).

Table 2. Characteristics of parents' participants.

Characteristics	**Category**	**Frequency (n= 88)**	**%**
Age (years)			
Mother	25-30	38	43.18
	31-35	7	7.95
	36-41	10	11.36
Father	19-24	17	19.32
	25-30	42	47.73
	31-35	10	11.36
	36-41	12	13.64
	42-46	7	7.95

Occupation			
Mothers	Civil servant	1	1.14
	Private employee	3	3.41
	Housewife	84	95.45
Fathers	Civil servant	10	11.36
	Private employee	41	46.59
	Labor	28	31.82
	Entrepreneur	9	10.23
Income average per month (rupiah)			
Mothers	<1.5 million	85	96.59
	1.5 - 3 million	2	2.27
	3 - 5 million	1	1.14
Fathers	1.5 - 3 million	34	38.64
	3 - 5 million	44	50.00
	>5 million	10	11.36
Education			
Mother	Primary	2	2.3
	Middle	11	12.5
	Secondary	68	77.3
	Higher	7	7.9
Father	Primary	3	3.4
	Middle	8	9.1
	Secondary	54	61.4
	Higher	23	26.1

The characteristics of the parents' participants are presented in Table 2. According to age, the majority of fathers and mothers aged 25-30. Most mothers were housewives with no monthly income, while most fathers were private employees and earned around 2.1-3.5 million rupiah monthly. According to education level, over 50% of parents completed secondary school.

Table 3. Risk Factors of Child Development.

Factors	**Category**	**Child Development (N= 88)**		**p-value**
		Deviant [n (%)]	**Normal [n (%)]**	
Breastfeeding duration at each session	<5 minute	2 (40)	3 (60)	0.027*
	5-15 minute	19 (57.58)	14 (42.42)	
	>15 minute	14 (28)	36 (72)	
Breastfeeding duration (month)	<6	15 (51.72)	14 (48.28)	0.201
	6-9	30 (69.77)	13 (30.23)	
	10-12	8 (50)	8 (50)	
Frequency of breastfeeding in a day	≤6 times	8 (61.54)	5 (38.46)	0.082
	>6 times	27 (36)	48 (64)	
Status of breastfeeding	Non-exclusive	30 (45.45)	36 (54.55)	0.050*
	Exclusive	5 (22.73)	17 (77.27)	
Current breastfeeding	No	14 (48.28)	15 (51.72)	0.253
	Yes	21 (35.59)	38 (64.41)	
Parents' knowledge	Less	29 (51.79)	27 (48.21)	0.032*
	Good	8 (25)	24 (75)	
Parents' behavior	Less	8 (32)	17 (68)	0.593
	Mid	20 (44.44)	25 (55.56)	
	Good	7 (38.89)	11 (61.11)	
The habit of squeezing in infants	Yes	20 (41.67)	28 (58.33)	0.691
	No	15 (37.50)	25 (62.50)	

**) significant at p-value ≤ 0.05*

The association between breastfeeding (duration at each session, length in a month, frequency in a day, and exclusive breastfeeding), the habit of squeezing, knowledge, and behavior of mothers with child development outcomes are shown in Table 3. Breastfeeding duration at each session (p=0.027), the status of breastfeeding (p=0.050), and knowledge (p=0.032) were significantly associated with infants' deviant development.

In the present study, exclusive breastfeeding played a significant role in determining the normal development of infants aged 6-12 months. Infants who breastfed for 10 to 12 months showed a lower corresponding deviant development (50%) than infants who breastfed for less than 6 months (51.72%) and 6 to 9 months (69.77%). The same finding was that the proportion of children with developmental deviations was lower when breastfeeding was longer (Chiu et al., 2011). Children who have never breastfed experience more fine motor and social delays than children who are still breastfeeding for up to 6 months. Children who have never breastfed also experience fine motor delays compared to children who have breastfed for less than a month (Chiu et al., 2011). In addition, this result supports the WHO expert recommendations that exclusive breastfeeding for six months has beneficial effects on children's cognitive development and no observable deficits in growth (Jedrychowski et al., 2012; Kramer & Kakuma, 2012; Nurhayati, 2017; Onyango et al., 2022).

