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Immunological Profile of Patients with Controlled and Uncontrolled Type 2 Diabetes Melitus in Mataram City, West Nusa Tenggara

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Abstract

The prevalence of DM disease in West Nusa Tenggara Province is not much different from that in Indonesia. DM cases in NTB are included in the ten most non-communicable illnesses suffered by the community and the incidence continues to increase from year to year. An increase in the levels of pro-inflammatory cytokines in the body is one of the causes of insulin resistance in cells which can further develop into type 2 diabetes. This study involved diabetic patients at the Mataram Community Health Center, who were assigned into 2 groups, namely the controlled diabetes group and the uncontrolled diabetes group and involved a standard group which was a group consisted of healthy people. Each group was examined for Fasting Blood Glucose (FBG) and HbA1c levels. The results of the examination in the standard group, controlled diabetes group and uncontrolled diabetes group obtained the FBG levels of 89.22 mg/dl, 110.0 mg/dl, and 245.80 mg/dl, respectively. Furthermore, the results of the HbA1c test in the standard group, controlled diabetes group and uncontrolled diabetes group were 5.44%, 6.03%, and 10.49%, respectively. The results of the examination of IL-6 levels in the standard group, controlled diabetes group and uncontrolled diabetes were 329.36 pg/ml, 331.52 pg/ml, and 320.33 pg/ml, respectively. The results of the IL-10 test in the standard group, controlled diabetes group and uncontrolled diabetes were 71.80 pg/ml, 116.60 pg/ml, and 128.10 pg/ml, respectively. Based on the results of the study, there was no significant difference in the levels of interleukin 6 and interleukin 10 between respondents with diabetes mellitus and healthy respondents ($p>0.05$). It can be concluded that there were no differences in interleukin 6 and 10 levels between healthy people with patients with controlled and uncontrolled diabetes.

Keywords: Diabetes mellitus, Pro-inflammatory, Interleukin, Glucose, HbA1c, Haemoglobin.

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1. INTRODUCTION

Currently, there are many significant changes in style and pattern of life of all people around the world (Sheng et al., 2019). Lifestyle changes are not for the better, and even in a negative direction, such as frequent consumption of fast food (Junk Food) and lack of activity/exercise (sedentary)(Giri et al., 2020; Sheng et al., 2019). Such changes has led to an increase in the incidence of non-communicable diseases in Indonesia, such as hypertension and diabetes mellitus (DM)(Asril et al., 2020).

In Indonesia, the prevalence of DM sufferers continues to increase (Khan et al., 2020). This can be observed in Basic Health Research data regarding DMin 2007, 2013, and 2018 which showed an increasing trend (Pradono et al., 2021). In 2019, cases of type 2 DM (Non-Insulin Dependent Diabetes Mellitus) became the ten most common diseases in outpatient hajj pilgrims in 2019 with a total of 15,679 patients (Yezli et al., 2021).

The prevalence of DM disease in West Nusa Tenggara Province is not much different from that in Indonesia. DM cases in NTB are included in the ten most non-communicable illnesses suffered by the community and the incidence continues to increase from year to year (Annisa, Puspitasari, & Aini, 2021). In 2018, there were 33,828 DM cases recorded at the CHC, which grew to 41,841 points in 2019. Even in 2019, metabolic diseases, such as DM, both type 1 and type 2, became the cause of death among pregnant women in NTB, as many as 12 cases. In addition, according to data derived from the Indonesian Ministry of Health, in 2019, only 7.79% of patients with DM received standardized health services (Primayanto, 2022)

Type 2 Diabetes Mellitus (type 2 DM) is a metabolic disease caused by the body's failure to process signals from the insulin hormone released by the pancreas (insulin resistance) (Sacerdote et al., 2019). This failure can be due to various factors, including damage or failure of the insulin signaling mechanism in cells (Zamora & Villena, 2019). This failure usually involves Glucose Transporter-4 (GLUT4) and Insulin Receptor Substrate (IRS) in cells (Babu et al., 2020). Such condition may further cause an increase in glucose levels outside the cell since the glucose transport process from outside the cell into the cell cannot take place (Poznyak et al., 2020).

An increase in the levels of pro-inflammatory cytokines in the body is one of the causes of insulin resistance in cells which can further develop into type 2 diabetes (Akash, Rehman, & Liaqat, 2018). An increase in the levels of pro-inflammatory cytokines among patients with type 2 diabetes can be due to obesity (Wang & He, 2018). Various studies found the correlation between an increase in the levels of pro-inflammatory cytokines such as TNF-alpha and IL-6 and obesity (Grosick, Alvarado-Vazquez, Messersmith, & Romero-Sandoval, 2018).

In addition to causing insulin resistance through cell signaling mechanisms, obesity also causes an imbalance between the levels of pro-inflammatory cytokines and anti-inflammatory cytokines (Guo et al., 2020). The increase in the levels of such pro-inflammatory cytokines cause a person to experience a state of low-grade chronic inflammation which can further lead to various complications and the emergence of other metabolic diseases, such as heart disease and hypertension (Villarroya, et al., 2018). In addition, chronic inflammation that occurs continuously and uncontrollably can increase susceptibility of a person to infection (Castro, Macedo-de La Concha, & Pantoja-Meléndez, 2017; Ellulu et al., 2017).

There should be a balance between the levels of pro-inflammatory and anti-inflammatory cytokines to minimize the risk and prevent disease complications related to metabolism. Moreover, mapping of the immunological profile is also required (Bolte et al., 2021). Data on anti-inflammatory and pro-inflammatory cytokine levels are required to get a clearer description of the patient's immunological state. Therefore, researchers are interested in conducting a study on the immunological profile of patients with controlled and uncontrolled type 2 DM patients.

2. RESEARCH METHOD

This was an analytic observational study with a cross-sectional approach. The population in this study were all type 2 DM patients in the Mataram City Community Health Center. Diabetic patients verified by the CHC were initially tested for the levels of fasting blood glucose (FBG) and HbA1c to determine whether they had controlled and uncontrolled diabetes mellitus.

The study samples involved healthy respondents and diabetic patients at the Mataram CHC. There were 50 people as the sample population in this study. Respondents were assigned into three groups: the control group (K) of healthy respondents and two observation groups consisted of type 2 DM patients: the controlled type 2 DM (DT) group and the uncontrolled type 2 DM patients (Figure 2). All respondents were examined for the levels of IL-6 and IL-10. Distribution of the study samples is presented in the chart below.
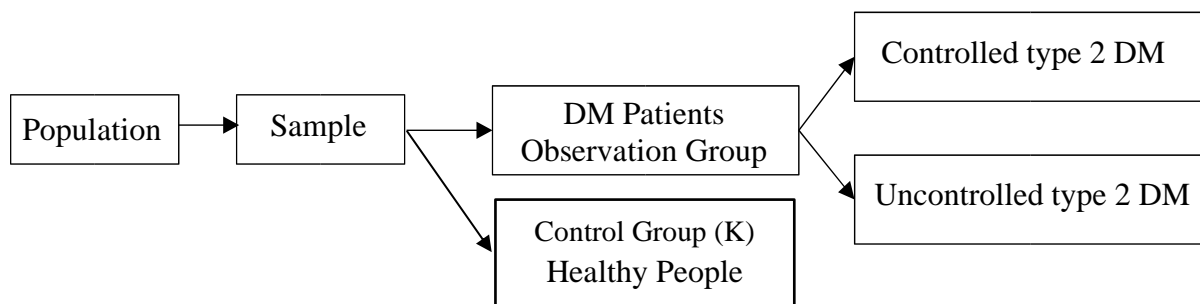
Figure 1. Distribution flow of the study samples. There were 17 respondents with Controlled type 2 DM, 17 respondents with uncontrolled type 2 DM, and 16 healthy respondents.

The inclusion criteria of the study samples involved here were adult male or female patients with age range from 25-60 years, Diabetes mellitus patients who had been diagnosed by a hospital or health care facility, were willing to become respondents, as evidenced by filling out and signing the Informed Consent form, did not have a history of allergies and other immunological diseases such as autoimmune and RA (rheumatoid arthritis), and had no infectious disease either chronic or acute. This study has been approved by the Health Research Ethics Committee, Faculty of Medicine, Al-Azhar Islamic University, through the letter Number 53/EC-03/FK-06/UNIZAR/X/2021.

3. RESULTS AND DISCUSSION

Data regarding laboratory examination in each group of respondents are presented in Table 1. Group assignment for controlled and uncontrolled diabetes was based on the results of FBG and HbA1c levels assessment among respondents with type 2 diabetes mellitus.

Table 1. The Results of Examination for FBG, HbA1c, IL-6, and IL-10 levels.

Variable	Standard	Controlled type 2 DM	Uncontrolled type 2 DM	p-value
FBG (mg/dl)	89.22	110.0	245.80	p <0.05
HbA1c (%)	5.44	6.03	10.49	p <0.05
IL-6 (pg/ml)	329.36	331.52	320.33	p>0.05
IL-10 (pg/ml)	71.80	116.60	128.10	p>0.05

Regarding fasting blood glucose (FBG) levels in each group of respondents, there was a significant difference (p<0.05) between the standard respondent group and the Diabetes Mellitus (DM) respondent group. The results of the FBG analysis showed that controlled DM respondents (110.0 mg/dl) and uncontrolled DM respondents (245.80 mg/dl) had different levels of FBG which tended to be higher than average respondents.

Diabetes mellitus is a disease of glucose metabolism disorder characterized by an increase in the levels of glucose in the blood (Xu et al., 2020). The results in this study indicated differences in blood glucose levels between the groups of respondents. Such finding is in line with a study conducted by Amir, Wungouw, and Pangemanan, (2015), which revealed that there were high blood glucose levels among respondents with diabetes mellitus (Amir, Wungouw, & Pangemanan, 2015).

Regarding HbA1c levels, the study results showed a significant difference (p<0.05) between the standard respondent group (5.44%) and the uncontrolled DM respondent group (10.49%). Such finding indicated that the HbA1c levels could be a parameter to define the uncontrolled DM group (Sherwani et al., 2016). However, there was no significant difference between the standard respondent group and the controlled diabetes mellitus group. The HbA1c examination is a specific examination to determine high blood glucose levels in the last two to three months (Dağ et al., 2009). This examination can assess the risk of tissue damage caused by high blood glucose levels in the blood (Utomo, Wungouw, & Marunduh, 2015).
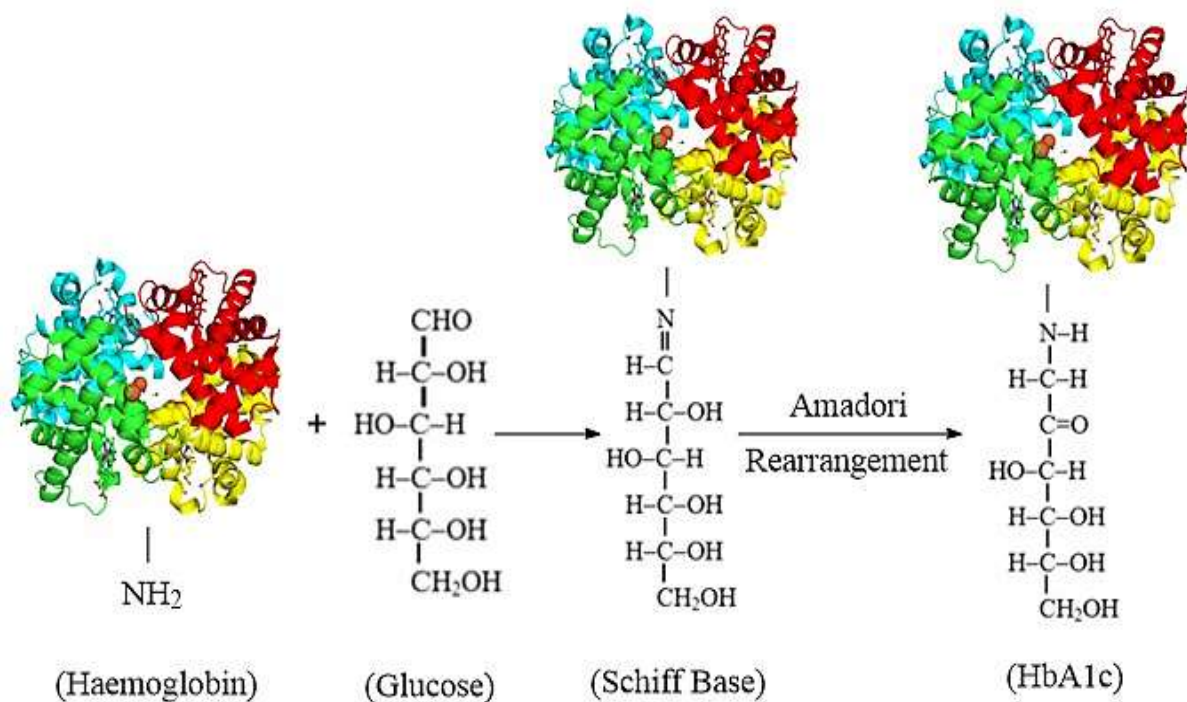
Figure 2. Formation of binding of Hemoglobin Glucose

Glycated haemoglobin (HbA1c) is a monitoring parameter for diabetes which is principally related to the half-life of red blood cells (RBC) (Sherwani et al., 2016). Haemoglobin is a blood component that binds oxygen (Ahmed, Ghatge, & Safo, 2020). The binding mechanism of haemoglobin to glucose can be observed in Figure 2. Haemoglobin will bind glucose non-enzymatically at the N-terminal end of the beta chain of hemoglobin to produce Schiff base aldimine. During the re-arrangement of Amadori, it will become a more stable ketoamine product, namely HbA1c (Muralidharan, Bhat, & Mandal, 2020).

The results of the examination which showed high HbA1c levels in the uncontrolled diabetes respondent group can be due to high blood glucose levels which facilitates the binding to hemoglobin so that it can be used to see a history of high blood glucose levels in the last three months (Silverman et al., 2006). The higher the blood glucose level, the more likely it is to bind to hemoglobin in the blood (Gupta, Jain, & Chauhan, 2017). However, in respondents

with controlled diabetes mellitus, HbA1c levels were not different from average respondents. This could be due to a low-glucose diet to prevent an increase in blood glucose in the blood so that there is no binding of blood glucose to hemoglobin (Paputungan & Sanusi, 2014).

Based on the results of the ANOVA test, there was a no significant difference in the mean level of interleukin 10 between the standard respondent group (71.80 pg/ml) and the controlled DM respondent group (116.60 pg/ml). In addition, there was no significant difference ($p > 0.05$) between the standard respondent group when compared to the uncontrolled DM group (128.10 pg/ml).

Interleukin 10 (IL-10) is an interleukin that plays a role in the anti-inflammatory response. IL-10 is produced by immune cells (Treg, Th1, Th2, Th17, Macrophages, DC) in response to inflammation, including IL-6 (Saraiva & O'garra, 2010). IL-10 is a cytokine widely secreted by monocytes, which has a pleiotropic effect on the immune system and inflammation. IL-10 was first recognized for its ability to inhibit activation and effector function of T cells, monocytes, and macrophages (Sabat et al., 2010).

Based on the results of the ANOVA test, there was no significant difference in interleukin 6 (IL-6) levels ($p > 0.05$) between average respondents (329.36 pg/ml), controlled DM respondents (331.52 pg/ml), and uncontrolled DM respondents (320.33 pg/ml). IL-6 is produced by adipose cells (adipokines) in response to the polarization of M2 to M1 macrophages among people with obesity (Matsubara et al., 2012; Trayhurn & Wood, 2005). In addition, there is an increase in FFA levels which can activate TLR 4 in adipocytes and produce an inflammatory response (Dasu et al., 2010; Hong et al., 2020).

In this study, there were no significant differences between the standard respondent group with controlled diabetes, and uncontrolled diabetes. Such finding could occur because IL-6 and IL-10 produced from high glucose levels were still able to be suppressed by endogenous and exogenous antioxidants presented in the patient's body so that no increase in IL-6 and IL10 was found (Wang et al., 2020). Diabetes mellitus can cause an increase in the production of free radicals and generate reactive oxygen species (ROS) (Volpe et al., 2018). The increase in free radicals can induce NF-KB to increase Interleukin 6 (Yeo et al., 2018). Reactive oxygen species (ROS) should be reduced so that it cannot generate NF-Kb, and prevent the increase of interleukin 6 (Kida et al., 2021).

In this study, the serum lipid levels were not assessed. Therefore, the relationship between lipid levels and IL-6 could not be revealed. In a survey, it was also found that IL-10 levels were also inversely related to TG and LDL-C levels (Forero et al., 2018; Yuan et al., 2018). Another study also found that in cases of insulin resistance and long-standing incidence of type 2 diabetes, a slight increase in FFA levels was found (Den Hartogh et al., 2020). This was thought to be related to the length of time respondents had suffered from DM, most of which were more than one year.

4.   CONCLUSION

High blood glucose can interfere with cell signaling and the immune response of the human body. Still, in our study, there was no significant difference in the interleukin 6 and interleukin 10 levels between respondents with diabetes mellitus and healthy respondents. Elevated blood glucose levels may cause comorbidities that can be harmful to the body. However, the effect of endogenous and exogenous antioxidants consumed by patients with diabetes mellitus can play an important role in preventing the increase in IL-6 and IL-10 levels.

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Effect of Soybean Juice on the Increase in Hemoglobin Levels among Adolescent Girls

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Abstract
The highest percentage of anemia occurs among adolescent girls, and one of the efforts to overcome such problem is iron supplementation along with iron-rich foods from animal sources such as red meat and marine products, as well as vegetable sources such as nuts. Soybean is a kind of iron-rich food which contains 8.0/100 g of iron. This study aims to observe the increase in hemoglobin levels after the administration of soybean juice among adolescent girls. This was a pre-experimental study with a one group pretest-posttest design. The populations consisted of 133 adolescent girls of VII and VIII graders with a sample size of 35 respondents who were selected by using purposive sampling technique. The respondents were given 250 ml of soybean juice for 21 consecutive days every morning. On the twenty-second day, the Hb levels of respondents were re-assessed (post-test). The blood sample taken was a capillary blood at the fingertip. The statistical test applied the Paired T-Test. The results revealed that hemoglobin levels of respondents who were given soybean juice increased by 12.06 g/dl with a difference of 1.62 g/dl. This study concluded that 250 ml soybean juice had an effect on the hemoglobin levels among adolescent girls. Adolescents are recommended to regularly consume iron-rich foods and beverages with various kinds of preparations such as soybean juice.

Keywords: Soybean juice, hemoglobin levels, adolescent girls, anemia.

1. INTRODUCTION

An increase in nutritional needs occurs in line with an increase in age of children, especially during the transition period from childhood to adolescence. Surely, several problems will also arise, one of which is nutritional problem. Anemia is a major problem, wherein the incidence is predicted to be 30% of the world community, especially in developing countries and mostly affects adolescents and pregnant women. Based on data derived from the Ministry of Health, 22.2% of nutritional anemia occurs among adolescents aged >15 years (Susanti et al., 2016).

Adolescent girls are one of the groups at risk for anemia with a greater risk than male adolescents due to monthly menstrual cycle and also unhealthy eating habits and patterns (lack of concern to nutritional content in foods consumed such as protein, carbohydrates, vitamins and minerals). The habit of consuming low-nutrient foods leads to unsufficient intake of nutrients required for the synthesis process to form hemoglobin (Hb). Certain long lasting habit may cause a decrease in Hb levels followed by anemia (Safyanti & Andrafikar, 2018), (Suryani et al., 2017).

The most important event experienced by adolescent girls is the first menstrual cycle or so called menarche (Puspitasari, & Budiastuti, 2019), which lasts every month. Thus, adolescent girls become a group that has the potential to experience anemia, especially due to iron (Fe) deficiency (Permatasari, 2016). Anemia is a condition wherein the erythrocytes (red blood cells) count or the Hb concentration decrease beyond normal level. One of the causes of nutritional anemia is the lack of nutrients that function in the process of hemoglobin formation, which is caused by impaired absorption or poor consumption of nutrients required such as Fe, protein, and pyridoxine. Ascorbic acid affects the absorption and release of Fe from transferrin into body cells, and Alpha Tocopherol affects the erythrocyte membrane (Adriyani & Wirjatmadi, 2016).

The World Health Organization (WHO) explains that anemia is one of the most significant health problems, and WHO predics the prevalence of anemia worldwide by two billion. The most significant trigger or cause of anemia in the world is iron (Fe) deficiency of around 50-80%. Therefore, it becomes the approach focal point often applied in substance-deficiency anemia (Masthalina et al., 2015). The 2018 Basic Health Research reported that the highest proportion of anemia was in the age group of 5-14 years (26.4 %), followed by the age group of 15-24 years (18.4% %) (Kementerian Kesehatan Republik Indonesia, 2018).