It is well-established that breastfeeding is a key component of optimal infant nutrition (Martin et al., 2016). It provides many essential health benefits to babies and mothers, including helping protect children against acute and chronic disorders. Previous studies examining the associations between breastfeeding and child development found a positive effect of prolonged breastfeeding on child development (Kramer et al., 2008; Mikšić et al., 2020; Oddy et al., 2012; Onyango et al., 2022) Unfortunately, most infants in this study were not received exclusive breastfeeding (75%). A woman's attitude and beliefs may influence this high number of non-exclusive breastfeeding regarding their breastfeeding performance (Mikšić et al., 2020). Moreover, a longer duration of exclusive breastfeeding was associated with a higher frequency of feeds, higher age, and a higher educational level of the parents (Hörnell et al., 1999; Jama et al., 2020; Specht et al., 2018). Given the importance of early child development, there should be a reasonable reason beyond the result that needs further investigation.

Although numerous studies prove that breastfeeding longer than the optimal duration delays child development, more references must be provided regarding the optimal time of each episode. This study found that breastfeeding for less than 5 minutes at each episode from one breast was not significantly affected child development. Although a previous study by Hornell et al defined one breastfeeding episode as the duration of suckling 2 minutes or longer, this does not consider whether the babies fed from one breast or both during the episode (Hörnell et al., 1999). Also, that study did not observe specific periods of increased feeding frequencies at certain times and appetite spurts. Many studies have also shown that the frequency, volume, and duration of feeds influence milk output and fat (Hector et al., 2012; Kent et al., 2006). Therefore, it is difficult to determine the causality between the optimal duration of breastfeeding episodes and infants' development.

In terms of knowledge, it was found that the children whose development deviated were more common in mothers with low knowledge of complementary feeding (77.1%) (Michaelsen, Grummer-Strawn, & Bégin, 2017). This result is consistent with the previous findings that early and late introduction of complementary feeding is associated with increased morbidity and nutritional deficiencies in children (Udoh & Amodu, 2016). It is one of the vital indicators to improve the nutritional status of children, which aims for proper growth and development. Initiation of complementary feeding within the early life of infants was associated with better development in general (Bimpong et al., 2020).

Inadequate mothers' knowledge regarding complementary feeding is essential. The nutritional needs of babies reaching the age of 6 months continue to exceed breast milk's nutrients, so complementary foods are needed to provide adequate nutrition for children. Food diversity in complementary foods has been recognized as an essential element in intake quality. Increasing the variety of food consumed can ensure the child's nutritional intake so that the child's growth and development are appropriate. However, most were unaware of the recommended time, frequency, or kind of complementary food (Venugopal S & Chandrashekar, 2016). Mothers' wrong beliefs, customs, and attitudes may distort the exact information (Al-Samarraie et al., 2020; Doğan et al., 2019). Furthermore, the age of giving complementary feeding is late due to inappropriate information, and the child does not want to receive it. This lack of knowledge may be caused by low socioeconomic status, rural areas, and education level, which were not assessed in the present study.

As for limitations, recall bias commonly seen in cross-sectional studies may also be an issue in this study. People may answer inaccurately for several reasons, such as a misunderstanding or a desire to appear favorably. Small sample size also may affect the reliability of a survey's results because it leads to a higher variability, which may lead to bias.

4. CONCLUSION

This study indicated that lack of knowledge regarding complementary feeding and non-exclusive breastfeeding were risk factors for suboptimal development outcomes in selected domains, not with shorter breastfeeding duration in every episode. As a result, these high-risk groups may benefit from improving education and compliance with breastfeeding. Compliance with breastfeeding in this study was low, and more attention should be given to increasing breastfeeding, especially exclusive breastfeeding, and monitoring trends. However, it is essential to note that integrated interventions to enhance knowledge and exclusive breastfeeding may also need to consider the culture and religion of the origin.