Data derived from the Gorontalo Provincial Health Office in 2019 revealed that 118 senior high school adolescent girls experienced anemia, mostly in one district in Gorontalo Province by 67 people (52%). Furthermore, 126 junior high school adolescent girls experienced anemia. Iron deficiency can lead to an adverse impact of a decrease in learning concentration, which further results in a decrease in learning achievement and work performance. Iron deficiency anemia may also causes a decrease in the body's resistance to infectious diseases, reduced body health, impaired growth, and a high risk in young marriage and pregnancy. Anemia is very influential issue for women, especially during pregnancy and childbirth since it may cause postpartum hemorrhage which may lead to maternal and/or neonatal mortality (Suryani & Sulastri, 2020).

In Indonesia, more than half of the population with anemia (57.1%) are adolescent girls and pregnant women of around 50.9% (Kementerian Kesehatan Republik Indonesia, 2018). Based on the data, it can be concluded that the highest percentage of anemia occurs among adolescent girls, and one of the efforts to overcome such problem is iron supplementation along with iron-rich foods from animal sources such as red meat and marine products, as well as vegetable sources such as nuts. Green beans and soybeans are types of beans with high iron content (Ekafitri & Isworo, 2014).

There are two kinds of anemia treatment, namely through pharmacological and non-pharmacological methods. Pharmacological treatment can be performed by taking one iron tablet every day during menstrual period. Meanwhile, non-pharmacological treatment can be performed by consuming iron-rich fruits and vegetables such as soybeans (Resmi & Setiani, 2020). Soybeans contain iron up to 8.0 mg per 100 grams, the majority of which is concentrated in the embryo and seed coat (Ekafitri & Isworo, 2014).

Soybeans contains protein and essential amino acids that are almost equivalent to the protein found in milk, eggs, and meat. In addition, anti-oxidants contained in soybeans can also prevent cancer. Minerals such as Ca, P, and Fe contained in soybeans also play a role in the body's metabolism (Ekafitri & Isworo, 2014), (Suryani & Sulastri, 2020). A previous study conducted by Lestari, et al proved that administration of 250 ml of soybean milk for 7 days was able to increase hemoglobin levels among students (Lestari et al., 2021). Furthermore, Astawan, et al explained that consumption of soybean tempeh had an effect on the increase in hemoglobin and erythrocyte levels among white rats (Astawan, 2019).

Based on several previously findings, the current study substituted soybean milk with soybean juice and increased the number of days of intervention to observe the effect of intervention on the increase in Hb levels. This study aims to analyse the effect of soybean juice on the increase in haemoglobin (Hb) levels among adolescent girls aged 12-14 years.

2. RESEARCH METHOD

This was a pre-experimental study with a one group pretest-posttest design. The study was conducted in one of the junior high schools in Bone Bolango Regency, Gorontalo Province. The populations consisted of 133 adolescent girls of VII and VIII graders with a sample size of 35 respondents who were selected by using purposive sampling technique based on inclusion and exclusion criteria. The inclusion criteria were Hb levels of <12 g/dl, permission from parents, were not having menstrual bleeding, not taking any supplements including Fe tablets, participated in the study from the beginning until the end. The exclusion criteria consisted of not following the complete intervention and experienced certain illness or disease. The data collection instrument used here was an observation sheet to record the Hb levels. Hb level assessment was performed using digital Easy Touch GCHb.

The study was conducted from January-March 2020 through the following steps: Before the intervention was applied, the authors provided clear information and asked the permission from parents as well as students' willingness by filling out an informed consent. The anemia status of the students was determined by assessinv the Hb levels (Pre-test). Furthermore, 40 students of VII graders who met the inclusion criteria as respondents were selected. Respondents were administered with 250 ml of soybean juice. Soybean juice was made by the researchers and several enumerators distributed it to the respondents. The enumerators had tasks to distribute juice, assist the respondents to consume the juice, and record the findings on the observation sheet. The intervention was carried out among all respondents every morning for 21 consecutive days. 4 respondents could not continue consuming juice because they experienced menstruation during the intervention on the 4th and 10th days. In addition, 1 respondent did not continue intervention due to health problem. Thus, the final number of samples involved was 35 respondents. On the twenty-second day, the Hb levels of respondents were re-assessed (Post test). The blood sample taken was a capillary blood sample at the fingertip. The sampling was performed by skin puncture method, and Hb levels were assessed by Cyanmet Hb method.

The data obtained were further analyzed using SPSS 22 software. The frequency distribution and the characteristics of study subjects for each variable were analyzed using univariate test. Meanwhile, a bivariate analysis was conducted through a paired t-test.

The implementation of study protocols was based on approval letter provided by the Health Research Ethics Commission (KEPK) of Gorontalo Health Polytechnic number LB.01.01/KEPK/01/2020.

3. RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents

Characteristic	Frequency	
	N	**%**
Age		
12 years old	12	34.29
13 years old	16	45.71
14 years old	5	14.29
15 years old	2	5.71

Table 1 presented that most of respondents were 13 years old as many as 16 adolescent girls (45.71%). 90% of adolescent girls experienced anemia at the age of less than 15 years. The result of previous study explained that adolescent girls aged <15 years had the potential to experience a higher risk of anemia than other age groups. Adolescent girls aged 13-15 years who have just experienced menstruation and have lost a lot of blood will be more susceptible to experience anemia. A study among female students conducted in Bogor revealed that the mean age of menarche was 13 years (Susanti et al., 2016).

An adolescent girl will be diagnosed with anemia if her erythrocyte count or Hb level is <12 g/dl. Adolescence is one of the factors of anemia. In fact, the need for iron increases along with the presence of menstruation and growth spurt. Moreover, adolescent girls are usually very concerned about body shape, so that many of them limit the amount of food consumed and undergo the wrong diet pattern (Permatasari, 2016), (Rusman, 2018).

Table 2. Distribution of Mean Hb Levels before and after soybean juice intervention.

Variable	Min	Max	Mean±SD (gr/dl)	Δ Change	p-value	CI Value	
						Lower	**Upper**
Hb levels before intervention	9.6	11.1	10.44 ±0.68	1.62± 0.67	0.001	1.631	1.193
Hb levels after intervention	11.3	12.9	12.06± 0.46				

Table 2 revealed an increase between before and after the administration of soybean juice. before the intervention of soybean juice, the mean Hb levels was 10.44 g/dl and increased to 12.06 g/dl with a difference of 1.62 g/dl after the administration of 250 ml of soybean juice for consecutive days. According to Farid (2022) the synthesis of Hb takes approximately 7-14 days to become mature and ready to be distributed throughout the body through red blood cells (erythrocytes). Hb is contained in erythrocytes, and has the same lifetime with erythrocytes of about 20 days (Farid et al., 2022).

The study findings showed that after the administration of soybean juice, the mean Hb levels increased from 10.44 g/dl to 12.06 g/dl with a difference between before and after intervention of 1.62 g/dl. Furthermore, the statistical test through the t-test obtained a p value of 0.001 (p <0.05). Thus, the null hypothesis (H_0) was rejected, meaning that soybean juice was effective to increase the Hb Levels among adolescent girls.

Before soybeans were made into juice, they were processed through soaking, boiling and mashing to facilitate the absorption of nutrients (Winham et al., 2017). Beans also contain phytic acid which can inhibit the absorption of minerals such as Fe, Zn and Ca. The levels of phytic acid in nuts can be reduced by soaking them before processing. Moreover, the

digestibility of protein in nuts is only around 77% due to anti-nutritional factors, such as anti-trypsin and tannins, so that soaking should be performed before processing (Ekafitri & Isworo, 2014).

An increase in Hb levels after soybean juice intervention is related to the fact that soybeans have a fairly high level of dietary fiber as well as iron contents. 100 grams of soybeans contain 331 cal of calories, 34.9 grams of protein, 18.1 grams of fat, 227 mg of Ca, 585 mg of P, 8 mg of Fe, 34.8 grams of carbohydrates, 110 SI of vitamin A, 1.07 mg of vitamin B1, and 7.5 grams of water (Lestari et al., 2021).

The study findings are in line with a study conducted by Suryani which concluded that there were changes in Hb levels and oxygen saturation among adolescent girls after being given half a glass of soybeans (Suryani & Sulastri, 2020). A similar finding was also found in a previous study which concluded that there was an increase in Hb levels among adolescents after the intervention of soybean milk for 7 days (Aulia, 2019). Furthermore, according to Cahyadi, soybeans have a high iron (Fe) content of 8.0 mg compared to green beans of only 6.7 mg. Such content is a substance that is required by the body, especially for the formation of erythrocytes (Retnorini et al., 2017).

In general, iron absorption in the body is in the form of ferrous ($Fe2+$), while soybeans contain iron in the form of ferric ($Fe3+$). The increase in Fe absorption can be supported by consuming ascorbic acid at the same time, since ascorbic acid can convert $Fe3+$ into $Fe2+$. The amount of Fe in the body affects the formation of hemoglobin levels.[14] Another study revealed that there was a relationship between Fe intake and blood Hb levels among adolescent girls aged 12 to 25 years, which was due to the presence of iron (Fe) as the main element that functions in the blood formation process (Siallagan et al., 2016).

In the current study, it was found that after soybean juice intervention, there were still 2 respondents (3.3%) who did not experience an increase in Hb levels. Such finding can be due to difference in personal absorption process, which is influenced by the dietary regulator. After iron administration, the absorptive cells can be resistant to iron absorption for some time (Putri & Isnaeni, 2017).

Researchers also assumed that no increase in Hb levels can be caused by poor pattern of fruits and vegetables consumption, especially those containing iron (Fe) and vitamin C (ascorbic acid) (Olii, et al., 2022), (Suryani et al., 2017), and also due to frequent consumption of tea and milk that are known to inhibit the absorption of iron in the body. Therefore, to facilitate the absorption of Fe in the intestine, it is recommended to consume vitamin C (ascorbic acid)-rich foods such as dragon fruit, Ambon banana, oranges, and guava (Olii, 2020), ((Putri & Isnaeni, 2017), (Fitriani & Panggayuh, 2017). In addition, it is recommended to avoid the consumption of foods containing tannins, Ca, P, and phytic acid. Tannins and phytic acid may bind and inhibit the absorption of iron from food (Siallagan et al., 2016).

Another study conducted by Irianto also reveal similar finding that lack of iron was the most common cause of anemia in women. Iron (Fe) is needed to form erythrocytes. Adolescent girls need more iron than young man, so they need to consume iron-rich foods such as red meat, liver, fish, chicken, as well as vitamin C-rich foods which can help iron absorption (Yulianti et al., 2016), (Suryani et al., 2017).

Several efforts can be made to increase the Hb level of adolescent girls in order to reduce the incidence of anemia, namely by regularly consuming soybeans in various forms, one of which is juice (Olii, et al., 2022), (Nurhayatun et al., 2020), (Oktaviani et al., 2020), (Magfirah, 2019). It is also necessary to consume quality foods high in iron content such as red meat, liver, fish, chicken meat, green compounds, fruits, as well as vitamin C-rich foods which can help iron absorption (Sonawane, 2017), (Cia et al., 2021), (Hardimarta et al., 2018). Consuming 250 ml of soybean juice was found to be effective in increasing Hb levels. The outcome will be even more effective if it is taken together with Fe tablets.

4. CONCLUSION

Administration of 250 ml of soybean juice for 21 consecutive days could increase hemoglobin levels among adolescent girls. Aadolescent girls are recommended to regularly consume iron-rich foods and beverages with various kinds of preparations such as soybean juice. It is also recommended to conduct further study on the effect of consumption of soybeans along with vitamin C on Hb levels.

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Prediction Model of Prolonged and Obstructed Labor in East Nusa Tenggara: A Multivariate Adaptive Regression Splines Analysis

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Abstract

Prolonged and obstructed labor are the type of abnormal labor that may lead to maternal and fetal mortality. This study established the model for predicting prolonged and obstructed labor in East Nusa Tenggara. A health facilities-based case-control study was conducted in November 2017 among 570 women who gave birth at public health facilities in East Nusa Tenggara. Data were obtained by reviewing antenatal records, the mother's card, and partographs. In bivariate analysis, all variables with a p-value less than 0.25 determined by chi-square for categorical and independent t-test for numerical variables were included in multivariate analysis. Multivariate Adaptive Regression Splines (MARS) analysis was used to establish the final prediction model. The present study found that women <22, >26, and >34, with Hb levels of <12.5 gr%, and had nulliparity or multiparity (4 times) were reported as a higher risk of prolonged and obstructed labor. Meanwhile women with a fundal height of <34 cm, a height of >156 cm and >149 cm, a history of normal labor, presentation of the fetus behind the head, gestational weight gain of <12.3 kg, and pre-pregnancy BMI of <28.9 kg/m2 were identified as factors decreasing the risk of prolonged and obstructed labor. In conclusion, significant predictors of the outcome were maternal characteristics (age, parity, height, and history of labor method), maternal nutrition status (BMI pre-pregnancy, gestational weight gain, and hemoglobin levels), and fetal status (fundal height and fetal presentation).

Keywords: Prolonged Labor, Obstructed Labor, Prediction Model, MARS.

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1. INTRODUCTION

Prolonged and obstructed labor are part of the major causes of maternal mortality and morbidity, with almost 95% occurring in low and lower-middle-income countries (World Health Organization, 2020). Excessive duration of deliveries contributed 2.8% (95% CI: 1.4-5.5) to maternal deaths globally, with the highest average occurring in East Asia at 12.3% and 6.4% for Southeast Asia. (Say et al., 2014). In Indonesia, it accounts for 4.3 % of common complications during childbirth (Kementerian Kesehatan RI, 2018).

Prolonged and obstructed labor are common birth complications. Diagnosis of prolonged labor depends on careful monitoring of uterine contraction intensity, duration and frequency, cervical dilation, and descent of the fetus through the pelvis. A previous study defined prolonged labor as prolonging the duration of labor, typically in the first stage of labor (Nystedt & Hildingsson, 2014). It is an active labor that lasts for more than 12 hours. (World Health Organization, 2014). Meanwhile, obstructed labor (labor dystocia) is a failure to progress due to mechanical problems, such as a mismatch between fetal size, or more accurately, the size of the presenting part of the fetus, and the mother's pelvis, although some malpresentation, notably a brow presentation or a shoulder presentation (Ayenew, 2021).

Prolonged and obstructed labor impacts both the mother and the fetus. Women with long labors had an increased risk of a negative birth experience, which might lead to women avoiding childbearing or cesarean section (Walker et al., 2020; Zhu et al., 2019). *It also* increases disease incidence, such as the risk of postpartum hemorrhage, uterine rupture, maternal death to the mother, permanent brain damage, neonatal seizures, fetal hypoxia, and fetal death of the baby (Li et al., 2011).

Many *factors* can influence labor's progress. Common underlying causes include inefficient uterine contractions, abnormal fetal presentation or position, inadequate bony pelvis, or soft tissue abnormalities of the mother (World Health Organization, 2014). A similar previous study reported that parity, premature rupture of membranes, and fetal weight correlated with the incidence of prolonged labor (Sui et al., 2021). Being a referral from a lower health facility (AOR 6.80, 95% CI: 4.20–11.00) and prime parity (AOR 2.15, 95% CI: 1.26–3.66) also contribute to prolonged and obstructed labor (Musaba et al., 2020).

A few studies have identified factors associated with prolonged and obstructed labor, but these have only described limited risk factors and lacked information on the role of spontaneous vaginal deliveries in the studies (Ayenew, 2021; Musaba et al., 2020; Yeshitila et al., 2022). No study has documented the risk factors for prolonged and obstructed labor that represent the population of East Nusa Tenggara. In addition, the MARS approach in prediction study could capture the intrinsic complicated data mapping in high-dimensional data patterns. therefore, the present study could estimate the contributions of the input variables and established the predictors model for prolonged and obstructed labor using MARS analysis.

2. RESEARCH METHOD

This was a case-control study where the information was obtained by reviewing antenatal records, the mother's card, and partographs at all public health centers located in Kupang City, Kupang Regency, TTS, Rote-Ndao, and Sabu-Raijua on November 2017. The study population consisted of women who delivered at East Nusa Tenggara and registered in public health centers between 1 January – 31 December 2016. The Research Committee of the Faculty of Public Health, Airlangga University (No. 91-KEPK) reviewed and approved this research protocol.

Women eligible for the study were those women who had: (1) gestational age ≥ 38 weeks; (2) have a birth record, which consists of gestational age and delivery process, which is filled out on the partograph; (3) have a complete pregnancy record on the mother's card at every antenatal visit (1-1-2), which consists of age, parity, height, weight before pregnancy, weight

in the 1st and 3rd trimesters, upper arm circumference, Hb levels in the 1st and 3rd trimesters, history of the maternal disease (allergic, chronic, infections or parasites), history of previous obstetric complications (abortion, premature rupture of membranes, stillbirth, prolonged labor), history of previous delivery methods (vacuum, forceps, section cesarean delivery), gestational age, number of fetuses, uterine fundal height, estimated fetal weight, fetal presentation, the position of the fetal head to pelvic inlet.

Prolonged or obstructed labor was defined as the progress of the labor, according to the partograph. If the opening of the cervix crosses the alert line, the woman who has long labor was recruited as the case (Dalal & Purandare, 2018). The controls were women who experienced normal birth patterns based on the notes on the partograph where the cervix did not cross the alert line, and both the mother and her baby were alive without complications and were declared healthy. The sample size was calculated to be 570 to obtain a power of 90% and a 5% significance level. The case and control groups were 285 women each.

The outcome of the study was the incidence of prolonged or obstructed labor. While the independent variables were: age during pregnancy, parity, BMI pre-pregnancy, gestational weight gain, upper arm circumference, Hb levels, history of the maternal disease (allergy, chronic, parasitic infections), maternal height, history of previous obstetric complications (abortion, premature rupture of membranes, stillbirth, prolonged labor), history of previous labor methods (normal, vacuum, forceps, cesarean section), gestational age, uterine fundal height, estimation of fetal weight, fetal presentation, the position of the fetal head to pelvic inlet.

The descriptive analysis uses frequency and percentage to describe categorical variables and the average value and standard deviation to describe numerical variables. Selecting research variables for multivariate analysis using the t-independent test for numerical variables and the Chi-Square test for categorical variables. Variables with p-value <0.25 will be included in the multivariate modeling. A predictive model for prolonged or obstructed labor is formed to analyze significant variables using the Multivariate Adaptive Regression Spline (MARS) Binary Logistics method. We determine the optimal model with the minimum GCV and MSE-test values and RMSE<1. The performance or the predictive ability of models of prolonged or obstructed labor events using the ROC Curve and the Hosmer and Lemeshow Test (Friedman, 1991).

3. RESULTS AND DISCUSSION

The descriptive characteristics of study participants are summarized in Table 1. A total of 570 women met the inclusion criteria; 285 experienced prolonged labor as the case group and 285 as the control group.