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RESEARCH **Open Access**

The Correlation of D- Dimer and Neutrophil Lymphocyte Ratio (NLR) Levels on COVID-19 Mortality

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Abstract

Coronavirus disease 2019 (COVID-19) is a disease caused by a novel coronavirus or a new type of corona virus, namely severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). D-dimer and Neutrophil Lymphocyte Ratio are parameters that can be used as a predictor of mortality in COVID-19, so this study aims to determine the relationship between D-dimer levels and NLR with mortality in COVID-19 patients. The study used an analytic observational method with a cross sectional approach from medical record data at UNS Hospital. The population in this study were COVID-19 patients at UNS Hospital who had their D-dimer and NLR levels checked in the period November 2020-January 2021. The sample was taken using a simple random sampling technique. Bivariate data analysis with Spearman Rank Correlation Test. Obtained 72 samples. 46 male patients and 26 female patients with the highest age range of 40-59 years as many as 34 patients. Patients who experienced mortality as many as 24 people while the rest survived. Spearman's Rank test obtained p-values of D-dimer and neutrophil lymphocyte ratio (NLR) with mortality of COVID-19 patients 0.009 and <0.001, respectively. While the correlation coefficients for D-dimer and NLR on mortality were 0.308 and 0.515, respectively. There is a relationship between D-dimer and NLR levels with mortality in COVID-19 patients with a positive correlation.

Keywords: COVID-19, D-dimer, Neutrophil Lymphocyte Ratio, Mortality.

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1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a disease caused by a novel coronavirus or a new type of corona virus, named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Baloch et al., 2020; Dhama et al., 2020; CDC, 2020). It was first discovered in Wuhan City, Hubei Province, China and then spread quickly throughout the world. The World Health Organization (WHO) then declared COVID-19 a global pandemic on March 11, 2021. Based on the latest WHO data update on February 9th, 2022, globally there were 2,893,613 new cases of confirmed COVID-19 while 11,378 patients died. Meanwhile, at the same time in Indonesia there were 46,843 new confirmed cases of COVID-19 while 65 patients died (Sarohan et al., 2021).

The SARS-CoV-2 virus spread rapidly because the virus is transmitted among humans via aerosol particles or droplets originating from the respiratory tract or through direct contact with surfaces contaminated with the virus (Liu et al., 2020; Prather et al., 2020; Sun et al., 2020). COVID-19 has a wide spectrum of symptoms from asymptomatic to mild symptoms such as cough, fever, shortness of breath, sore throat, headache, rhinorrhea and diarrhea (Çalıca Utku et al., 2020; El-Anwar et al., 2020; Guo et al., 2020; Hornuss et al., 2020; Lan et al., 2020; Menni et al., 2020). Patients with severe clinical manifestations may experience disseminated intravascular coagulation (DIC), septic shock, severe pneumonia, multiple organ dysfunction syndrome (MODS) and acute respiratory distress syndrome (ARDS) (Hu & Wang, 2021; Mellett & Khader, 2022; Tsai et al., 2021; Yu et al., 2020).

SARS-COV-2 attacks target organs that express angiotensin converting enzyme 2 receptors (ACE2R) (Cevik et al., 2020; Harrison et al., 2020; Lamers & Haagmans, 2022). ACE2R is expressed by various organs in the human body but the density is higher in the heart and lungs. In severe cases the inflammatory or inflammatory response can occur excessively (hyperinflammatory), which causes a cytokine storm or systemic cytokine storm. Systemic cytokine storm results in systemic endothelial injury and a hypercoagulable state. Hypoxia in COVID 19 patients will shift the anti-inflammatory and antithrombotic phenotype to a pro-inflammatory and procoagulation phenotype. Endothelial injury will cause the release of ultralarge von Wilebrand factor (UVWF) which functions in the process of hemostasis, named triggering platelet aggregation and initiation of thrombogenesis (Becker, 2020; Gomez-Mesa et al., 2021; Iba et al., 2020).

D-dimer is the final degradation product of fibrin cross-links in a blood clot degradation process called fibrinolysis. Increased D-dimer is a marker of thrombosis. Incidence of increased D-dimer levels often occurs in patients with severe COVID-19 and can be a predictor of acute respiratory distress syndrome (ARDS), the need for a long intensive care unit (ICU), and mortality (Farasani, 2021; He et al., 2021; Li et al., 2020; Ozen et al., 2021).