Table 1. Descriptive Characteristics of Study Participants

| Characteristics | Prolonged Labor | | Total (N= 570) | p-value |
	Cases (n= 285)	Control (n= 285)		
Age (Mean ± SD)	32.1 ± 5.8	26.7 ± 5.0	29.4 ± 6.1	
< 20	22 (7,7%)	15 (5,3%)	37 (6,5%)	<0.001[*)]
20 – 35	185 (64,9%)	255 (89,4%)	440 (77,2%)	
> 35	78 (27,4%)	15 (5,3%)	93 (16,3%)	
Parity				
Nulliparity (0)	108 (37,9%)	72 (25,3%)	180 (31,6%)	0.005[**)]
Primiparity (1)	73 (25,6%)	81 (28,4%%)	154 (27,0%)	

Multiparity (2)	30 (10,5%)	61 (21,4%)	91 (16,0%)	
Multiparity (3)	33 (11,6%)	51 (17,9%)	84 (14,7%)	
Multiparity (≥ 4)	41 (14,4%)	20 (7,0%)	61 (10,7%)	
Height (Mean ± SD)	149.9 ± 3.5	154.1 ± 5.0	152.0 ± 4.8	
< 145 cm	15 (5,3%)	6 (2,1%)	21 (3,7%)	<0.001[*)]
145 – 149 cm	111 (38,9%)	46 (16,1%)	157 (27,5%)	
150 – 154 cm	138 (48,4%)	92 (32,3%)	230 (40,4%)	
155 – 159 cm	16 (5,6%)	99 (34,7%)	115 (20,2%)	
≥ 160	5 (1,8%)	42 (14,8%)	47 (8,2%)	
Childbirth Complications				
No	230 (80,7%)	251 (88,1%)	481 (84,4%)	0.021[**)]
Premature rupture of membranes	13 (4,6%)	6 (2,1%)	19 (3,3%)	
Prolonged labor	9 (3,1%)	6 (2,1%)	15 (2,6%)	
Stillbirth	12 (4,2%)	5 (1,7%)	17 (3,0%)	
Abortion	21 (7,4%)	17 (6,0%)	38 (6,7%)	
Labor method				
Never	108 (37,9%)	72 (25,3%)	180 (31,6%)	0.001[**)]
Vaginal spontaneous	163 (57,2%)	213 (74,7%)	376 (65,9%)	
Vacuum assist/ Forcep	14 (4,9%)	0 (0,0%)	14 (2,5%)	
Cesarean Section	0 (0,0%)	0 (0,0%)	0 (0,0%)	
Disease history				
No	280 (98,2%)	283 (99,3%)	563 (98,8%)	0.246[**)]
Yes (Malaria)	5 (1,8%)	2 (0,7%)	7 (1,2%)	
Pre-pregnancy BMI (kg/ m^2) (Mean ± SD)	23.2 ± 2.8	21.6 ± 2.9	22.4 ± 2.8	
< 18,5	49 (17,2%)	53 (18,6%)	102 (17,9%)	<0.001[*)]
18,5 – 24,9	174 (61,1%)	204 (71,6%)	378 (66,3%)	
25 – 29,9	58 (20,3%)	26 (9,1%)	84 (14,7%)	
≥ 30	4 (1,4%)	2 (0,7%)	6 (1,1%)	
Upper arm circumference (cm) (Mean ± SD)	24.9 ± 2.6	24.4 ± 2.4	24.6 ± 2.5	
< 23,5	64 (22,5%)	58 (20,4%)	122 (21,4%)	0.001[*)]
≥ 23,5	221 (77,5%)	227 (79,6%)	448 (78,6%)	
Hemoglobin Levels in the Third Trimester (gr%) (Mean ± SD)	10.4 ± 1.05	11.1 ± 1.06	10.7 ± 1.03	
< 8,0	3 (1,0%)	1 (0,4%)	4 (0,7%)	<0.001[*)]
8,0 – < 11,0	174 (61,1%)	130 (45,6%)	304 (53,3%)	
≥ 11,0	108 (37,9%)	154 (54,0%)	262 (46,0%)	
Weight gain during pregnancy (kg) (Mean ± SD)	12.2 ± 1.91	11.7 ± 1.98	12.0 ± 1.96	
< 9,0	7 (2,4%)	25 (8,8%)	32 (5,6%)	0.001[*)]
9,0 – 16,0	267 (93,7%)	257 (90,2%)	524 (91,9%)	
> 16,0	11 (3,9%)	3 (1,0%)	14 (2,5%)	

Gestational age (week) (Mean ± SD)	40.0 ± 0.95	39.5 ± 0.98	39.8 ± 0.99	
38 – 41	283 (99,3%)	284 (99,6%)	567 (99,5%)	<0.001[*)]
> 41	2 (0,7%)	1 (0,4%)	3 (0,5%)	
Fundal height (cm) (Mean ± SD)	33.2 ± 1.1	31.8 ± 0.8	32.5 ± 1.17	
< 31	0 (0,0%)	6 (2,1%)	6 (1,1%)	<0.001[*)]
31 – 35	273 (95,8%)	279 (97,9%)	552 (96,8%)	
> 35	12 (4,2%)	0 (0,0%)	12 (2,1%)	
Estimation of fetal weight (gram) (Mean ± SD)	3360.5 ± 174.98	3147.1 ± 146.10	3258.8 ± 190.52	
2500 – 2999	0 (0,0%)	47 (16,5%)	47 (8,3%)	<0.001[*)]
3000 – 3500	231 (81,1%)	236 (82,8%)	467 (81,9%)	
> 3500	54 (18,9%)	2 (0,7%)	56 (9,8%)	
Position of the fetal head to the pelvic inlet				
In	150 (52,6%)	165 (57,9%)	315 (55,3%)	0.238[**)]
Not in yet	135 (47,4%)	120 (42,1%)	255 (44,7%)	
Fetal presentation				
Top of head	20 (7,0%)	2 (0,7%)	22 (3,9%)	<0.001[**)]
Back of head	265 (93,0%)	283 (99,3%)	548 (96,1%)	

[*)]*t-independent test;* [**)]*Chi-square test;* [)] *statistically significant*

The results showed that most subjects who experienced prolonged labor were older (average aged 32.1), in parity of first children (37.9%), and had lower average height (149.9 cm). Of the 570 study subjects, it was found that most of the mothers (84.4%) had never experienced a history of complications in previous labors, and the remaining 15.6% had experienced a history of complications of childbirth such as abortion, premature rupture of membranes, prolonged labor, or stillbirth. Most subjects in both groups delivered spontaneously vaginally, and only 1.2% had a history of illness (malaria). Those who experience prolonged labor have an average pre-pregnancy BMI higher (23.2 kg/m^2) than women with normal delivery (21.6 kg/m^2).

The average size of the upper arm circumference in the first trimester of women with prolonged labor was slightly larger (24.9 cm) than that of women with normal delivery (24.4 cm). Meanwhile, women who experienced prolonged labor had lower hemoglobin levels in the third trimester (10.4 gr%), a more significant weight gain during pregnancy (12.2 kg), a slightly longer gestational age at delivery (40 weeks), and had a higher fundal height (33.2 cm) than in control. The estimated fetal weight calculated at gestational age ≥ 38 weeks is heavier (3360.5 grams) in women who experience prolonged labor than in women with normal delivery. It can be seen that almost the same percentage of mothers with the position of the fetal head enter the pelvic inlet during labor between cases and controls. Most subjects with back-of-the-head presentations experienced long labor progress and normal labor progress. Multivariate analysis should include all the independent variables (p-value <0.25).

Table 2. Results of Optimal Model Selection with the MARS Method for Predicting Prolonged and Obstructed Labor.

MARS[1] Model	GCV[2]	MSE-test[3]	RMSE[4]
Model without interaction	0.0804	0.0816	0.2691
A model with the interaction of two variables	0.0863	0.0863	0.2817
Maximum interaction of all variables	0.0925	0.0876	0.2915

[1]*Multivariate Adaptive Regression Splines;* [2]*Generalized cross-validation;* [3]Mean Square Error*;* [4]*Root Mean Square Error*

Table 2 shows the results of the optimal model selection between three models with 30 basis functions and validated with 10-fold cross-validation. The best prediction model was the MARS model without interaction with the lowest GCV (0.0804), the lowest MSE-test (0.0816), and RMSE <1 (0.2691).

Table 3. Results of Selection of Predictor Variables Included in the MARS Model

Predictor	Importance Scale	GCV
Age	100.00*	0.1294
Fundal height	72.51*	0.1062
Maternal height	47.37*	0.0914
Hemoglobin levels	29.63*	0.0848
Parity	25.52*	0.0837
Delivery method	16.66*	0.0818
Fetal presentation	13.97*	0.0814
Gestational weight gain	8.08*	0.0808
BMI	5.46*	0.0806
Obstetric Complications History	0.0	0.0805
History of illness	0.0	0.0805
Estimation of fetal weight	0.0	0.0805
Upper arms circumference	0.0	0.0805
Gestational age	0.0	0.0805
Position of the fetal head to the pelvic inlet	0.0	0.0805

Important contribution variables

From the selected MARS model, the contribution of the predictor variable was identified based on the predictor variable that minimized the GCV value with a rating scale of 0–100. Variables considered essential in the predictive model of prolonged or obstructed labor were age, uterine fundal height, body height, hemoglobin level, parity, history of delivery, fetal presentation, gestational weight gain, and prepregnancy BMI.

Table 4. Final MARS Model for Predicting Prolonged and Obstructed Labor.

Predictors	Regression Equation	Coefficient	Std. Error	t	p-value
Intercept		0.6419	0.0829	7.7367	<0.001
Age					
BF 4	Max (0. 22 – age)	0.0850	0.0113	7.5234	<0.001
BF 17	Max (0. age – 26)	0.0705	0.0148	4.7499	<0.001
BF 13	Max (0. age – 34)	0.0869	0.0051	16.8856	<0.001
Fundal height					
BF 2	Max (0. 34 – fundal height)	-0.1723	0.0127	-13.5814	<0.001

Height					
BF 5	Max (0. height – 149)	-0.0300	0.0051	-5.8824	<0.001
BF 19	Max (0. height – 156)	-0.0165	0.0116	-1.4217	0.0018
Hemoglobin levels					
BF 10	Max (0. 12.5 – Hemoglobin)	0.0679	0.0115	5.9043	<0.001
Parity 0 or 4					
BF 11	(Parity in (0. 4))	0.1603	0.0308	5.2079	<0.001
History of labor method					
BF 7	(Labor method (spontan))	-0.1237	0.0326	-3.7894	0.0002
Fetal presentation					
BF 15	(Fetal presentation (back of the head))	-0.2058	0.0606	-3.3985	0.0007
Gestational weight gain					
BF 22	Max (0. 12.3 – Gestational weight gain)	-0.0150	0.0094	-1.6019	0.0079
Pre-pregnancy BMI					
BF 24	Max (0. 28.9 – BMI)	-0.0146	0.0060	-2.4286	0.0155
$R^2 = 0.7104.$ $(R – 0)^2 = 0.8552$				F = 113.8859	
R^2 Adj = 0.7042				p = <0.001	

Regression Equation:

Y = 0.6419 + 0.0850 max (0. 22 – age) + 0.0705 max (0. age – 26) + 0.0869 max (0. age – 34) - 0.1723 max (0. 34 – fundal height) - 0.0300 max (0. height – 149) - 0.0165 max (0. height – 156) + 0.0679 max (0. 12.5 – Hemoglobin) + 0.1603 (Parity 0 or 4) - 0.1237 (Spontan delivery method) - 0.2058 (Fetal presentation back of the head) - 0.0150 max (0. 12.3 – Pregnant weight gain) - 0.0146 max (0. 28.9 – Pre-pregnancy BMI);

Probability (Y = 1) = π(x) as mothers with prolonged or obstructed labor

Probability (Y = 0) = 1 – π(x) as mothers with normal labor

BF: Basis Functions

Table 4 describes the final MARS model without interaction for predicting the incidence of prolonged or obstructed labor under empirical data. Overall, a p-value <0.001 was obtained and could explain 70.42% of the variation in the probability of prolonged or obstructed labor (R^2Adj = 0.7042), so it can be concluded that the model can be accepted as a regression equation to predict the probability of prolonged or obstructed labor on subjects with specific characteristics. Risk indicators that can increase the occurrence of prolonged and obstructed labor, in order of highest risk level were fetal presentation, uterine fundal height, parity, history of labor method, age, hemoglobin levels, maternal height, gestational weight gain, and BMI pre-pregnancy.
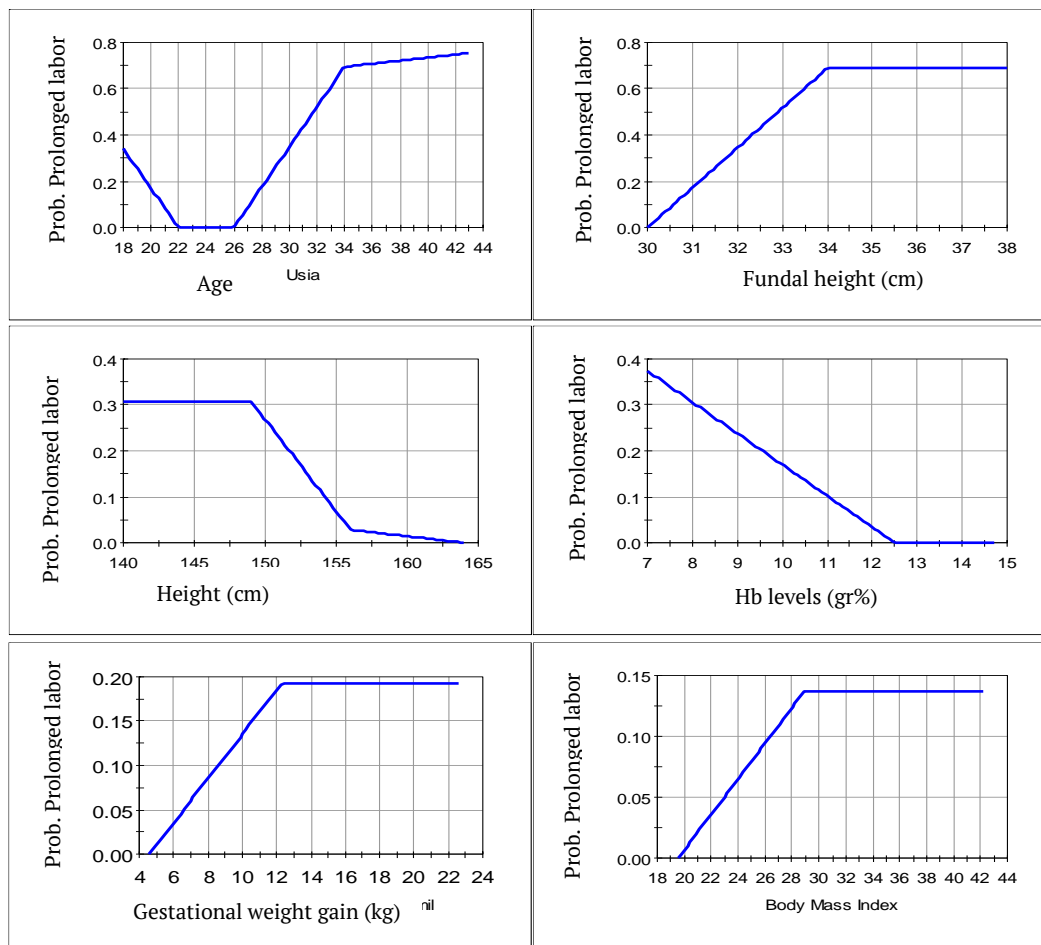
Figure 1. Curve Relationship of Probability of Prolonged and Obstructed Labor for Numerical Variables in the MARS Model without Interaction.

The relationship pattern of prolonged or obstructed labor events with continuous predictor variables included in the model is shown in Figure 1. The risk of prolonged or obstructed labor will increase in women under 22 years old, more than 26 years old, and more than 34 years old, with Hb levels of less than 12.5 gr%, and mothers with nulliparity or multiparity (4 times). In contrast, the risk of prolonged or obstructed labor will decrease in women with a fundal height of less than 34 cm, a height of more than 156 cm and more than 149 cm, a history of spontaneous delivery, presentation of the fetus behind the head, gestational weight gain of less than 12.3 kg, or a pre-pregnancy BMI of less than 28.9 kg/m^2.

Age was found to be significantly associated with the incidence of prolonged and obstructed labor. The present findings are consistent with previous literature that women aged less than 20 years old and advanced maternal age ($\geq$35 years old) had significant odds for various maternal complications, such as severe preeclampsia, eclampsia, postpartum hemorrhage, fetal distress, and poor fetal growth (Cavazos-Rehg et al., 2015; Lundborg et al., 2021). Those at risk of age for pregnancy experiencing prolonged labor are 25.9% (Wulansari et al., 2022). However, a slightly different result was found in this study that women aged more than 26 years old also increasingly developed prolonged labor.

Severe anemia or lower hemoglobin levels is also crucial for pregnant women. It antedates pregnancy is aggravated by increasing requirements during pregnancy, blood loss at delivery, and infections in the antenatal and postnatal periods. Severe anemia was proven to be associated with increased operative deliveries and prolonged labor (Malhotra et al., 2002).

Higher blood loss may be attributed to impaired uterine muscle strength for labor, affecting labor duration (Kumari et al., 2019).

Around 37.9% of cases in the current study were those with nulliparity. This is slightly different from a previous result that only primiparity (AOR = 7.74: 95%CI = 2.13, 18.2) caused higher odds of longer duration of labor (Musaba et al., 2020). However, the MARS model found different results that mothers with nulliparity or multiparity (4 times) increase the risk of developing prolonged or obstructed labor. This may be caused by other dominant studied factors.

Although this study has statistically proven fundal height can predict prolonged and obstructed labor, little literature has been published. It has been found in Thailand that the cut point for uterine fundus height predicts an increased risk of cesarean section delivery due to cephalopelvic disproportion at a size of more than 35 cm (Khunpradit et al., 2007). A similar finding of the present research is that the risk of prolonged or obstructed labor will decrease in women with a fundal height of less than 34 cm.

The results showed that a history of normal delivery methods was a predictor of a decrease in the incidence of prolonged labor. Table 1 presents 36.9% of all studied subjects had normal labor, meaning that they were exposed to oxytocin augmentation. Women with augmentation of labor decreased risk of emergency cesarean section (aRR 0.62, 95% CI 0.59-0.66) (Litorp et al., 2021).

It is also well-established that physical factors such as maternal height affect labor. The present result shows that the risk of prolonged and obstructed labor decrease gradually at a height of more than 156 cm and more than 149 cm. Existing studies have supported that shorter maternal height was associated with a higher frequency of caesarian section, low birth weight newborns, stillbirths, and prolonged obstructed labor (Myklestad et al., 2013; Stulp et al., 2011; Wu et al., 2021). This is because short-statured women tend to have *narrow pelvic areas which* are related to prolonged obstructed labor (Marbaniang et al., 2022).

A study in Mojo Town, Central Ethiopia has shown 16% of women experience obstructed labor and 66% are caused by cephalo-pelvic disproportion, and 22% account for malpresentation (Girma et al., 2022). Fetal malpresentation and malposition were identified as other causes of prolonged and obstructed labor (Ayenew, 2021) leading *to a greater risk of cesarean delivery* (Senécal et al., 2005). Therefore, longer durations may be appropriate to reassure maternal and fetal status and continued descent of the fetal presenting part (Gill et al., 2023).

In this study, gestational weight gain of less than 12.3 kg and a pre-pregnancy BMI of less than 28.9 kg/m^2 statistically proved to be associated with declining the risk of prolonged labor. Previous studies suggested that compared to normal-weight women, overweight and obese women have a prolonged duration of labor (Ellekjaer et al., 2017; Schuster et al., 2016; Zhou et al., 2019). Obese women were more likely to have a prolonged second stage (Frolova et al., 2021). Obesity during pregnancy may decline the contractility of abdominal muscles, resulting in suboptimal use of abdominal pressure during labor and lack of productive force, leading to prolonged labor (Zhou et al., 2019). This also resulted in a higher risk of cesarean delivery for overweight and obese compared to normal-weight women (Ellekjaer et al., 2017). Maternal obesity risks the newborn's life by increasing the risk for macrosomia, fetal distress and low Apgar score, hypoglycemia, and meconium aspiration (Schuster et al., 2016). More weight gain than recommended for maternal obesity and pregnancy leads to less breastfeeding (Marchi et al., 2015). Another finding reported that an effect modification between BMI and maternal age contributes to the longer duration of labor.
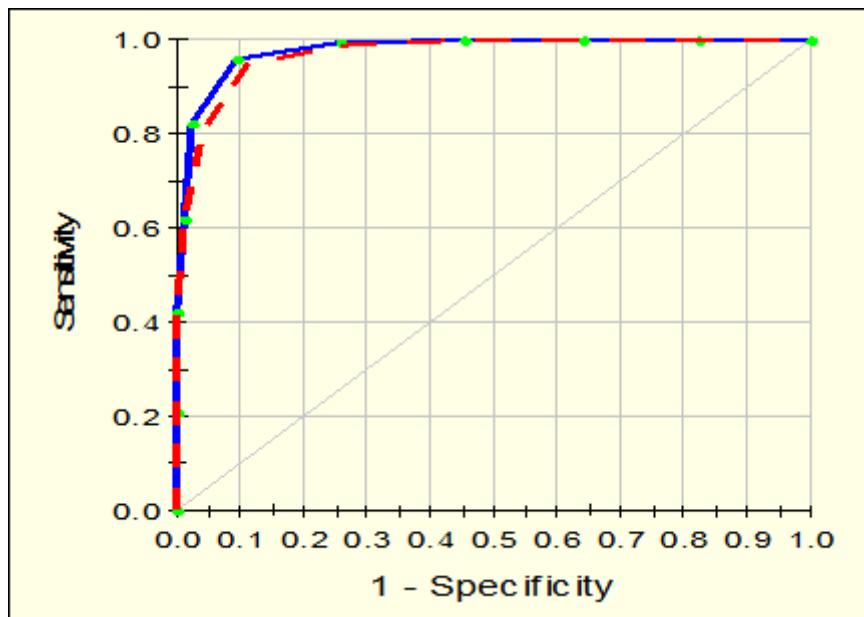
Figure 2. MARS Model ROC Curve for Predicting Prolonged and Obstructed Labor.

The performance of the MARS model prediction of prolonged and obstructed labor has been statistically measured from the results of the above ROC curve test. The results of the test-sample ROC curve showed a value of 0.974 (95% CI: 0.963-0.984). A slight decrease in the AUC value of only 0.01 after the model was validated. The learn-sample ROC curve and the test-sample ROC curve nearly coincide; this shows that the difference in AUC values can be neglected. The Hosmer-Lemeshow test sample yields a p-value of 0.348 (> 0.05); thus, the selected MARS model had good statistical quality and properly can be used to compile a risk index for preventing prolonged or obstructed labor.

This study benefited from its case-control design, accuracy in determining case subjects, and involving all registered pregnant women in primary health facilities in East Nusa Tenggara province; thus, the study represents the source population. However, we also acknowledge that the use of secondary data from partograph records and mother's cards is a limitation in this study. The subjectivity of data collection may be biased toward the results that we are unable to control.

4.   CONCLUSION

Prolonged and obstructed labor is a complicated condition that may cause maternal death. Significant risk factors used to predict the likelihood of prolonged and obstructed labor are maternal characteristics (age, parity, height, and history of labor method), maternal nutrition status (BMI pre-pregnancy, gestational weight gain, and hemoglobin levels), and status of the fetus that is determined by the fundal height and fetal presentation. Future studies need to use a cohort study design by including the variable of the feet length and an etiological conceptual framework to determine the relationship between age in the normal reproductive period (20-35 years) and its confounding factors for dystocia.

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R E S E A R C H	**Open Access**

Nursing Competencies in Ambulance Needs at Prehospital: A Scoping Review

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Abstract

Prehospital care has historically provided medical care with the aim of saving lives and preventing disability. Prehospital services that are accommodated by ambulances have complex and unpredictable care arrangements, so ambulance personnel, namely nurses, must prepare themselves to deal with all situations and conditions. This study aims to describe the competencies possessed by nurses while on duty in prehospital ambulances. This research is a literature study from several databases, and we obtained 20 articles for analysis. The results of the article analysis show that nurses who work in prehospital ambulances must have the competence to be able to save patients' lives, which is formed from knowledge, attitudes, and skills. Knowledge that must be possessed by ambulance nurses includes assessment, triage, and situation analysis. The positive attitudes of ambulance nurses include decision-making, communication, collaboration, caring, ethics, and culture. The skills possessed by ambulance nurses are BHD, intubation, examination of vital signs, interpretation of supporting examinations, and drug management. Ambulance nurses can improve their emergency care competencies through continuous education and training.

Keywords: Prehospital, Ambulance, Nurse, Competencies.

1. INTRODUCTION

Prehospital care has historically provided medical care with the aim of saving lives and preventing disability (Waldrop et al., 2020). Prehospital emergency services that begin with an emergency call to an emergency service centre are a very important part of the health care system (Forslund, 2007). Prehospital care has been described as early care, high quality first aid provided to a sick or injured patient starting from the moment an emergency call is received through to treatment at the scene or during ambulance transport to a medical (Nilsson et al., 2020).

Prehospital services accommodated by ambulances have complex and unpredictable care arrangements so that ambulance personnel, namely nurses, must prepare themselves to deal with all situations and conditions (Sjölin et al., 2020). There are generally two types of ambulances, namely emergency ambulances and transfer ambulances. An emergency ambulance refers to an ambulance that has the equipment to carry out resuscitation and the necessary medications. So, the patient still gets help during the transportation process. Transfer-type ambulances can be used to transfer relatively stable patients to the hospital. During the transfer process, only a few simple treatments can be performed such as infusion, oxygen inhalation, haemostasis, and splinting (Chen et al., 2021).

Nurses who work in ambulances should have emergency competence to be able to provide help to patients with complex conditions (Abelsson & Lindwall, 2012). Registered nurses have all responsibilities for care and treatment, which include patient assessment, decision-making, and evaluating the patient's condition (Colldén Benneck & Bremer, 2019). Until now, there has been no standard guideline regarding the competencies that nurses must have while on duty in an ambulance. In addition, nurses who work in ambulances only received basic emergency training, did not receive advanced emergency management, and did not receive formal prehospital care education (Suryanto et al., 2017). The data found in the field shows that nurses who work in ambulances have a diploma three educational background and the nursing profession.

Therefor it is necessary to have a literature discussion about the competencies that nurses should have to be able to serve in prehospital ambulances. This literature study aims to describe the competencies possessed by nurses when working in prehospital ambulances.

2. RESEARCH METHOD

This research is a literature study using several electronic databases, including Science Direct, ProQuest, SpringerLink, and EbscoHost. The selected article discusses the competence of nurses in ambulances with the keywords "*nurse competence AND prehospital AND ambulance*". Inclusion criteria in the selection of articles to be analyzed include articles published from 2016 to 2021, review articles, or original research written in English. The article selection process is carried out by prism analysis according to the purpose of the article review.

3. RESULTS AND DISCUSSION

After searching the literature from several databased using keyword, it was found that there were 410 articles consisting of 105 articles on science direct, 88 articles on ebscohost, 180 articles on ProQuest and 105 articles on springer link. After the screening process and abstract analysis were carried out, 20 articles were obtained which were analysed in full text to answer the research objectives. Researchers classify the competencies possessed by nurses who work in ambulances are divided into knowledge, attitudes and skills of nurses.

In general, nurses who work in ambulances should have competencies that have the main goal of life saving. The results of the literature review show that the knowledge possessed by nurses when serving in prehospital ambulances includes knowledge of triage, assessment (patient self-care; psychiatry; critical conditions; patient medical history; and medical assessment), knowledge in utilizing resources, understanding in conditions of care. emergency and critical care, understanding of the environmental situation, interpretation of the patient's condition and education. Attitudes that must be possessed by nurses on duty in prehospital ambulances include good decision making, therapeutic communication, collaboration, paying attention to cultural, social and ethical aspects, caring feelings, awareness of the patient's situation, implementing value-based nursing, and maintaining patient confidence. Meanwhile, the skills possessed by nurses on duty in prehospital ambulances include: basic life support, intubation, cardiopulmonary resuscitation, ventilation, physical examination, airway management, ECG examination, examination of vital signs, skills according to procedures, ability to handle medical conditions and psychiatry, safe and effective care, laboratory examination, prehospital point of care ultrasound, comprehensive patient surgery, medical care and drug management, attention to patient safety and leadership.
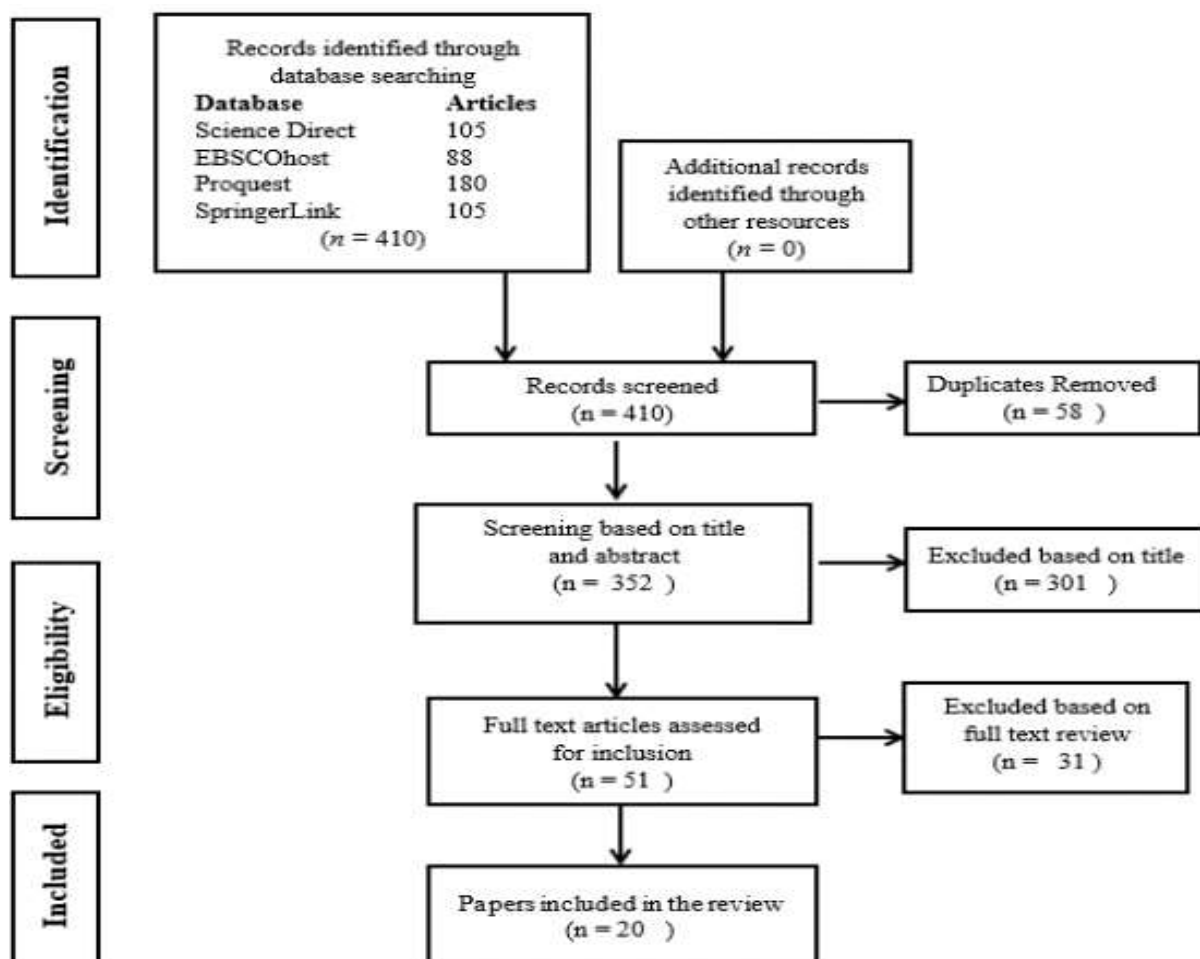
Figure 1. Flow chart of article selection.

Table 1. Selected Research Article.

No	Study Reference	Title	Prehospital Ambulance Nurse Competence
1.	Abelsson et al. (2018)	• The Prehospital assessment of severe trauma patients` performed by the specialist ambulance nurse in Sweden - a phenomenographic study	• Interventions to saving lives • Handling speed • Intubation • Cardiopulmonary resuscitation • Ventilation • Triage • Patient assessment • Physical examination • Airway management • Decision-making • Communication • Resource utilization • Personal skills
2.	Todorova et al. (2021)	• Perceptions of ambulance nurses on their knowledge and competence when assessing psychiatric mental illness	• Collaboration • Assessment of possible psychiatric disorders • Assessment of psychiatric characters
3.	Boyle and Eastwood, (2018)	• Drug calculation ability of qualified paramedics: A pilot study	• Accurate drug administration calculations
4.	Coll-Badell et al. (2017)	• Emergency Nurse Competence in Electrocardiographic Interpretation in Spain: A Cross-Sectional Study	• Ability in electrocardiographic examination
5.	Vicente et al. (2021)	• Experience of using video support by prehospital emergency care physician in ambulance care - an interview study with prehospital emergency nurses in Sweden	• Assessment of patient self-care • Interprofessional collaboration • Decision-making
6.	Nilsson and Lindström (2017)	• Nursing students' perceptions of learning nursing skills in the ambulance service	• Professional skills o Assessment o Prioritizing, initiation of care and medical care o Evaluation of intervention

No	Study Reference	Title	Prehospital Ambulance Nurse Competence
			• Provide care by paying attention to cultural, social and ethical aspects • Decision making in collaboration • Caring
7.	Holmberg et al. (2017)	• The knowledge desired by emergency medical service managers of their ambulance clinicians – A modified Delphi study	• Knowledge in exploring patient situations holistically • Knowledge in assessing and providing patient care • Medical knowledge to study and treat different diseases • Knowledge in reviewing and providing treatment in critical conditions
8.	Hörberg et al. (2019)	• Challenging encounters as experienced by registered nurses new to the emergency medical service: explored by using the theory of communities of practice	• Able to make decisions independently with minimal resources and support
9.	Bremer et al. (2020)	• Translation and further validation of a global rating scale for the assessment of clinical competence in prehospital emergency care	• Situation awareness • History assessment • Patient assessment • Decision-making • Resource utilization • Communication • Procedural skills
10.	Axelsson et al. (2016)	• How the context of ambulance care influences learning to become a specialist ambulance nurse a Swedish perspective	• Spontaneously must be able to deal with any possible medical and psychosocial problems in an unexpected environment
11.	Tavares et al. (2016)	• Informing a Canadian paramedic profile: Framing concepts, roles and crosscutting themes	• Provide safe and effective clinical care • Focusing on providing integrated, safe and effective health care • Provide collaborative nursing care

No	Study Reference	Title	Prehospital Ambulance Nurse Competence
			• Can provide patient education
12.	Sedlár (2020)	• Cognitive skills of emergency medical services crew members: A literature review	• Able to understand pre-hospital emergency situations that can change at any time • Able to collect patient situation and environment well • Able to interpret the patient's condition • Able to make decisions
13.	Rubenson Wahlin et al., (2016)	• Do male and female trauma patients receive the same prehospital care?: An observational follow-up study	• Provide emergency services without discriminating against patients
14.	Magnusson et al. (2020)	• Pre-hospital triage performance and emergency medical services nurse's field assessment in an unselected patient population attended to by the emergency medical services: A prospective observational study	• Triage • Clinical decision making • Care focus
15.	Nadim et al. (2021)	• Prehospital emergency medical technicians can perform ultrasonography and blood analysis in prehospital evaluation of patients with chronic obstructive pulmonary disease: a feasibility study	• Laboratory examination • Prehospital point of care ultrasound
16.	Dúason et al. (2021)	• Patient handover between ambulance crew and healthcare professionals in Icelandic emergency departments: a qualitative study	• Perform comprehensive and accountable patient operations
17.	Castrèn et al. (2017)	• The effects of interprofessional education – Self-reported professional competence	• Nursing care • Able to perform medical treatment and medication management

No	Study Reference	Title	Prehospital Ambulance Nurse Competence
		among prehospital emergency care nursing students on the point of graduation – A cross-sectional study.	• Able to provide education to patients • Maintain patient safety • Leadership
18.	Jansson et al. (2020)	• Prehospital care nurses' self reported competence: A cross-sectional study	• Nursing care • Value-based nursing process • Medical treatment • Understanding the emergency nursing environment • Understanding the nursing environment in critical conditions • Leadership management
19.	Vázquez-Casares and Vidal (2020)	• Specific competencies of prehospital emergency nursing: The views of Spanish university professors	• Able to measure and recognize life-threatening vital signs • Able to perform basic and advanced life support
20.	Yoon (2021)	• Development of emergency nursing care competency scale for school nurses	• Maintain patient confidence when providing emergency nursing care • Take action in accordance with the laws and regulations • Collect subjective and objective patient data quickly and systematically • Conducting data analysis that has been carried out thoroughly • Carry out emergency nursing care in accordance with evidence-based • Perform therapeutic communication and build a trusting relationship with patients

DISCUSSION

1.   Knowledge

The results showed that the knowledge possessed by ambulance nurses included assessment, triage, and situation analysis. Knowledge becomes a basis for a person in taking an action. The knowledge possessed by nurses is the basis for nurses' competence when working in prehospital ambulances. Assessment is the first step of the five nursing care processes. The assessment carried out by nurses must be comprehensive, systematic and ongoing regarding the condition, situation and needs of patient care. Kurniawan dan Hariyati (2019) stated that there are six factors that can influence nurses in conducting assessments. The six factors include specific abilities, clinical experience, patient safety culture, education level, team performance and health systems. Knowledge in conducting assessments will be directly proportional to the management of nursing care. The better the knowledge of emergency nurses in conducting initial assessments, the better they will be in conducting primary surveys (Massa, 2018). Knowledge of the assessment is needed, because the assessment is the first way to determine the patient's condition to be able to provide appropriate action.

Knowledge of triage is defined as a nurse's understanding of the process of sorting out emergency patient conditions to determine the priority of patients being treated (AlMarzooq, 2020). Triage has an essential role in prehospital services because in hospital services it does not have the same facilities or resources as intra-hospital. This makes it very important for ambulance nurses to understand triage. Work experience and training history of nurses have a relationship with nurses' triage knowledge (Duko et al., 2019). Knowledge of triage is also said to be complex and multifactorial and can also depend on several variables including gender, age, last education level, long working history, and individual factors owned by nurses (Widyani et al., 2020).

Nurse's knowledge regarding the analysis of the patient's situation and condition is needed because the patient's condition is different. Prehospital patients have varying degrees of urgency. In addition, the resources owned by ambulance nurses are limited, so the ability to extract information about the patient's situation and condition is needed. Knowledge of patient situation analysis is also needed because not all patients understand emergency conditions that do require ambulance handling. Hoikka et al. (2017) said that there were still many patients who after being provided with ambulance services did not require referral or further action, because they were not in an emergency condition. Therefore, prehospital ambulance nurses must be able to distinguish patients who are in a condition requiring immediate help through a good situation analysis.

2.   Attitude

The results of the literature review found that the attitudes of nurses that shape the competence of nurses in providing services include decision making, communication, collaboration, caring, ethics, and culture. The attitude of the ambulance nurse is understood as a term that expresses evaluative statements towards emergency patients who require ambulance services.

Decision making is the ability of the ambulance nurse in deciding the conditions and actions required by the patient. Decision making is defined as a continuous process and experience is one of the main factors in determining decision-making ability (Maharmeh et al., 2016). Ambulance nurses who are always dealing with emergency conditions should have a good attitude in determining the right decision making regarding the actions given according to the patient's condition.

Communication is the process of sending and receiving messages between two or more people with the aim of understanding the message conveyed. Communication that occurs in prehospital ambulance services can occur between nurses and patients, nurses with work partners or nurses with other communities. Communication has an essential role because with good communication optimal results in providing nursing care can be achieved (Yulviana, 2020). A good communication attitude is also needed when we operate on patient conditions by ambulance nurses to officers at hospitals or advanced health services. The lack of structured communication procedures and the dual meaning of responsibility to patients in patient operations can jeopardize patient safety (Dúason et al., 2021). In addition, the existence of language barriers is also an obstacle found in communication attitudes. Differences in the language used by patients with the official language used can be a social risk factor in decision making (Gerchow et al., 2021).

Collaboration in providing prehospital emergency services can be done by nurses with other professions such as doctors or pharmacists. Willingness and ability to collaborate is needed to be able to provide optimal service for patients. Collaboration with pharmacists can be in the form of governance of drug formulation, dosage, storage and compliance with the use of drug content regulated by legislation (Acquisto et al., 2020). The attitude of collaboration between nurses and doctors or other professions should be improved as much as possible. The existence of inter-professional education and teamwork can be used as a way to increase this collaboration (Suryanto et al., 2016).

Caring attitude is the basic essence of nursing care services. It is very important for nurses to have a caring attitude because patients or families who are in an emergency condition have higher emotions than ordinary patients. Therefore, a caring attitude towards patients and families is needed to know the unique needs of patients (Svensson et al., 2019). Satisfaction is also expressed by patients when receiving health services by nurses who show a caring attitude, explain the results of the examination, and provide health education (Kumboyono et al., 2018). This shows that patients will feel more valued and feel that nurses are indeed there to provide services to patients. Therefor it is very important to have a caring attitude in providing prehospital ambulance services.

Ethics and culture have a role in how ambulance nurses behave in paying attention to patient culture and how to provide actions or services that are in accordance with the code of ethics. Violations that become ethical dilemmas found in providing emergency services by ambulance nurses include nurses not maintaining the confidentiality of patient identities, and unpleasant treatment if there is a gap between the nurse's wishes and the patient's request (Abelsson & Lindwall, 2018). In addition, nurses may have maximized umama in providing services by always paying attention to ethics. Nurses in providing services cannot be separated from dealing directly with patients' ethical problems. So it is very important for prehospital ambulance nurses to know how to make decisions so that the moral rights of patients feel respected (Torabi et al., 2020).

3. Skills

The results of the study show that the clinical skills possessed by prehospital ambulance nurses are basic life support (cardiopulmonary resuscitation, airway management and ventilation), intubation, vital sign examination, physical examination, supporting examinations (ECG, laboratory, ultrasound) and management drugs. Ambulance nurse skills refer to the skills possessed by ambulance nurses in providing emergency services. Basic Life Support (BLS) is defined as the efforts made by ambulance officers to maintain the life of patients who experience life-threatening conditions. These conditions include immediate recognition of signs of cardiac arrest, immediate activation of the emergency response, immediate CPR, and immediate defibrillation with Automated External Defibrillation (AED) (Yayasan Ambulans

Gawat Darurat 118, 2020). BLS skills are the basis of every health worker and of course ambulance nurses have a vital role in conducting BLS (Hansda et al., 2020). In BLS there are several actions that can be taken including Cardiopulmonary Resuscitation (CPR), airway management and providing ventilation or breathing assistance.

CPR is the most important part of BLS to restore circulatory and respiratory function in patients experiencing cardiac and respiratory arrest. The success of CPR to restore circulatory and respiratory function depends on how quickly CPR is initiated upon finding a patient in cardiac arrest (Rikhotso et al., 2021). Regular education and training on CPR and certification based on the American Heart Association is needed to improve their ability to save the lives of patients experiencing cardiac arrest (Alnutaifi, 2021).