An increase in d-dimer levels associates with an increase 3 to 4 times worse outcomes. Increased d-dimer levels in COVID-19 patients can be triggered by underlying conditions such as diabetes, cancer, stroke and pregnancy. 71% of COVID-19 patients who experienced hypercoagulability died because they met the DIC criteria. Venous thromboembolism occurs in 25% of patients with severe COVID-19, and 30% of these patients develop pulmonary embolism. Based on existing research, 42% of COVID-19 patients had D-dimer levels > 1 µg/mL and 81% of them were reported die (Breakey & Escher, 2020).

Another parameter that can be used to determine the mortality rate of COVID-19 patients is the ratio of neutrophils to lymphocytes or the neutrophil lymphocyte ratio (NLR). NLR can be an indicator that is commonly used to see a systemic inflammatory response, including in COVID-19 infection. An increase in NLR indicates an increase in the inflammatory process and is associated with a poor prognosis. The NLR value is higher in patients with severe COVID-19 than in patients with mild symptoms. The intensity of the inflammatory response is indicated by an increase in the number of neutrophils while a decrease in the number of

lymphocytes is a marker of damage to the body's immune system. Out of a total of 15 studies consisting of 6033 patients with high NLR levels, 822 (14%) died in hospital (Simadibrata et al., 2021).

Examination of D-dimer and NLR levels can potentially be used as a marker parameter in determining the mortality rate of COVID-19 patients (Bastug et al., 2020; Liu et al., 2020; Singh et al., 2021). The purpose of this study was to determine whether there was a relationship between D-dimer levels and NLR on the mortality of COVID-19 patients.

2. RESEARCH METHOD

This study was an analytic observational study using a retrospective cross-sectional approach. The research was conducted at the medical record installation at UNS Surakarta Hospital, Central Java. The study population was confirmed COVID-19 patients at UNS Hospital with the inclusion criteria of patients confirmed for COVID 19 who show positive results for SARS-CoV-2 by rRT-PCR examination during the 1st wave of COVID-19, November 2020 to January 2021. The patients had a medical record with the results of the D-dimer and NLR examinations, and hospital inpatients. The exclusion criteria were patients with a history of immune disease and blood disorders, patients with incomplete medical record data, and patients with a history of coagulation disorders.

Samples were taken using simple random sampling technique. The total population is 300 patients. 72 respondents are obatained by random sampling technique. The independent variables are levels of D-dimer and Neutrophil Lymphocyte Ratio measured by a ratio scale. Dependent variable was the mortality rate of patients diagnosed with COVID-19, which was measured on a nominal scale which the patients died or survived.

Data analysis was performed using a computer application. Data on D dimer levels and NLR with mortality rates was analyzed using bivariate analysis to determine whether there were a correlation between D dimer and NLR levels with the mortality rate of COVID 19 hospital patients. A significant relationship is obtained if the p value <0.05. Ethical approval was obtained in dr Moewardi Hospital with ethical number: 916/VI/HREC/2022.

3. RESULTS AND DISCUSSION

The results of the study which obtained from 72 medical records of confirmed COVID-19 patients at UNS Hospital during the period November 2020 to January 2021 which were examined for D-Dimer and NLR levels. In data collection, the average value of D-dimer was 1709.5521 (SD 2131.6943) with the highest value of 10000 ng/ml and the lowest value of 195.60 ng/ml. While the mean value of NLR is 8.4479 (SD 12.469) with the highest value of 92.26 and the lowest value of 0.95. Distribution based on mortality in the study results showed that 48 out of 72 patients experienced mortality with an average D-Dimer level of 2490.32 (SD 2827.83) and an average NLR level of 14.30 (SD 19.24). There were 24 of the 72 patients who survived, with an average D-Dimer level of 1319.17 (SD 1576.18) and an average NLR of 5.52 (SD 5.22).

Table 1. COVID-19 Mortality.