Airway management is an action taken by ambulance nurses in freeing the airway of patients who have partial or total obstruction. Prehospital airway management can be performed by people with varying levels of training and skills. Basic airway management can be carried out by a layperson who has received training and further moderate and advanced airway management can be carried out by trained ambulance personnel (Tawfik et al., 2021). Meanwhile, intubation is an advanced airway management by inserting an airway tube into the patient endotracheal. Intubation should be performed by personnel who have been trained and have clinical authority to perform the procedure. After the airway is declared patent, the ambulance nurse must then be able to ensure that the patient's breathing can meet the patient's oxygen needs.

In addition to core skills in carrying out life-saving actions, ambulance nurses must also be able to perform a comprehensive vital sign examination and physical examination. Vital sign checks that are often carried out by ambulance nurses include checking the patient's blood pressure, pulse, temperature, respiratory rate and peripheral oxygen saturation. While the physical examination that must be done must focus on the patient's problem or trauma that the patient has. This is done because the nurse must take action as soon as possible after meeting the patient. Therefore, an examination that focuses on the patient's health problem is needed.

The results of the study showed that the supporting examinations were carried out including ECG, laboratory and prehospital point of care ultrasound examinations. ECG examination is performed in patients who have complaints of chest pain (Wibring et al., 2021). Emergency nurses and nurses who work in ambulances as the front line of health care providers should be able to install and interpret ECGs. The active involvement of nurses in interpreting the ECG and continuous learning is needed to be able to develop and improve the competence of nurses in interpreting ECG. Interpretation of the results of laboratory tests is also needed to establish a proper diagnosis so that it can provide accurate action.

Prehospital Point of Care Ultrasound (POCUS) can be performed in providing ambulance services to patients with trauma, breathing difficulties, and in cardiac arrest. With the POCUS prehospital examination, nurses can find out if there is trauma or injury in the patient's body that is not visible through a physical examination (Bøtker et al., 2018). Diagnostic accuracy is highly dependent on the training and experience of the operator performing the examination. Procurement and training are needed to increase the probability of using POCUS in prehospital settings (Ketelaars et al., 2018). Thus, ambulance nurses can immediately provide focused action to overcome patient problems.

In addition to skills in carrying out supporting examinations, ambulance nurses must also understand drug management. Ambulance nurses who are usually on duty without a doctor, must be able to provide emergency medicine to save the patient's life. This requires that every ambulance nurse must understand the calculation of drug doses and the use of each emergency drug.

4. CONCLUSION

Nurses who work in prehospital ambulances should have the competence to be able to save patient's lives. Nurse competence is formed from the knowledge, attitudes and skills of nurses. Knowledge that must be possessed by ambulance nurses includes assessment, triage, and situation analysis. The positive attitudes of ambulance nurses include decision making, communication, collaboration, caring, ethics and culture. The skills possessed by ambulance nurses are BLS, intubation, examination of vital signs, interpretation of supporting examinations and drug management. Ambulance nurses can improve emergency care competencies through continuous education and training.

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R E S E A R C H	**Open Access**

Philosophy of Science on The Development of Palliative Nursing Practice in The Implementation of Long-Term Care for The Elderly: A Literature Review

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Abstract

As people gets older can increase health problems due to degenerative processes, thus requiring long-term care. Nurses as providers of palliative nursing care are based on nursing philosophy as a guide for acting and behaving in providing nursing care. Provide scientific information to nurses related to the role of philosophy of science in the development of palliative nursing practice that supports the implementation of long-term care in elderly. A literature review study, using various databases from Pubmed, Google Scholar, Science Direct and Research Gate. The inclusion criteria for searching for literature sources is the year of publication of the articles used starting from 2017 to 2022, in English, Indonesian and full articles. The search keywords are, nursing philosophy, nursing theory, palliative nursing, palliative care. Article selection was carried out using PRISMA and critical appraisal with a final total of 20 articles. The provision of palliative care to patients is carried out through a philosophical approach that emphasizes optimal quality of life and function, mitigates symptoms that cause sadness and promotes the values of care that focuses on comfort so as to reduce suffering and improve the quality of life of patients and families. Palliative nursing includes an understanding of the disease, pain management, and general symptoms, and follow-up care planning. Nurses are expected to make the philosophy of nursing as a basic of human as a holistic being in providing palliative nursing care.

Keywords: Long Term Care, Palliative Nursing, Philosophy.

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1. INTRODUCTION

Philosophy is now more advanced in various fields and has an important role in life. The branch of philosophy itself has now developed in various fields, namely philosophy of knowledge, moral philosophy, philosophy of art, metaphysics, politics, philosophy of religion, philosophy of science, philosophy of education, philosophy of law, philosophy of history, philosophy of mathematics, and so on. Philosophy also plays a very important role in the field of health, especially in nursing. Philosophy in the field of nursing can be seen or viewed from two sides, namely, from the philosophy of education and the philosophy of nursing (Rofii, 2021). Nursing philosophy is a statement of basic and universal assumptions, beliefs, and principles about the nature of knowledge and thinking (epistemology) and about the nature of the entities represented in the paradigm, namely nursing practice and the human health process. There is no single dominant philosophy that prevails within the discipline of nursing.

Palliative care is an approach that aims to improve the quality of life of patients (adults and children) and their families in the face of a life-threatening illness by relieving sufferers from pain through early identification, perfect assessment, and management of pain and other problems, both physical, psychological, social, and spiritual (World Health Organization, 2020). The implementation of palliative care in Indonesia is still in its infancy and is still limited to certain hospitals. The number of health workers who understand the concept of palliative care is still limited. As a result, more patients die in hospitals without receiving specific palliative care, or they die at home without adequate support from palliative care professionals. Patients also experience various forms of suffering related to disease symptoms that should not have happened if their need for palliative services was properly met (Siagian & Perangin-angin, 2020).

The Long-Term Care Guidelines (2017) state that the older a person is, the more physical, mental, spiritual, economic, and social problems they experience (BKKBN, 2017). Data on disease patterns in the elderly show that one of the most basic problems in the elderly is health problems caused by degenerative processes. Based on (Kementerian Kesehatan Republik Indonesia, 2018) the most common diseases in the elderly are hypertension, osteoarthritis, stroke, dental-oral problems, chronic obstructive pulmonary disease (COPD), and diabetes mellitus (DM). In addition, with increasing age, various disorders appear, such as hearing loss, visual impairment, memory impairment, depression, easy falls, and so on (Badan Pusat Statistik, 2016). The emergence of these various diseases cannot be separated from the decline in functional ability due to decreased intrinsic capacity with increasing age. Frailty affects 25% of the elderly population today. Frailty causes disability to emerge from the level of disability. Currently, around 30% of those with disabilities suffer from mild to severe disabilities, although those with severe disabilities are only around 10%.

These conditions indicate that the elderly tend to have various diseases, vulnerabilities, and disabilities, thus requiring long-term care. As a result, a companion/caregiver is required, as well as the participation of health nursing professionals with various roles and specializations in elderly care, as well as a companion who can provide assistance in daily life. For family-based long-term care, family members have an important role as caregivers (BKKBN, 2017). Long-term care is an activity carried out by informal or professional carers or companions to ensure that the elderly, who are not fully able to care for themselves, can maintain their quality of life so that they are dignified until the end of their lives.

Long-term assistance for the elderly is the process of providing long-term assistance and support to the elderly who are unable to take care of themselves either partially or totally because they have limitations in physical and/or mental aspects, which are provided by informal and professional caregivers. Through this long-term care, it is hoped that families who live with

the elderly can provide long-term care services for the elderly optimally at home. We are interested in writing an article that discusses the role of philosophy of science in the development of palliative nursing practices that support the implementation of long-term care in the elderly based on the description above.

2. RESEARCH METHOD

The research design used in this study is a literature review. The protocol and evaluation of the literature review use the PRISMA checklist to determine the selection of studies that have been found and adjusted for the purpose of the literature review. The literature search was carried out using four databases, namely Pubmed, Google Scholar, Scient Direct, and Research Gate. The inclusion criteria for this article's literature search are the year of publication of the article used starting in the 2017-2022 range, in English or Indonesian, and the full article. Keywords adapted to Medical Subject Heading (MeSH), namely nursing philosophy, nursing theory, palliative nursing, and palliative care. The total number of articles used for analysis was 20 of 246 articles. The results of the selection of study articles can be described in the flow diagram below:
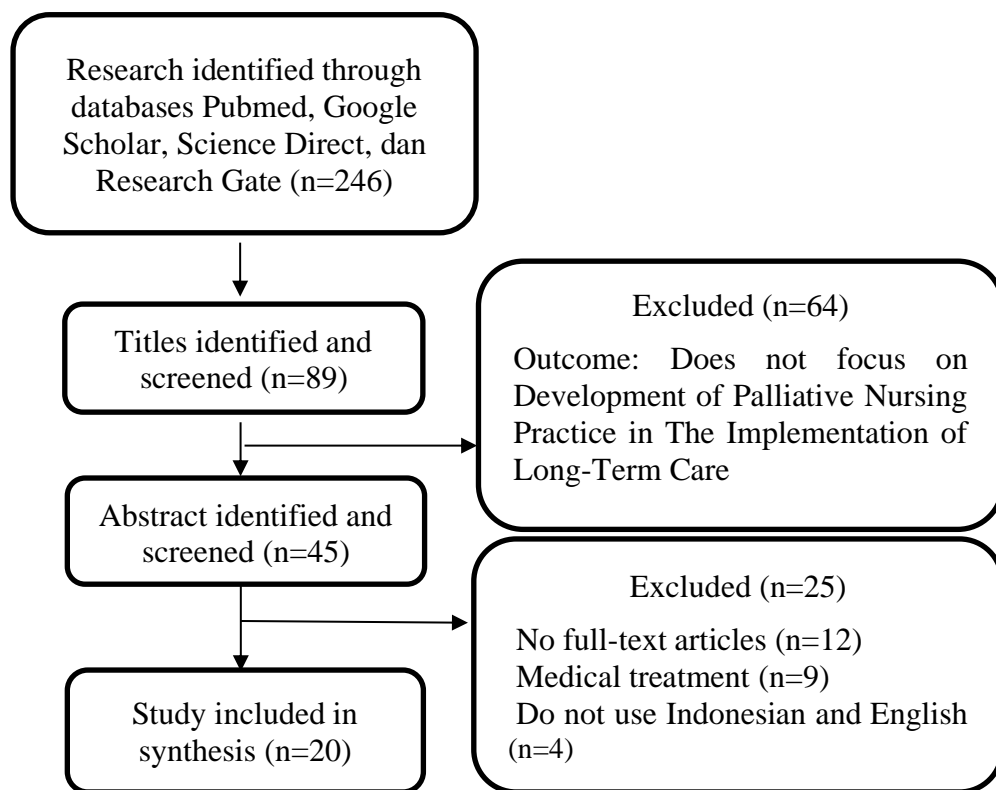
Figure 1. Flow diagram based on PRISMA

Critical appraisal is used by researchers to assess eligible studies. The study meets the inclusion criteria if the study score is at least 50% higher than a cut-off point value agreed upon by the investigator. Researchers excluded low-quality studies to avoid bias in the validity of the results and review recommendations, so that the last screening of articles used in the literature review contained 20 articles.

3. RESULTS AND DISCUSSION

Table 1. Data Analysis Results of the Literature Review.

No	Titles	Researcher	Outcome
1.	Why do nurses need philosophy?	(Prabawati, 2019)	Philosophy improves the ability of nurses to understand phenomena and helps nurses think critically in clinical and academic fields.
2.	The Role of Educational Philosophy as a Foundation for Health Transformation	(Pauzi et al., 2022)	The role of philosophy is important in the transformation of health, where there are demands for human resource competence to meet standards in order to encourage the formation of new health study programs.
3.	The Philosophies of Science in Developing Nursing Science Discussion Paper/Philosophical Paper	(Thet & Akbar, 2019)	The role of the philosophy of science in the development of nursing science, namely to provide views on science, knowledge, and research methodology, has made a significant shift in this era in the development of nursing science.
4.	Thoughts of Creation and the Discipline of Nursing	(Kristoffersen, 2018)	The results obtained by exploring participants thoughts on nurse roles in providing nursing care, three themes, namely: 1. Life is something greater than man 2. The creation of power is associated with humans 3. The understanding of life as something that is basically good Thus, the idea of a philosophical basis is supported by the experience of nurses in daily care, which will add elements to nursing care.
5.	Self-Confidence of Nurses Philosophy: A Concept Analysis	(Suandika et al., 2021)	Every nurse must understand the philosophy of nursing as a guide for acting and behaving in nursing practice. In addition, nurses must also understand aspects of balance, including how to make society and people healthy, reduce disease, improve environmental health, increase self-confidence, and balance the health of nurses.
6.	The Role and Status of Philosophy in Nursing Knowledge, Insight and Competence	(Cheraghi et al., 2019)	The results obtained were classified into three groups. 1. The role of the nurse in nursing science and education Integrating philosophical models with education is an effective method

			of applying critical, creative, and compassionate thinking so as to assist nurses in analyzing, combining, rationalizing, predicting, and thinking about ideas, feelings, and beliefs to provide professional care based on nursing care.
			2. The role of philosophy in developing nurse insights In terms of cognition, philosophy influences the nurse's insight into the nature of nursing, personality, environment, health, and disease. Nursing epistemology is considered a major factor in developing insights and identifying concepts in the nursing paradigm.
			3. The role of philosophy in nursing competence Nursing practice based on a holistic attitude integrated with philosophical thinking helps nurses analyze experiences and situations and better evaluate challenges. Beliefs, values, and hypotheses will enhance the ability of nurses to rationalize, predict complications, and transfer knowledge in clinical situations, thereby increasing their competence in clinical situations.
7.	Philosopical and Contextual Issue in Nursing Theory Development Concerning Technological Competency as Caring in Nursing	(Lim-Saco, 2018)	In today's technological world, theory-based nursing practice is proven to be effective in implementing the ontological perspectives that underlie interdisciplinary healthcare environments. When nurses face professional quandaries, they can use philosophical, conceptual, and theoretical thinking to shape nursing care.
8.	The role of philosophy in the development and practice of nursing: Past, present and future	(Bender et al., 2021)	There are 3 conclusions based on the topic of discussion related to the role of philosophy in the development and practice of nursing, namely: 1. The past The formation of the International Philosophy of Nursing Society (IPONS) reminds us that nursing and philosophy do not need to be

			distinguished, because the two can work together.
			2. Currently Concerning the status of nursing philosophy in Canada and the Nordic countries, it draws attention to society in general and education in particular to where philosophy is involved in nursing and the empirical activities that underpin research, with the goal of developing it into social practice. The involvement of philosophers in the development of nursing science with research based on empirical evidence (ontology, epistemology, and axiology). 3. The future The thoughts of some experts regarding the view of philosophy in the future, where ethics and philosophy are still placed separately between clinical and academic practice, then it needs to be followed up later to synergize between ethics and philosophy in future nursing practice.
9.	Toward Understanding of Nursing Knowledge Development	(Tuyen, 2018)	Understanding philosophy helps nurses better understand the roles, functions, and philosophical thinking of views in professional nursing practice.
10.	Fundamental Care Guided by the Careful Nursing Philosophy and Professional Practice Model	(Meehan et al., 2018)	"Careful Nursing" provides nurses with an opportunity to understand practical knowledge guides and philosophies, encouraging nurses to review how their understanding of human spirituality in nursing compares with their personal experience of spirituality in nursing. Nurses can be considered motivators in providing basic care when the dimensions and concepts of professional practice models are considered nursing values.
11.	The Nurse Practitioner Role is Ideally Suited for Palliative Care Practice: A Qualitative Descriptive Study	(Collins & Small, 2019)	Nurses involved in palliative nursing practice have a personal philosophy about death as a patient's emotional comfort and a normal part of the life process. Experienced nurses will be more comfortable caring for palliative

			patients and their families because it will create their own satisfaction.
12.	Study of Nurse's Philosophy: The Convenient Place to Die Peacefully for Terminal a Patients	(Yetti et al., 2019)	Terminal patient care is a program or facility provided specifically for patients who are nearing the end of their lives. Terminal patient care is a treatment that uses a philosophical approach toward the end of life, where nurses will replace the role of the family if they experience physical and emotional burden.
13.	A Nursing Philosophy of Chronic Disease Services-Based Palliative Care Nursing During Covid-19	(Nimah et al., 2022)	Palliative care aims to reduce suffering and improve the quality of life of patients and their families, which can be applied in hospitals, communities, and nursing homes. Various ways exist to reduce suffering, but there are many obstacles faced by patients and families trying to access health services during the COVID-19 pandemic due to social restrictions, so a special policy is needed to overcome this.
14.	American Academy of Nursing Expert Panel consensus statement on nursing's roles in ensuring universal palliative care access	(Rosa et al., 2021)	Integrating all sectors, including government, academia, and health facilities, in implementing palliative care, it is expected to be able to provide high-quality palliative care, with nurses taking on the main role, especially for marginalized communities and other high-risk populations.
15.	Culture and Palliative Care: Preferences, Communication, Meaning, and Mutual Decision Making	(Cain et al., 2018)	It was concluded that palliative care can be applied more easily and uncomplicated, namely emphasizing the need to work with patients, families and communities to negotiate care that is culturally meaningful and can ensure high quality palliative care.
16.	Specialist palliative care nursing and the philosophy of palliative care: a critical discussion	(Robinson et al., 2017)	The growth and integration of palliative care and the mediation of the biomedical model are linked to its development as contemporary palliative care. This has an impact on the focus of palliative nursing itself which only focuses on physical health. So a balance is needed between medical and nursing, where nurses can take a role in fulfilling psychosocial, emotional, and spiritual needs so as to achieve holistic and optimal care in the implementation of palliative care.

17.	An integrative review to identify how nurses practicing in inpatient specialist palliative care units uphold the values of nursing	(Moran et al., 2021)	Four themes were identified related to nurses implementing palliative care in hospitals: (1) improving patient-centered care; (2) being there; (3) exposure to suffering and death; (4) the value of nursing is seen but not heard. The findings highlight that while palliative care nurses do not articulate their nursing values, their actions and behaviors are evident in the literature, indicating caring, compassion, and commitment.
18.	Examining the Role of Specialist Palliative Care in Geriatric Care to Inform Collaborations: a Survey on the Knowledge, Practice and attitudes of Geriatricians in Providing Palliative Care	(Runacres et al., 2019)	A total of 168 participants provided information, with 58.3% being women and 36.6% having more than 20 years of clinical experience. Most geriatricians (85%) reported having treated the patient within the past 12 months. Geriatricians believe they need to coordinate care (84%), and they derive satisfaction from providing palliative care (95%). The vast majority (69%) thought that all patients with advanced disease should be cared for by a specialist palliative nurse.
19.	A New Pedagogical Approach to Enhance Palliative Care and Communication Learning: A Mixed Method Study	(Chang et al., 2022)	The quantitative study findings of the pre-post questionnaire showed an increase in the abilities of students participating in palliative care, namely knowledge (t=2.83, p=0.02), attitude (t=4.21, p=0.00), and efficacy (t = 0.27, p = 0.05). The quantitative study with a focus group discussion approach, showed an increase in learning palliative care and communication.
20.	A gap between the philosophy and the practice of palliative healthcare: sociological perspectives on the practice of nurses in specialised palliative homecare	(Glasdam et al., 2020)	There are two themes related to the problem of medical logic and organizational structure. Where in the implementation of care, especially in palliative nursing, the nurse's position is said to be under the doctor and their performs more delegation or mandate (collaborative) actions, the philosophy of nursing science in palliative nursing care itself is neglected or cannot be carried out optimally. This was realized by the nurse, so a home visit was made as a form of compensation.

a. The Big Picture of Philosophy of Science in Nursing

The philosophy of ontology is related to humans, while the science of ontology also contributes to the science of nursing. Therefore, according to this viewpoint, nursing can be an object of philosophical inquiry. Epistemology is used as a basis for human action and development in science as well as a means of knowing the truth of knowledge. This is closely related to the methodology of science-how to get that knowledge through processes and procedures. From this point of view, the nature of nursing knowledge can be an object of philosophical inquiry. The axiology of nursing science is an investigation or consideration of the morality of our actions and the knowledge or way of thinking that underlies the terms right versus wrong, good versus bad, or can also be interpreted for what knowledge is used and its relation to its use with moral principles (Risnah & Irwan, 2021).

b. The Existence of Nursing as an Independent

Science Existence is something that exists, has actuality, and is perfect. The existence of nursing is the existence of the actual perfection of nursing in Indonesia and in the world as an independent science. Existence in nursing is divided into three parts: ontology, epistemology, and axiology. Ontology is the study of reality or facts. Epistemology studies the origin, sources, structure, methods, and validity of knowledge. And ontology is a value theory concerned with the usefulness of acquired knowledge. In accordance with the times, the development of nursing science from year to year is increasing. Because the modern era and sophisticated technology have helped the process of developing nursing science develop rapidly, this is supported by several government policies that have recognized nursing as a profession. evidenced by Law No. 38 of 2014 concerning Nursing, which regulates nursing services as a form of professional service that is an integral part of health services based on nursing knowledge and tips aimed at individuals, families, groups, or communities, both healthy and sick. Then, the development of the nursing profession is also regulated in Permenkes No. 40 of 2017 concerning the development of clinical nurse career paths and is also supported by Kepmenkes No. HK.01.07/MENKES/425/2020 concerning nurse professional standards.

c. The Role of the Philosophy of Science in Palliative Nursing

Nursing philosophy is a basic view of the nature of a human being and the essence of nursing that forms the basic framework for implementing nursing practice. The nature of the human being referred to here is the human being as a living being biologically, psychologically, socially, and spiritually, while the essence is the philosophy of nursing, which consists of first viewing the patient as a holistic human being who must have all his or her biological, psychological, social, and spiritual needs met. given in a comprehensive manner and cannot be carried out unilaterally or as part of the need; second, the form of nursing services provided must be direct while still paying attention to the human aspect; third, everyone has the right to receive treatment regardless of differences in ethnicity, belief, social status, religion, and economy; fourth, nursing services are an integral part of the health system considering that nurses work within the scope of the health team, not alone; and fifth, the patient is a partner who is always active in health services, not as a passive recipient of services (Risnah & Irwan, 2021). The nurse's role in the discipline of nursing is not limited to the client; the family is also the focus of attention when providing care. The existence of a disease diagnosis in one of the family members will affect the family system as a whole, so the care provided is not only focused on the client. One way to improve the quality of end-of-life and palliative nursing care for families is to assess family satisfaction. Measuring satisfaction can be used to determine clinical and policy changes in palliative care so that it can result in an increase in the overall quality of care.

d.   Implementation of Long-Term Treatment

Law Number 52 of 2009 concerning Population Development and Family Development; Article 47 states that the government and regional governments establish policies for family development through fostering family resilience and welfare. The family development policy is in accordance with Article 48 Paragraph (1c) through fostering family resilience and welfare, which is carried out by improving the quality of life of the elderly so that they remain productive and useful for families and society by providing opportunities to play a role in family life. Indonesia is one of the top five countries with the most elderly population in the world, reaching 18.1 million people or 7.6 percent based on the results of the 2010 population census and increasing to 21.6 million people or 8.5 percent of the population based on data from the 2015 Inter-Census Population Survey. The number of elderly residents is expected to increase to 29.1 million in 2020 and 36 million in 2025 (BKKBN, 2017).