		Frequency (%)	D-dimer Mean (SD)	NLR Mean (SD)
Mortality	No	48 (66.7)	1319.17 (1576.18)	5.52 (5.22)
	Yes	24 (33.3)	2490.32 (2827.83)	14.30 (19.24)

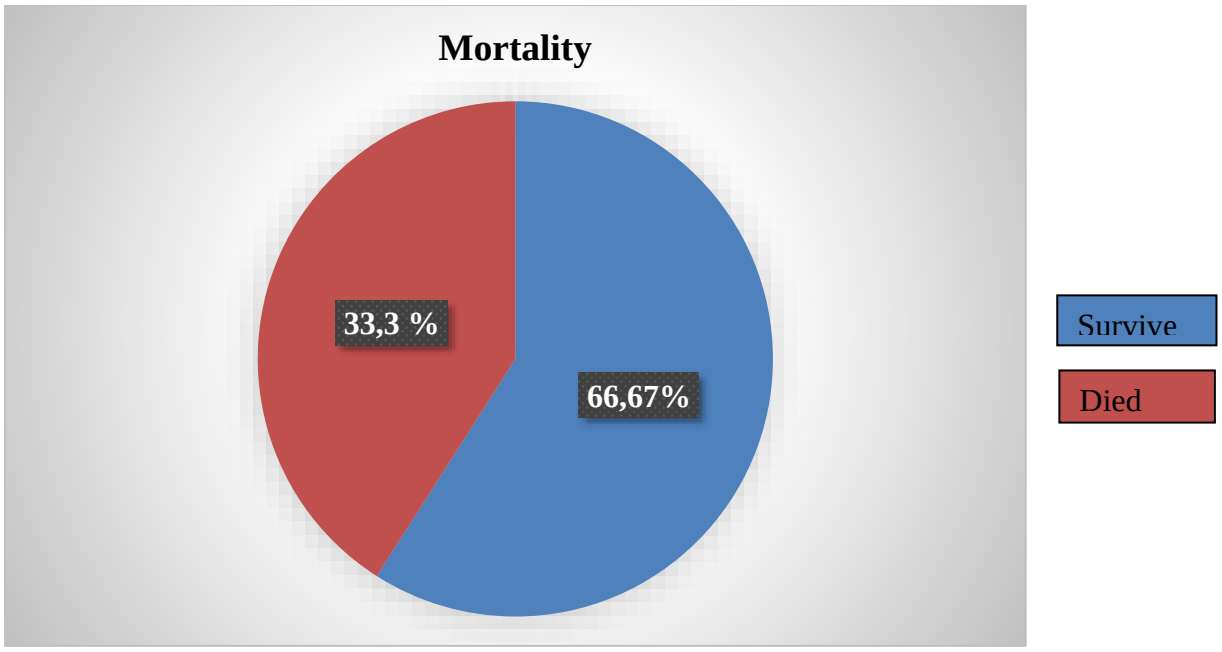

Figure 1. Mortality Proportion of COVID-19. Patients in Universitas Sebelas Maret Hospital During November 2020- January 2021.

Table 2. Samples Distribution Based on Age and Gender.

Distribution	Total	Mortality		D-Dimer Mean (SD)	NLR Mean (SD)
		No (%)	Yes(%)		
Age (Years)					
0-18	0	0	0	0	0
19-39	5	4(80%)	1 (20%)	620.27 (386.28)	3.02 (1.86)
40-59	34	26 (76.47%)	8 (23.53%)	1416.72 (1742.02)	6.48 (5.36)
≥60	33	18 (54.54%)	15 (45.45%)	2147.06 (2511.99)	11.06 (17.27)
Sex					
Male	46	28(60.87 %)	18(39.13 %)	1483.57 (1903.77)	10.36 (15.19)
Female	26	20(76.92 %)	6 (23.08 %)	1340.91 (937.41)	5.07 (2.78)

Patients in the age group of 40-59 years were the group that had the highest number, namely 34 patients with 8 deaths and had an average D-Dimer level of 1416.72 (SD 1742.02) and an average NLR of 6.48 (SD 5.36). Meanwhile, the 60-year-old group had the highest mortality rate, which 15 out of 33 confirmed COVID-19 patients with an average D-Dimer level of 2147.06 (SD 2511.99) and an average NLR level of 11.06 (SD 17.27). The age group of 19-39 years had the lowest mortality rate, which 1 in 5 confirmed COVID-19 patients with an average D-Dimer level of 620.27 (SD 386.28) and an average NLR level of 3.02 (SD 1.86).