With increasing age, more and more health problems will be experienced due to a decrease in functional capacity and a higher risk of developing heart disease, diabetes, hypertension, degenerative diseases, and geriatric syndromes. Long-Term Care (PJP) is the process of providing long-term assistance and support to the elderly who are unable to care for themselves either partially or totally because they have limitations in the physical and/or mental aspects, provided by professional assistants and informal assistants (BKKBN, 2017). The elderly tends to have various diseases, vulnerabilities, and disabilities, so they require long-term care. As a result, a companion/caregiver is required, as well as the participation of health nursing professionals with various roles and specializations in elderly care, as well as a companion who can aid in daily life.

The goal of palliative care until death is to provide comfort and peace when you are in a palliative condition (a disease that cannot be cured medically) until the end of life (Agustini et al., 2022). Palliative care is special medical care for people with fatal illnesses for which there is no clear cure or even those who have been diagnosed with a terminal illness. The aim of this treatment is to relieve the patient's condition, not cure it. Palliative care cannot be done by just anyone; it must involve a special team of doctors, nurses, and other medical experts who are professionals in the field of palliative specialization. They are tasked with providing support for patients suffering from terminal illnesses and their families as they face the inevitable death. Palliative care is a type of care that does not only emphasize the physical condition of the patient but also focuses on emotional, psychosocial, economic, and spiritual aspects to meet the needs of improving the quality of life for the patient and his family (Agustini et al., 2021).

This treatment is appropriate for patients of all ages and with varying degrees of disease severity. This treatment is administered beginning with the diagnosis and continuing until near death or after death. This is so that patients can get a good quality of life before facing death, whose exact time is never known. It is important for patients to have access to health professionals who specialize in mental health so that they can help them be stronger through any psychological problems they have to face. Fear about the future is often a major concern for patients, and it is not uncommon for them to sometimes feel the need to express this. To help with their anxiety, this treatment consists of: counseling; visualization; cognitive therapy, a combination of psychotherapy and behavioral therapy carried out by means of counseling, the main goal is to change the mindset or behavior that causes various problems in one's life; drug therapy; stress management and relaxation therapy are also components of palliative care, which includes offering emotional support to patients who believe they require it (Cleary, 2020).

4. CONCLUSION

Nursing philosophy is a basic view of the nature of a human being and the essence of nursing that forms the basic framework for implementing nursing practice. The philosophy of nursing is a basic view of human nature as a holistic being (with biological, psychological, sociocultural, and spiritual needs). The provision of palliative care to patients is carried out through a philosophical approach that emphasizes optimal quality of life and function, mitigating symptoms that cause grief, and promoting care values that focus on comfort so as to reduce suffering and improve the quality of life of patients and their families. Palliative care includes an understanding of the disease, management of pain and common symptoms, planning of follow-up care, knowledge of community resources, and knowing when to refer the patient to a specialist. The application of long-term care should also be seen from the cultural perspective of the community, and the role of a palliative care specialist nurse is needed to maintain the values of nursing itself in practice. Nurses providing palliative nursing care can make the philosophy of nursing a basic view of human nature as a holistic being so that nurses do not only focus on curative actions but also pay attention to psychosocial and emotional aspects that are no less important in long-term care.

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R E S E A R C H   **Open Access**

MRI Case Report of Perianal Fistula with T2 TSE SPIR Sequence

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Abstract

MRI is a diagnostic imaging tool crucial for pelvic examination in perianal fistula cases. MRI imaging offers some advantages, especially in showing the area of spesi and secondary dilatation. Both have a high recurrence rate after surgery and an important role in determining surgical outcomes and minimizing complications. This study aims to evaluate pelvic MRI examination of perianal fistulas using the T2 TSE SPIR (Turbo Spin Echo Spectral Presaturation with Inversion Recovery) sequence. Research design used a qualitative descriptive method with participatory observation through a case study approach to Perianal Fistula using T2 TSE_SPIR. It was carried out at the Radiology Department of Mayapada Hospital in South Jakarta from August to December 2022. The MRI equipment Philips Achieva 1.5 Tesla with Sense Body Coil. MRI contrast agent of gadoteric acid, Vitamin E capsule, was attached to the perianal fistula location to make it easier for the radiologist to see the path of the perianal fistula. The results of Pelvis MRI images in perianal fistulas using the T2 TSE SPIR sequence shown with clear boundaries of perianal fistulas with anal organs, sigmoid colon, bladder, and prostate between one organ and another. Implementing the selection of the T2 TSE SPIR sequence to visualize fluid images becomes hyper-intensive by suppressing fat signals so that only fluid is visible in the perianal abscess and fistula images.

Keywords: MRI Perianal Fistula, T2 TSE SPIR, Gadoteric Acid, Sense Body Coil.

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1. INTRODUCTION

Perianal fistula is an inflammatory disorder in the anorectal area characterized by the presence of a channel between the anal canal and the (Das & Chakrabartty, 2021; Sarda et al., 2022; Włodarczyk et al., 2021). An anal fistula is usually the result of an untreated perianal abscess. This condition may also be associated with tuberculosis, cancer, radiation therapy, etc. (Amarprakash et al., 2022; Hokkanen et al., 2019). Perianal fistulae are the second most common anorectal disease after hemorrhoids. Surgery is considered the treatment of choice, aiming to avoid recurrence and maintain anal sphincter function. The risk of recurrence increases to 25% if the surgeon fails to recognize and thoroughly remove the fistula and associated elements during corrective surgery, especially internal openings and secondary tracts (Singh et al. 2022). Accurate and comprehensive evaluation of the fistula tract before surgery is, therefore a very important diagnostic strategy and greatly contributes to the success of the surgery. Magnetic resonance imaging (MRI) examination to determine fistula tract anatomy, presence of an abscess, and parameters of inflammation (Halligan, 2020; Shahzad et al., 2021; Włodarczyk et al. 2021)

MRI imaging has emerged as the preferred technique for preoperative evaluation of perianal fistulas to better treatment outcomes. The importance of MR imaging in this context lies in its ability to reveal hidden areas of sepsis and secondary enlargement, both of which contribute to high postoperative recurrence rates, determine surgical outcomes, and minimize complications. It plays an important role in limiting. Additionally, MRI images can be used to define the anatomic relationship of the perianal fistula and forecast the likelihood of post-operative faecal incontinence (Amato et al., 2020; Criado et al., 2018; Molteni et al., 2018; Shahzad et al., 2021; Sharma et al., 2020; Westbrook & Talbot, 2019).

MRI tools are more accurate than endosonography in determining the type of fistula and allow more branches to be detected (Cerit et al., 2020; Wahyuningtiyas & Apriantoro, 2020; Sharma et al., 2020). In another study, CT scan fistulography was able to locate the internal orifice in 28 patients (68.2%), whereas MRI was able to detect this aspect in 35 patients (85.3%).was more successful (Shahzad et al., 2021). Granulation tissue, inflammation, and edema around the fistula, abscess, and fistula wall fibrosis were also evaluated, from the study benefit from resonance imaging Magnetic (MR) includes Multiplanar imaging and advanced soft tissue differentiation (Madany et al., 2023; Sharma et al., 2022)

MRI is a diagnostic imaging tool that is very crucial in Pelvis MRI in cases of perianal fistula (Chen et al., 2021; Hyde et al., 2018; Lee et al., 2018). Examination technique and Pelvis MRI sequence for perianal fistulas used in routine examinations at MRI Radiology Installation Mayapada Hospital South Jakarta using a marker procedure at a location suspected of having a perianal fistula using vitamin E with the clockwise method and the sequence used T1W_TSE, T2W_TSE, and T2W_TSE_SPIR followed by gadolinium-based contrast material sequence T1W_TSE (Konan et al., 2018; Kakani, 2021; Sarma, 2019; Westbrook & Talbot, 2019). Using fat suppression techniques used in MRI examination is Spectral Presaturation with Inversion Recovery (SPIR), a fat suppression method that applies a frequency selective Inversion pulse. Frequency selective Inversion pulse is a combination of Fat Saturation and Short TAU Inversion Recovery (STIR) techniques which are based on not only fat tissue resonance frequency but also a short Time Inversion (TI) time (McRobbie et al., 2017; Westbrook & Talbot, 2019). This technique for this study to get a result that can suppress the fat signal so that only fluid signals are visualized on imaging, showing the perianal fistula tract, and inflammation in the area around the fistula.

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2. RESEARCH METHOD

The research method used qualitative descriptive with participatory observation through a case study approach to Perianal Fistula using T2 TSE SPIR. The Case study was conducted

at the Radiology installation of Mayapada Hospital in south Jakarta. These observation samples include only patients with perianal fistula cases from August to December 2022. Data were taken based on the results of observations, bibliographies, documentation, and interview results. Instruments and materials used during the research include; MRI equipment with PHILIPS 1.5 Tesla Achieva, Sense Body Coil, MRI headphones, and other supporting devices in the form of an MRI operator table, handscoon, tissue, earplugs, and patient monitoring devices in the MRI room. The examination parameters was used as shown in Table 1. This research has received ethical approval from the Health Polytechnic of the Ministry of Health Jakarta II No.LB.02.01/I/30/1091/2022.

Table 1. Parameters for Pelvis MRI using T2_TSE_SPIR sequences.

Sequences		TR[a] (ms)	TE[b] (ms)	FOV[c] (cm)	Matrix	Thick (mm)	Gaps (mm)	NSA[d]
Sagittal T2W_TSE		3660	80	38	512 x 256	3	0.3	2
Sagittal T2W_TSE_SPIR		3658	120	38	512 x 320	3	0.3	2
sagittal T1W_TSE		645	10	38	512 x 256	3	0.3	2
T2W_TSE axial oblique		466	80	25	320 x 256	3	0.3	3
T2W_TSE_SPIR axial oblique		3658	120	25	320 x 256	3	0.3	3
T2W_TSE coronal oblique		466	80	28	320 x 256	3	0.3	3
T2W_TSE_SPIR coronal oblique		3658	120	28	320 x 256	3	0.3	3
Postcontrast T1W_SPIR	Sagittal	593	9	38	512 x 256	3	0.3	2
	Axial oblique	593	9	25	320 x 256	3	0.3	2
	Coronal obliques	593	9	28	320 x 256	3	0.3	2

[a]TR = Time Repetition, [b]TE= Time Echo, [c]FOV= Field of View, [d]NSA = Number of Average

To prevent the patient from vomit or discomfort during the examinations, the patient must have fasted for 4 hours before the examinations start. The patient has to fills out informed consent and the examination procedure must be explained to the patient right before examinations. for precautions of allergic reactions for contrast injection, patients must be doing an allergic test before examinations. A nurse did abocath installation. The abocath used size no. 22, which is placed on the right metacarpal. Three-way installation was carried out and connected to a double syringe injector. If needed before starting injections of sterile fluid (NaCl) in perianal fistulas.

Placing a marker (vitamin E capsule) where there is a suspected lump of boil or pus is coming out using the anal clock method. If the location is more than one, then the marker is also more than one according to the number of boils. Position the patient supine at the MRI examination table with head first into the gantry (head first). The collimator light parallel to the Mid Sagittal Plane (MSP) and the middle of the pelvic area. Attach the Sense Body Coil in the middle of the pelvic area with the upper limit of the iliac crista and the lower border of the pubic symphysis. Provide an emergency bell to communication between the radiographer and the patient and instruct the patient not to move during the examination.

After all the preparations, the next step is to complete the patient identity and parameter examination to create axial, sagittal, and coronal topograms. Do the parameter settings for taking the sagittal image first, then axial oblique and coronal oblique sections are made from the sagittal image. After the pre-contrast sequence is completed, it is continued with the contrast media administration and scanned for Sagittal, Coronal, and Axial Oblique images. The

contrast medium concentration of a gadoteric acid 0.5 mmol/ml was used in Pelvic MRI examination of perianal fistulas at the Radiology Department of Mayapada Hospital.

3. RESULTS AND DISCUSSION

The patient of 44 years old man and 60 kg weight with perianal fistula has present in this study, ureum and creatinine results showed that kidney function is in normal range for urea and creatinine laboratory test of 20 mg/dl and 0.97mg/dl, respectively. Then the patient can continue the examination. In this study, to obtained the image of perianal abscess or perianal fistula, three planar images of T2W TSE are important to made, it's very helpful to visualize fluid images. However, on the T2 image, there is fat, and the visualization results are also hyper-intense. Fat has a high signal on magnetic resonance images (MRI), high signal due to fat may be responsible for artifacts such as ghosting and chemical shift. Therefore, the SPIR fat suppression method is used to suppress the fat signal so that only fluid signals are visualized on imaging (Delfaut et al., 1999; Murphy, 2020)

T1W_SPIR Post contrast media three-planar sequence to visualize inflammation in the perianal abscess and perianal fistula area using the SPIR fat suppression method suppresses fat signals so that only fluid signals are visualized on imaging.
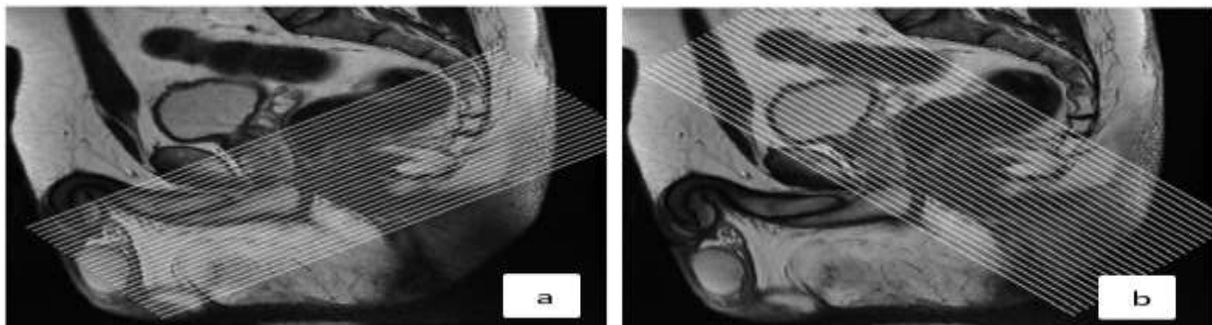
Figure 1. Sagittal MRI sequence images: a. T2W TSE, b. T1W TSE

The objective of the sagittal topogram in MRI is to determine the anatomical description of the pelvic organs and the fistula tract in axial and coronal image. Figure 1 shows that the sagittal image has been used to determine axial and coronal planes. Image (a), sagittal T2W TSE recommended guidance for axial MRI imaging of the anal canal. Position the oblique cross perpendicular to the anal canal to obtain a completely axial image, and image (b), T2W TSE, Recommended guidance for coronal MRI imaging of the anal canal. Coronal MRI imaging is implemented oblique or at $90°$ to the axial plane to acquire images parallel to the long axis of the anal canal (Criado et al., 2018).

Figure 2. Image of vitamin E capsule in *Sagittal* sequence of a) T2 TSE and b) T1 TSE.

Figure 2 shows the vitamin E capsule markers in the T2 TSE and T1 TSE sagittal sequence images as shown by the arrows indicating the fistula opening to the surface of the skin.
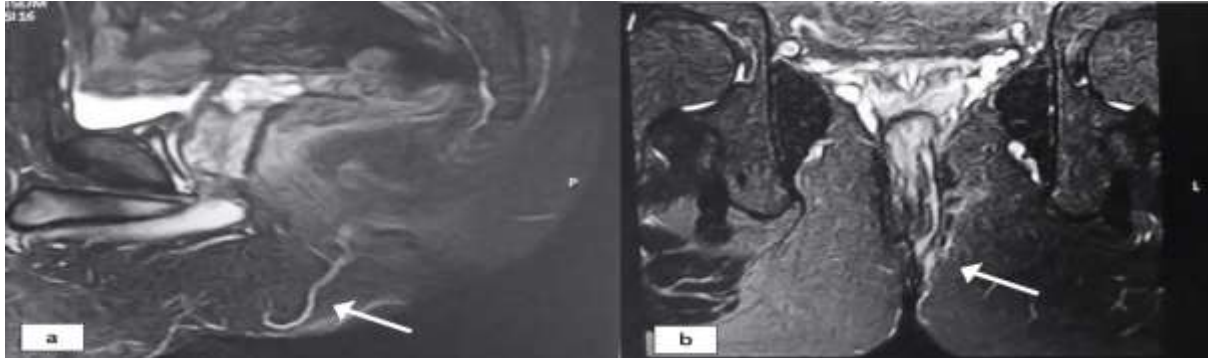
Figure 3. Image fat suppression of sequence images: a. T2 TSE SPIR *sagittal* and b. T2 TSE SPIR coronal oblique.

Figure 3 shows that the fat suppression method with the T2 TSE SPIR sagittal sequence (a), which shows the fistula path as shown by the arrows, and the T2 TSE SPIR (b) oblique coronal sequence images with the fat suppression method, the arrows show the fistula tract looking hyperintense.
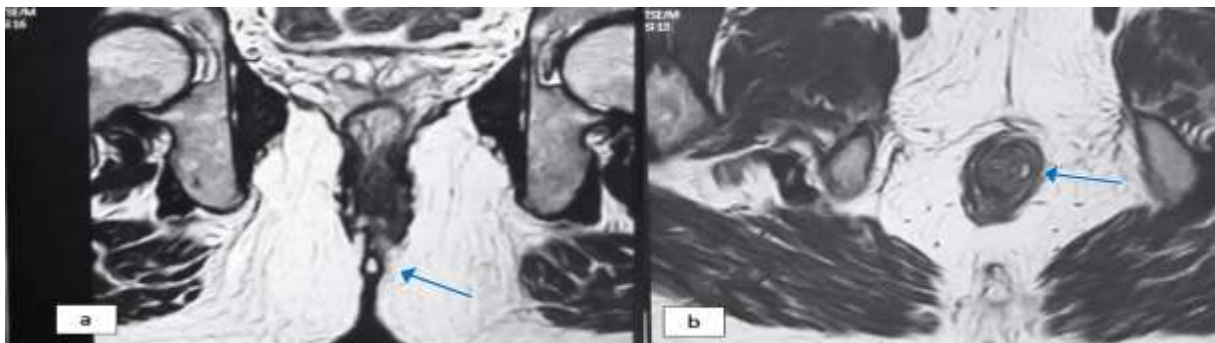
Figure 4. Sequence images of: a. coronal oblique T2 TSE and b. Axial oblique T2 TSE.

Figure 4 (a) shows the vitamin E capsule marker with hyperintense showing the location of the perianal fistula on the skin's surface, and (b) shows the interspinteric fistula indicated by arrows on a hyperintense view.
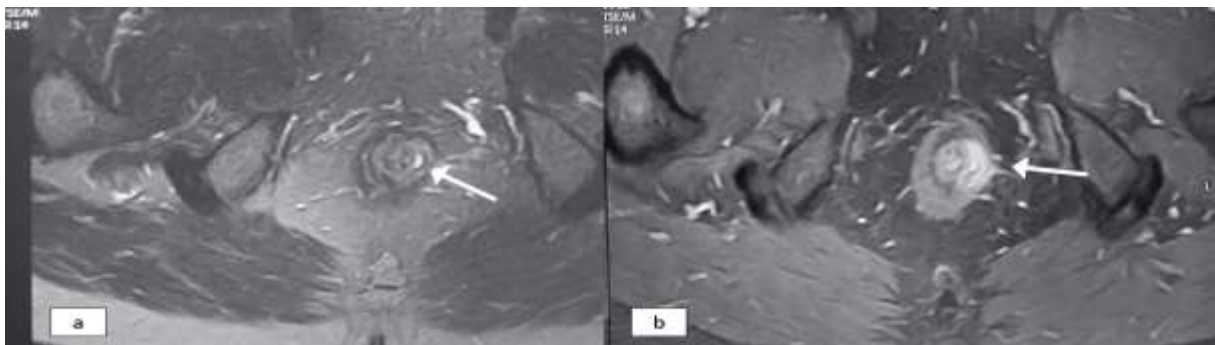
Figure 5. Interspinteric fistula Image: a. Axial oblique T2 TSE and b. coronal oblique T1 TSE SPIR + C.

Figure 5 (a) shows an interspinteric fistula with Axial oblique T2 TSE SPIR sequence shown by arrows and (b) Coronal oblique T1 TSE SPIR + C sequence image, with contrast media administration and fat suppression method, arrows showing active inflammation in the area around the fistula.
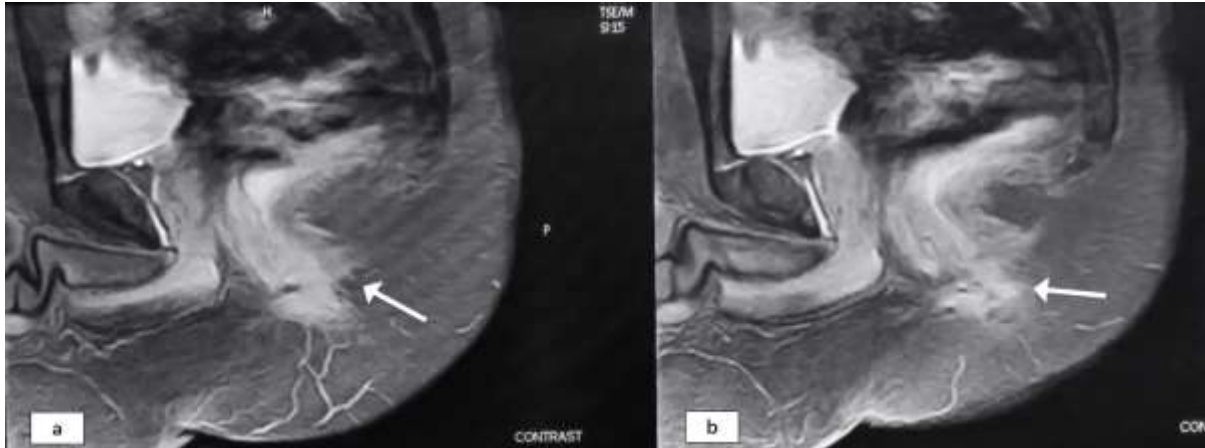
Figure 6. T1 TSE SPIR sagittal sequence images.

Figure 6 shows an image with the administration of contrast media and the T1 TSE SPIR + C sagittal fat suppression method and arrows showing active inflammation around the fistula sagittal fat suppression method and arrows showing active inflammation around the fistula.

Imaging technique of pelvis MRI at Radiology Department of Mayapada Hospital is in accordance with the theory by using the right topography. It began with obtaining the sagittal plane and was then used as a guidance to obtain other planes, such as axial oblique and coronal oblique (Deprest et al., 2021; Ho et al., 2019). The retriever is tilted anteriorly approximately 45° vertically in the sagittal plane to allow accurate assessment of fistula tract origin on axial and coronal images (Figure 1). There are several things that have been changed, namely the use of the T1 TSE sequence before and after the contrast as shown in Figure 2. The purpose of creating T1 TSE sequences is to assess anatomy in the pelvic area. After that, use the SPIR fat suppression method, which eliminates fat signals with an inversion time corresponding to the zero point of fat.

T2 images showed that there is fat which the visualization results are also hyper-intense, therefore we use the SPIR fat suppression method to suppress fat signals so that only fluid signals are visualized on imaging (Figure 3). The usage of pelvic MRI protocol of perianal fistula examination of perianal fistulas at the Mayapada Hospital consist of pre contrast media - sagittal T2 TSE, sagittal T2 TSE SPIR, sagittal T1 TSE, axial oblique T2 TSE, axial oblique T2 TSE SPIR, coronal oblique T2 TSE, Coronal oblique T2 TSE SPIR, Contrast media - Sagittal T1 TSE SPIR, axial oblique T1 TSE SPIR, and coronal oblique T1 TSE SPIR. Focus on MRI Pelvis perianal fistula, namely the presence of fluid, then use the T2 sequence to visualize the fluid image to become hyper-intense so that you can see fluid in the perianal abscess and perianal fistula Figure 4

The contrast media used in Pelvic MRI examination of perianal fistulas at the Radiology Department of Mayapada Hospital, South Jakarta, is contrast media with a gadoteric acid concentration of 0.5 mmol/ml (Braun et al., 2020; GE Health Care, 2017; Moon et al., 2021). The standard volume of contrast media used to visualize perianal abscesses and fistulas properly is around 10 ml, using an injector or manually assisted by a radiologist to inject contrast media. The purpose of contrast medium application is to visualize any active

inflammation that can be seen in a fistula. By injection appropriate contrast medium through the vein, the images of inflammation in the fistula is clearly enhanced, so the blood flow is high contrast in the fistula as shown in Figure 5 and Figure 6. Only in old perianal fistulas, the inflammation does not appear active.

Pelvic MRI examination techniques for perianal fistulas at the Radiology Department of Mayapada Hospital in South Jakarta mostly follow the theory. Starting with installing a vitamin E marker using the anal clock method on the boil area. If there is more than one boil, then the marker follows. Marker images on the T2 and T1 sequences will appear hyper-intense with a firm shape. But when using the SPIR sequence, the marker is not visualized because of fat suppression (fat suppression) Figure 6. According to the theory (Westbrook, 2013; Westbrook & Talbot, 2019), only using three planar T2W TSE sequences and three planar T2 TSE SPIR (sagittal, axial oblique, and coronal oblique) is sufficient to image abnormalities in perianal abscesses, but at Mayapada Hospital is necessary to add contrast medium to see whether inflammation in perianal fistulas is still new or old. What can be seen in the T1 TSE SPIR sequence are three planar (sagittal, axial oblique, and coronal oblique) if the fistula is new, the picture of the inflammation in the fistula clearly shows hyper-intense enhancement.

4. CONCLUSION

Based on the results of research conducted to analyze Pelvic MRI examination techniques for perianal fistulas at the Radiology Department of Mayapada Hospital, it was concluded that the pelvic MRI examination techniques for perianal fistulas are in accordance with several recent journals to produce informative images. The vitamin E as a marker was very helpful in visualizing the images of the perianal fistula on the surface of the skin, and it makes it easier for the radiologist to see the path of the perianal fistula Pelvic. MRI images of perianal fistulas show clear boundaries of perianal fistulas with the anal organs, sigmoid colon, bladder, and prostate between one organ and another. Better image are generated from the selection T2 TSE SPIR sequence to visualize fluid images to become hyper-intensive by suppressing fat signals so that only fluid is visible in the perianal abscess and fistula images.

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R E S E A R C H	Open Access

The Impact of Aging on the Quality of Sperm in White Rats (Rattus Norvegicus) Wistar Strain

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Abstract

Due to the reproductive aging process, the testes, epididymis, and other reproductive organs gradually lose all their physiological capabilities. This study aimed to determine the effect of aging on the sperm quality of Wistar rats (Rattus Norvegicus). The research design is quantitative and descriptive. This study used white male rats (Rattus norvegicus) of the Wistar strain aged 19–20 months. The number of samples was 18 individuals, with a purposive sampling technique following the inclusion and exclusion criteria. Mice were put to sleep on the seventh day, then the cauda epididymis and testes were separated, and a media container was used to accommodate them. The spermatozoa produced were then examined for their motility, morphology, and viability. The results showed that the range, mean, and standard deviation of progressive motility of spermatozoa was 5.83%, 217% ± 1.87%, normal morphology was 39.17%, 61.6% ± 9.57%, and spermatozoa viability was 19.50%, 74.6 ± 5.83%. There was a progressive decrease in motility, but morphology was expected, and spermatozoa viability was within normal limits. This study concludes that aging affects spermatozoa motility, but the morphology and viability of spermatozoa are still within normal limits. Future studies should do genetic analysis to determine how hereditary factors affect the quality of sperm in aged white rats and compare the results to those of young rats to identify changes in sperm quality.

Keywords: Aging, Morphology, Viability, Motility, Spermatozoa.

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1. INTRODUCTION

The majority of chronic illnesses and functional problems are significantly increased by aging, which causes a decrease in regenerative potential and molecular and cellular decline so that the organism becomes weak and susceptible to disease and death (Carmona & Michan, 2016; Wagner *et al.*, 2016; Hernandez-Segura et al., 2018).

The testes, epididymis, and other reproductive organs gradually lose their physiological abilities due to the reproductive aging process (Luceri *et al.*, 2018). With age, oxidative stress increases, sperm motility decreases, normal morphology decreases, sperm count decreases, and DNA fragmentation increases (Nago *et al.*, 2021). Reactive oxygen species (ROS) are significant in various male infertility issues (Asadi *et al.*, 2021). Oxidative stress results from an imbalance between the body's ability to fight off the adverse effects of free radicals, also known as reactive oxygen species (ROS), and their creation (Torres-Arce *et al.*, 2021). ROS production, which affects aging biomarkers, plays a significant role in the age-related loss of male fertility (Baker & Sabanegh, 2015). According to the research, aged animals produced more free radicals than their younger counterparts and had lower antioxidant activity in their spermatozoa (Sabeti *et al.*, 2016).

According to Henkel, Sandhu, and Agarwal (2018), oxidative stress is closely linked to various pathologies, such as aging and male infertility. Based on the research done by Pino et al., (2020), males over the age of 50 were significantly more likely to exhibit abnormalities in semen volume, sperm concentration, and sperm DNA fragmentation; males aged 41 and older were more likely to have lower sperm concentration levels; males aged 31 and older were more likely to have decreased sperm motility; when sperm concentration remained constant, more sperm volume and motility anomalies were seen as the age increased; when the volume of sperm was held constant, an increase in sperm concentration and motility was observed as anomalies.

ROS can be formed in the body (endogenous ROS), and a small part is the result of exposure from outside the body (exogenous ROS), namely reactive oxygen originating from environmental pollutants, radiation, bacterial, fungal, and viral infections (Parwata, 2015; Conti *et al.*, 2016; Panel, Ghaleh, & Morin, 2018). One of the hypotheses of the concept of aging is the theory of oxidative stress.

During normal respiration, oxygen will be reduced by adding four electrons to become water (H_2O). Small amounts of harmful chemicals, including anion peroxide (O_2^-), hydrogen peroxide (H_2O_2), and hydroxyl radicals (OH), are created as a result of the oxidative enzymes that cause these changes in the cells (Bisht *et al.*, 2017; Luceri *et al.*, 2018). The OH- radical will produce fat and then become a new radical, LO- or LOO-.

Polyunsaturated fatty acids (PUFAs) predominate in the phospholipids of the sperm plasma membrane. The production of lipid peroxides and aldehydes is sensitive to PUFAs, which are linked to lower sperm motility, viability, structural integrity, and metabolic activity (Evans *et al.*, 2021). This study aims to ascertain how white rats (Rattus norvegicus) of the Wistar strain of old age relate to the morphology, motility, and viability of spermatozoa. The selection of Wistar strain rats as research subjects is because they have an average of 92% live spermatozoa, which is higher than the percentage of live spermatozoa in Sprague-Dawley (90.7%) (Simbolon et al., 2013). This study aimed to determine the effect of aging on the sperm quality of Wistar rats (Rattus norvegicus).

2. RESEARCH METHOD

This study used a descriptive design. Wistar strain white rats (Rattus Norvegicus) aged 19-20 months as the research sample, equivalent to 45-46 years in humans (Sengupta, 2013),

with body weight 200-250 grams, in good health, and not physically disabled. The time for conducting research is from January to March 2020 at the Udayana University Integrated Histology Laboratory.

White rats (Rattus norvegicus) male Wistar strain, with bodyweight 200-250 grams, age 19-20 months, a total of 18 rats were put into cages. Rats were kept in cages measuring 40 cm x 15 cm x 10 cm, one cage for two rats. Rats were fed BRI CP511B pellet feed produced by PT. Charoen Pokphand as much as ± 12-20 grams per day and drink ad libitum. The acclimatization period of the sample was seven days, with 12 hours of light phase and 12 hours of darkness at a temperature of $25 ± 0.50C$ and humidity of 50-60% to reduce stress.

After passing the acclimatization period for seven days, euthanasia was carried out with rat termination. Rats were anesthetized first using ketamine: xylazine 75–100mg/kg: 5–10 mg/kg (10:1 ratio) IM, then euthanized by cervical dislocation method. After that, an open orchidectomy with a midline or pre-scrotal incision was carried out. The testicles were milked out of the wound. The tunica vaginalis is incised, and the spermatozoa cord is shown to identify the epididymis. The testes are housed in a media container after being cut loose from the cauda epididymis. Rat bodies burning machine.

a.   Testicular Sampling and Cauda Epididymis Sampling

The method for acquiring testes and spermatozoa samples from the cauda epididymis secretion involved removing the epididymis and testes, which were subsequently placed in a Petri plate containing 0.9% NaCl solution. The proximal portion of the corpus epididymis and the vas deferens' distal portion were sliced to separate the epididymis under a surgical microscope with a 400-fold magnification. Spermatozoa from the cauda epididymis were removed as per standard procedure by inserting a medium or air tube/syringe through the vas deferens and pushing the spermatozoa out through a small incision made distal to the epididymis and suspended with 0.9% NaCl. The proximal cauda is then cut slightly with scissors. Different containers/tubes are utilized to place the testes and the suspension of spermatozoa obtained from the cauda epididymis (Pamungkas, 2012).

b.   Spermatozoa Motility Examination

The examination was carried out immediately when Spermatozoa were taken from the cauda epididymis by dripping a drop of Spermatozoa on an object glass. Droplets were attempted to be the same size for each examination. Observations were employed under a microscope with a magnification of 400 times (Hook & Fisher, 2020; Bjorndahl & Brown, 2022).

1)   Progressive motility (PR): Spermatozoa travel freely at any speed, either straight or in broad circles.
2)   Non-progressive motility (NP): all types of Spermatozoa that do not have progressive criteria, such as swimming in small circles, tail/flagella that are difficult to move the head, or only the tail that moves.
3)   Immotility (IM): not moving at all
     The standard motility value is Progressive motility (PR) = 32% or PR + NP = 40%.

c.   Calculating spermatozoa viability

Observation and calculation of spermatozoa viability were carried out using sperm smear preparations stained with 1% eosin and 10% nigrosine. Observations were made using a light microscope with a magnification of 400 times. Spermatozoa viability was calculated on 100 spermatozoa cells (%) with observation replication six times for each white rat. Viability can be determined by the difference in the spermatozoa cells' color. The live spermatozoa are light-colored, while the dead spermatozoa are purple (Majzoub &Sabanegh, 2017).

d.   Observation of Spermatozoa Morphology

By spreading spermatozoa on an object glass, adding one drop each of Eosin 1% and Nigrosine 10%, homogenizing the mixture, and allowing it to air-dry for 5 minutes, the morphology of the spermatozoa was evaluated. They were then observed under a light microscope with a magnification of 400 times. The repetition is done six times. The typical morphology of spermatozoa is when the head and neck are intact, and the tail is straight. Spermatozoa were regarded as expected if they had a hook-shaped head, a straight neck, and a single, free tail. If the head is abnormally small or large, the neck is branched or broken, the tail is branched, coiled, and broken, and there are cytoplasmic droplets on the head, neck, or tail, the morphology is abnormal (Majzoub & Sabanegh, 2017).

Explain the chronology of research, including research design, research procedures (in the form of algorithms, Pseudocode, or other), ways of testing, data acquisition, and method of data analysis. The description of the procedure of the research must be supported by references so that the explanation can be accepted scientifically. Furthermore, adding an ethical clearance number (Costabile, 2013). This research has obtained ethical approval with number 361/EA/KEPK-BUB/2020 and used descriptive analysis to probe the data.

3.   RESULTS AND DISCUSSION

A total of 18 male Wistar rats in good health, meeting the qualifying requirements of proper sex, age, and weight (200-250 grams), were included in the study. The analysis of the mean and standard deviation of the weight of the mice used was 228.11gr ± 10.53%.
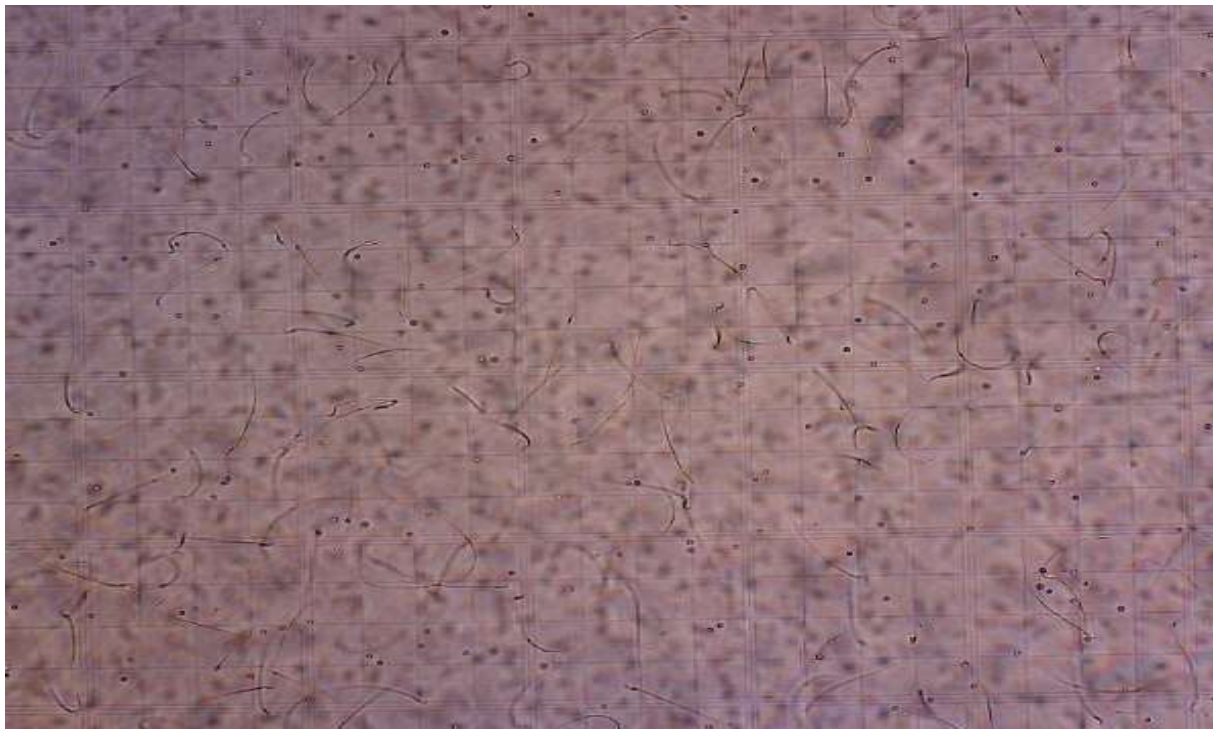
Figure 1. Calculation of progressive spermatozoa motility of white rats (Rattus norvegicus) Wistar strain with 400 times magnification

Figure 1 shows motility. Under a microscope with a magnification of 400 times, the observations focused on identifying progressive motility spermatozoa, which refers to spermatozoa exhibiting unrestricted movement in either a linear trajectory or extensive circular paths at varying velocities.
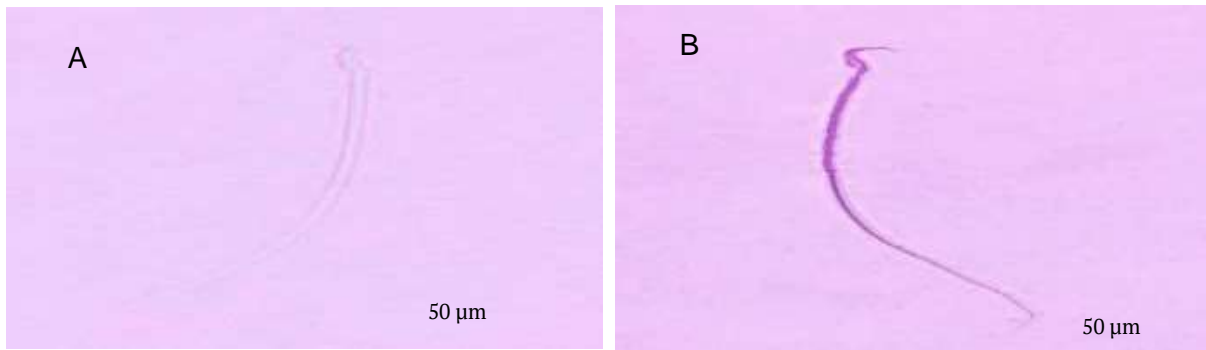
Figure 2. Viability of spermatozoa. Live spermatozoa (A). Dead spermatozoa (B) were observed under a microscope with a magnification of 400 times.