The results of the study including 72 patients were 46 male patients which 18 among them died with an average D-Dimer level of 1483.57 (SD 1903.77) and an average NLR of 10.36 (SD 15.19). While female patients with a total of 26 which 6 of them died. The average D-Dimer level in women was 1340.91 (SD 937.41) and the average NLR was 5.07 (SD 2.78).

Table 3. Distribution based on comorbidity.

Distribution	Total	Mortality No (%)	Mortality Yes (%)	D-Dimer Mean (SD)	NLR Mean (SD)
Comorbidity					
Hypertension	11	8 (72.7 %)	3(27.3%)	1292.72 (913.36)	12.66 (26.48)
Diabetes Mellitus	16	10(62.5%)	6 (37.5%)	1161.14 (721.08)	12.15 (21.69)
Congestive Heart Faillure	4	3 (75 %)	1 (25 %)	1106.04 (645.27)	4.53 (2.49)
Stroke	2	0 (0%)	2 (100%)	1274.50 (287.79)	5.92 (1.77)
Chronic Kidney Disease	1	0 (0%)	1 (100%)	1621.60 (0)	13.48 (0)
Tuberculosis	2	1 (50%)	1 (50 %)	1129.42 (1320.61)	2.71 (1.83)
None	46	31 (67.39%)	15 (32.61%)	1754.38 (2278.31)	7.92 (8.92)

The results of the analysis showed that diabetes mellitus was the most common comorbid which found in 16 patients, 6 of them were died. The highest mortality rate was in 46 patients without comorbidities written in the medical record, which 15 of them were died. The highest average D-Dimer level was found in patients without comorbidities which 1754.38 (SD 2278.31). Meanwhile, the highest NLR level was found in patients with chronic kidney disease, which was 13.48.

Table 4. Normality Test.

Variable	p-value
D-dimer	0.000
Neutrophil Lymphocyte Ratio	0.000

The number of samples exceeds 50 so that the normality test is interpreted by Kolmogorov-Smirnov using computer application. The results of the normality test show that the significance value for D-Dimer and NLR is 0.000 so that the data is not normally distributed because the significance value is <0.05.

Table 5. Spearman Correlation Test of D-dimer and NLR with COVID-19 Mortality.

Variable	p-value	Correlation Coefficient
D-dimer	0.009	0.308
Neutrophil Lymphocyte Ratio	0.000	0.515

The results of the Kolmogorov-Smirnov Normality Test showed that the results of the data were not normally distributed, so the Spearman correlation test was used to determine the relationship between D-Dimer and Mortality and NLR with Mortality. The interpretation of the D-Dimer correlation test with mortality showed a significance value of 0.009 and is interpreted as less than 0.05 so that there was a significant relationship between the two variables. The D-dimer correlation coefficient with mortality was 0.308, meaning that the relationship had moderate strength because it was in the range of 0.26 – 0.5 (Vidali et al., 2020). The correlation

coefficient of D-Dimer and Mortality was positive so it means that the two variables had a unidirectional relationship.

While the results of the Spearman Correlation Test on NLR and mortality showed a significance value of 0.000 meaning less than 0.05 so that there was a significant relationship between the two variables. The correlation coefficient value of NLR and mortality was equal to 0.515 so that the relationship between the two variables had strong correlation because it was included in the range 0.51-0.75 (Vidali et al.,2020). The correlation coefficient of NLR and Mortality was positive which means that the two variables had a unidirectional relationship.

DISCUSSION

The Correlation Between D-dimer Levels and Mortality of COVID-19 Patients.

The results of the Spearman correlation test to find out the relationship between the D-Dimer variable and Mortality showed a significance value of 0.009 which was interpreted as less than 0.05 so that there was a significant relationship between the two variables. The D-dimer correlation coefficient with mortality is 0.308, meaning that the relationship has moderate strength because it is in the range 0.26 – 0.5. The correlation coefficient of D-Dimer and Mortality is positive so it means that the two variables have a unidirectional relationship. So that the greater the level of D-Dimer, the greater the risk of mortality.

D-Dimer, which is one of the independent variables in this study, is the result of degradation of dissolved cross-linked fibrin (fibrinolysis) by plasmin activity. D-dimer is an indirect marker of coagulation activation and fibrinolysis (Demelo-rodríguez et al., 2020; Vidali et al., 2020; Yu et al., 2020). In this study, the results showed that 48 of 72 patients experienced mortality with a mean D-Dimer level of 2490.32 (SD 2827.83) ng/ml. The mean D-dimer value was greater than the patients who did not die, which is 24 patients with an average D-Dimer level of 1319.17 (SD 1576.18) ng/ml. These results are in accordance with previous studies which stated that D-dimer levels in COVID-19 are associated with a high risk of venous thromboembolism, disease severity, and risk of death (Giannis et al., 2020). Elevated D-dimer values contribute to the poor prognosis and high mortality in these patients (Giannis et al., 2020; Soni et al., 2020; Vidali et al., 2020; Yu et al., 2020). High D-Dimer values can be associated with activation of the coagulation cascade Secondary to Systemic Inflammatory Response Syndrome (SIRS) in COVID-19 patients. Incidence of increased D-dimer levels often occurs in patients with severe COVID-19 and can be a predictor of acute respiratory distress syndrome (ARDS), the need for a long intensive care unit (ICU), and mortality (Farasani, 2021). An increase in d-dimer levels causes a 3 to 4 times worsening. Increased d-dimer levels in COVID-19 individuals can be triggered by underlying conditions such as diabetes, cancer, stroke and pregnancy. 71% of COVID-19 patients who experienced hypercoagulability died because they met the DIC criteria. Venous thromboembolism occurs in 25% of patients with severe COVID-19, and 30% of these patients develop pulmonary embolism. Based on existing research, 42% of COVID-19 patients had D-dimer levels > 1 μg/mL and 81% of them were reported died (Breakey & Escher, 2020).

The Correlation Between Neutrophil Lymphocyte Ratio Levels and Mortality of COVID-19 Patients.

The Neutrophil Lymphocyte Ratio (NLR) is a biomarker of inflammation that can be measured during routine hematological examinations. An increase in NLR indicates an increase in the inflammatory process and is associated with a poor prognosis. The NLR value is higher in patients with severe COVID-19 than in patients with mild symptoms. The intensity of the inflammatory response is indicated by an increase in the number of neutrophils while a decrease in the number of lymphocytes is a marker of damage to the body's immune system. Previous

studies have shown that a higher NLR is associated with clinical deterioration and death in COVID-19 patients. NLR can be easily calculated from routine hematology tests by dividing the absolute neutrophil count by the absolute lymphocyte count. NLR has been reported as great value in demonstrating the inflammatory status of the patient. A recent study showed that severe cases of COVID-19 tend to have higher NLR (Channappanavar & Perlman, 2017).

In the study, patients who experienced mortality had an average NLR level that was greater than patients who were alive, with a value of 14.30 (SD 19.24). Meanwhile, 24 out of 72 patients who did not die had an average NLR of 5.52 (SD 5.22). The results of this study are in line with previous studies, namely NLR has proven prognostic value in cardiovascular disease, infection, inflammatory disease and in several types of cancer (Imran et al., 2021). The results of the Spearman Correlation Test on NLR and mortality showed a significance value of 0.000 meaning less than 0.05 so that there was a significant relationship between the two variables. The correlation coefficient value of NLR and mortality is equal to 0.515 so that the relationship between the two variables has strong strength because it is included in the range 0.51-0.75. The co rrelation coefficient of NLR and Mortality is positive so it means that the two variables have a unidirectional relationship. This means that the greater the NLR value, the greater the patient's risk of experiencing mortality.

4. CONCLUSION

Based on research that conducted using the cross-sectional approach on 72 samples of confirmed COVID-19 patients' medical records at UNS Hospital during the period November 2020-January 2021, it was concluded that there was a relationship between D-Dimer levels and NLR on mortality in COVID-19 patients. The two relationships between D-Dimer and mortality and also NLR and mortality have a significant and positive correlation. A positive correlation means that increased levels of D-Dimer and NLR increase the risk of mortality in COVID-19 patients. With this research, it is hope that there will be further studies with a larger sample size.

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