Figure 2 shows the viability of spermatozoa. The difference in the color of the spermatozoa cells can determine viability. The live spermatozoa are light-colored, while the dead spermatozoa are purple.
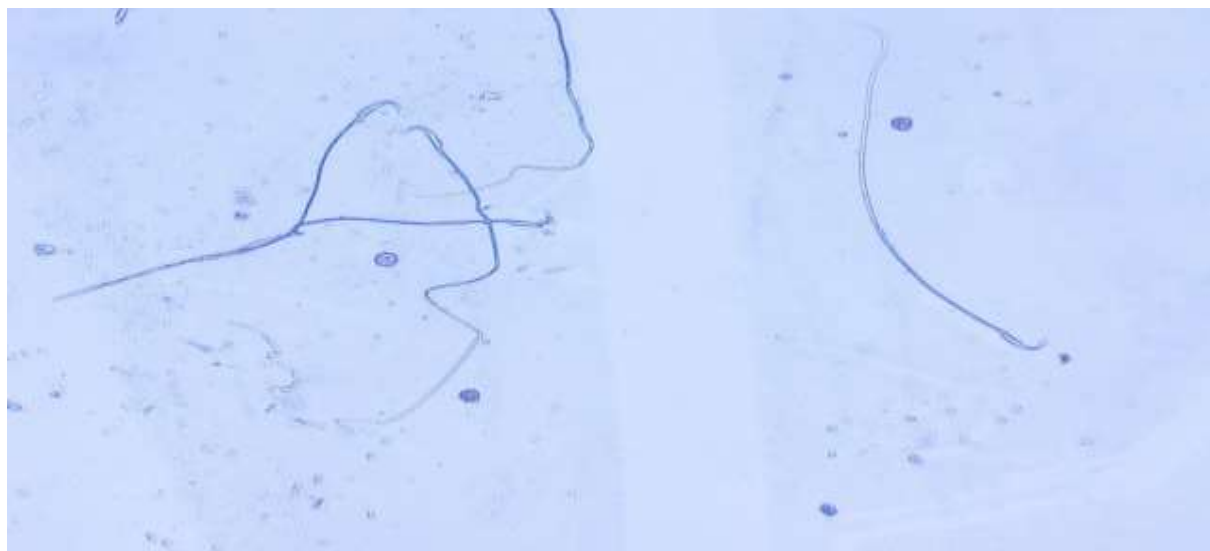
Figure 3. Spermatozoa morphology examination of white rat (Rattus norvegicus) Wistar strain with 400 times magnification.

Figure 3 shows the morphology of spermatozoa. The spermatozoa were regarded as expected if the head was curved like a hook, the neck was straight, and the tail was one with a free tip. A morphology was deemed aberrant if the head is too tiny or large, the neck is broken or branched, the tail is branched, coiled, and broken, and there are cytoplasmic droplets on the head, neck, or tail.

Table 1. Descriptive analysis of spermatozoa of white rats (Rattus norvegicus) Wistar strain

Variable	Range	Mean	SD
Progressive motility	5,83	21,7	1,87
Normal morphology	39,17	61,6	9,57
Viability spermatozoa	19,50	74,6	5,83

Table 1 shows that the range, mean, and standard deviation of progressive motility of spermatozoa is 5.83%, 21.7%±1.87%, normal morphology 39.17%, 61.6%±9.57%, and spermatozoa viability. was 19.50%, 74.6±5.83%.
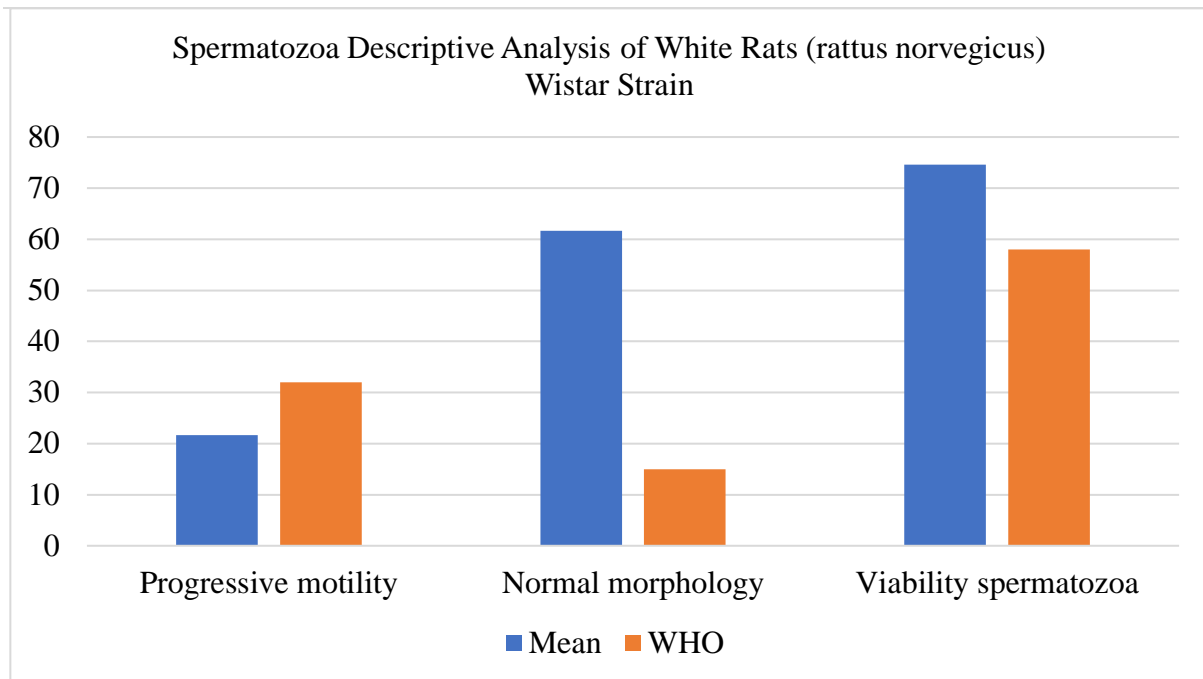
Figure 4. Spermatozoa Descriptive Analysis of White Rats (Rattus norvegicus) Wistar Strain

The criteria normal male fertility include sperm morphology showing the percentage of abnormal forms found in semen and morphological disorders if sperm shape <15% normal morphology. The standard average viability value is 58% of motile sperm are found <58% of viable sperm, then the possibility of sperm motility will decrease because there are dead sperm (necrospermia), and the average motility value is Progressive motility (PR) 32% or PR + NP = 40%.

The results showed that the range, mean, and standard deviation of progressive motility of spermatozoa was 5, 83%, 217%±1.87%, normal morphology 39, 17%, 61.6%±9.57%, and spermatozoa viability was 19, 50%, 74.6%±5.83%. At the level of all organs and systems, aging in men is a natural process that can be altered by endogenous and external influences. Spermatozoa undergo genetic and epigenetic alterations as a result of the effects of aging on the reproductive system, which interfere with male reproductive function and lower sperm quality and quantity (Gunes *et al.*, 2016; Nguyen-Powanda & Robaire, 2020). Spermatozoa production in men occurs continuously, but the quantity and quality decrease with age (Costabile, 2013; Fricke & Koppik, 2019).

ROS production, which affects aging biomarkers, plays a major part in the age-related loss in male fertility (Alahmar, 2019; Wang *et al.*, 2022). The findings showed that older animals created more free radicals than younger ones and had decreased antioxidant activity in their spermatozoa (Sabeti *et al.*, 2016; Fatehi *et al.*, 2018).

The shape and number of the spermatozoa in this study, however, remained within normal bounds, and the loss in spermatozoa quality only happened in the steady decline of spermatozoa. This may be brought on by increased aging-related Mehrotra *et al.* (2013) oxidative stress, which lowers the energy generated to maximize spermatozoa motility. This result is consistent with research, which demonstrated that increased ROS production had been linked to reduced spermatozoa motility. Spermatozoa membrane lipid peroxidation affects the fluidity and mobility of spermatozoa axonemes, inactivation or reduction of membrane enzymes, structured DNA damage, and cell death (R. Dias *et al.*, 2020).

4. CONCLUSION

White rats (Rattus norvegicus) of the Wistar strain, aged 19–20 months, were used in this study, equivalent to 45-46 years of human age. The conclusion was that there was a progressive decrease in motility, but normal morphology and spermatozoa viability were still within normal limits. More research is needed to identify the effect of aging on lowering spermatozoa motility at the organelle level, such as how mitochondria operate in creating the energy needed for spermatozoa motility. Future studies should do a genetic analysis to determine how hereditary factors affect the quality of sperm in aged white rats and compare the results to those of young rats to identify changes in sperm quality.

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R E S E A R C H   **Open Access**

Ergonomic Risk Analysis on Traditional Weaving Workers on Semau Island Kupang Regency

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Abstract

Musculoskeletal disorder has caused casualty on traditional weaving workers. With manual equipment that uses no electricity, the workers do not apply anthropometry into their daily labor; resulting in working with bent position. Such condition forces the workers to be in a non-ergonomic work position. The research objective was to determine the relationship between work fatigue, workload, and work attitude with musculoskeletal disorders in traditional weaving workers. This research is an analytic descriptive research with a cross sectional study design. The sample in this study was 38 traditional weavers. The results showed that there was a relationship between work fatigue, workload, and work attitude with musculoskeletal disorders in traditional weaving workers on Semau Island, Kupang Regency with p-value <0.05. Workers can be given counseling and pamphlets regarding ergonomic and comfortable work, so as to avoid occupational safety and health problems.

Keywords: Workload, Ergonomics, Work Fatigue, Musculoskeletal Disorders, Work Attitude.

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1.   **INTRODUCTION**

Musculoskeletal disorders are health problems in the locomotor apparatus, in the form of soft tissue injuries. The causes are sudden or continuous loading of muscles and bones, repeated movements for a long time, exposure to vibration, loading that exceeds capacity, and uncomfortable working positions. This condition can affect muscles, ligaments, nerves, tendons and joints. (Luttmann, et al., 2004).

In Indonesia, the prevalence of musculoskeletal disorders related to occupational factors is quite high. An Indonesian Ministry of Health study concluded that around 40.5% of workers' illnesses are related to work. Health problems experienced by workers based on research conducted on 9,482 workers in 12 regencies/cities in Indonesia showed the highest number of musculoskeletal disorders (16%), followed by cardiovascular disorders (8%), nervous disorders (5%), respiratory disorders (3%) and ENT disorders (1.5%) (Sekaaram & Ani, 2017).

Musculoskeletal disorders have caused considerable losses in both developed and developing countries. This disruption does not only affect the individual workforce but also affects the continuity of the business world such as decreased work productivity, decreased welfare, increased health costs, decreased job satisfaction, degradation of the quality of physical and mental health, and decreased ability to carry out other physical activities (Dinar et al., 2018).

East Nusa Tenggara Province (ENT) is one of the provinces located in Eastern Indonesia. This province consists of several islands, including the islands of Flores, Sumba, Timor, Adonara, Lembata, Alor, Sabu, and Rote (Hartono & Sunarya, 2010). Semau Island is one of the areas included in the working area of Kupang Regency, where Semau Island has about 40 traditional weavers. Apart from farming seaweed, another livelihood for the people on Semau Island is traditional weaving which women mostly do to help support the family's livelihood.

The making of traditional weaving has a lot of uniqueness because it is still attached to the customs of the people on Semau Island. In addition, the weaving crafts made by weavers on Semau Island still use organic materials, both for thread making and for coloring materials, so the colors produced are very natural and have a different beauty from the colors produced by chemical dyes. The manufacturing process is also handmade without the help of any machine. The tools used in the process of making weaving crafts are traditional tools without the help of electricity. Due to the manual process, weaving crafts from Semau Island are unique because no cloth is the same as any other cloth. Unfortunately, traditional looms and seats were designed without considering the anthropometry of workers, so workers must adapt and work with a bent back. It forces workers to be in an attitude and working position that is not ergonomic, which lasts a long time and is static. These conditions can cause health problems, especially in the musculoskeletal system. Moreover, the process of making weaving takes a long time, high precision, as well as patience. One piece of woven cloth can be finished in approximately three to four months (Setiawan & Suwarningdyah, 2014)

Behind the monotonous manual weaving work, there are ergonomic risks that the workers might experience such as work fatigue, workload, work attitudes, and musculoskeletal disorders. This has an impact on decreasing work performance and the risk of occupational diseases. Behind the long and continuous manual weaving work, the workers are at risk of poor ergonomics. Examples are Work Fatigue, Workload, Work Attitude, and High Musculoskeletal Complaints, which have an impact on decreasing work performance and the risk of other diseases (Maksuk, Shobur & Habibi, 2021).

The research formula is what are the ergonomic risks experienced by traditional weaving workers on Semau Island, Kupang Regency. The purpose of this study was to determine the

relationship between work fatigue, workload, and work attitude towards the musculoskeletal disorders of traditional weaving workers on Semau Island, Kupang Regency.

2.   RESEARCH METHOD

The method used in this study is descriptive analytic research with a cross-sectional study design. The population of this study were all traditional weaving workers on Semau Island, Kupang Regency, totaling 58 people. 38 workers were obtained as a research sample usingthe Slovin formula. The independent variables were work fatigue, workload, and work attitude. Meanwhile, the dependent variable is Musculoskeletal Disorders. Primary data was obtained through interviews with general fatigue questionnaire, Nordic Body Map questionnaire, stopwatch, and the Rula Method assessment form. Secondary data was obtained from documentation in the form of notes and data from the village office on Semau Island. Data processing included editing, coding, entry, and tabulating. Data were analyzed through univariate analysis in the form of distribution and percentage of each variable in the form of frequency tables, addedd with bivariate analysis to determine the relationship between one independent variable and the dependent variable using the Chi square test. If the p value <0.05, then the null hypothesis (Ho) is rejected. Conversely, if the p value > 0.05, then Ho is accepted (Wibowo, 2017). If Ho is rejected, it means that there is no relationship between Work Fatigue, Workload, and Work Attitude with Musculoskeletal Disorders. This research has also received research ethics permit from the Faculty of Public Health, Nusa Cendana University with no. 2022187–KEPK.

3.   RESULTS AND DISCUSSION

Weaving, for the people of Semau Island, is seen as a valuable treasure for the family. In the past, woven fabrics were made just as ordinary clothes. As time goes on, the purpose has beendeveloped as customary needs, such as ceremonies, dances, weddings, and parties. Currently, woven fabrics are also commonly used as scarves, sarongs, blankets, and clothing. Weaving, specifically on Semau Island, is the business of informal sector workers and is mostlydominated by women workers to get additional income for the family. The woven fabrics are the result of work using a traditional weaving system. Weaving is a skill that requiresprecision and patience. Traditional weaving techniques with machine-less tool is unfortunately not in accordance with anthropometry that has the risk of causing work fatigue, workload, and work attitude problems, which are part of Occupational Health and Safety.

Table 1. Distribution of variable data results on Traditional Weaving workers in Semau Island Kupang Regency.

Variable	Muskuloskeletal Disorder				Total		p-value
	Not at Risk	%	At Risk	%	n	%	
Work Fatigue							
Not at Risk	0	0	7	100	7	100	0.035
At Risk	13	41,9	18	58,1	31	100	
Total	13	34.2	25	65.8	38	100	
Workload							
Not at Risk	13	86,7	2	13,3	15	100	0.00
At Risk	0	0	23	100	23	100	

Total	13	34.2	25	65.8	38	100	
Work Attitude							
Not at Risk	11	73,3	4	26,7	15	100	0.00
At Risk	2	8,7	21	91,3	23	100	
Total	13	34,2	25	65,8	38	100	

Table 1 shows several variables. In the Work Fatigue variable, there were 7 (100%) workers who were not at risk of work fatigue experiencing Musculoskeletal Disorders, 13 (41.9%) workers were at risk of work fatigue but did not have Musculoskeletal Disorders, and 18 (58.1%) workers were at risk of work fatigue and Musculoskeletal Disorders. In the Workload variable, there were 13 (86.7%) workers who were not at risk of workload and Musculoskeletal Disorders, 2 (13.3%) of workers did not have workload risks but were at risk of Musculoskeletal Disorders, and 23 (100%) workers had workload risks work and musculoskeletal disorders. In the work attitude variable, 11 (73.3%) workers were not at risk for work attitudes and musculoskeletal disorders, 4 (26.7%) workers were not at risk for work attitudes but at risk for musculoskeletal disorders, 2 (8.7%) workers were at risk for work attitudes but not at risk of Musculoskeletal Disorders, and 21 (91.3%) workers have a risk of work attitudes and Musculoskeletal Complaints.

Fatigue is the body's protective mechanism to avoid further damage, or it can be said as the body's alarm signaling a person to rest immediately (Permatasari et al., 2017). This mechanism is regulated by the central nervous system which can accelerate impulses that occur in the activity system by the sympathetic nervous system and slow down impulses that occur in the inhibition system by the parasympathetic nerves. Decreased ability and endurance will result in decreased efficiency and work capacity. If conditions like this are allowed to continue, it will certainly affect a person's productivity (Grandjean, 2001) and (Sedarmayanti, 2018).

Table 1 shows a relationship between Work Fatigue and Musculoskeletal Disorders in Traditional Weaving workers on Semau Island, Kupang Regency, where the results of the Chi Square statistical test showed a significant relationship with p-value = 0.035 (p-value $<\alpha$). There were 18 (58.1%) workers at risk of work fatigue and musculoskeletal disorders.

The results of interviews with workers revealed that most of the workers often complained of pain in the head, fatigue in all parts of the body, feeling heavy in the eyes, staggering when standing, difficulty thinking, stiffness in the shoulders, pain in the back, and feeling unwell. This is because they work an average of 14 hours a day, from 08.00 am to 10.00 pm. In addition, breaks are made at 13.00 noon only for eating and taking a nap. The work on each sheet of woven fabric can be completed within 1 - 1.5 months depending on the complexity of the selected motif. This proves that workers are very vulnerable to experiencing muscle complaints and, if this is allowed to continue, it is very risky to progress to a more serious stage which will certainly seriously affect the health of weaving workers.

This research is in line with research conducted by (Suaebo et al., 2020), which stated that there is a significant relationship between work fatigue and musculoskeletal disorders in 35 pedicab drivers at Balapan Station, Solo. In addition, this study is also in line with other studies (Ngai et al., 2022) where there is a relationship between work fatigue and musculoskeletal disorder in rice-mill workers in Soa District, Ngada Regency. Another study from Patandung and Widowati, (2018) showed that there is a relationship between the level of fatigue and musculoskeletal disorders in bus drivers on the Toraja-Makassar route.

The results of this study are also in line with research from (Deng et al., 2021) where there is a relationship between work fatigue and musculoskeletal disorders in coal mining workers in China.

Workload is very closely related to metabolism. The heavier the workload of workers, the greater the metabolism (Farhati, & Wahyuningsih, 2021). The size of the workload depends on the size of the pulse in units of beats per minute (bpm). In the perspective of ergonomics, every workload received by workers must be appropriate or balanced both in terms of physical abilities, cognitive abilities, and the limitations of the humans who receive the burden (Rizqiansyah et al., 2017). Loads that are too heavy can cause backbone, muscle tissue, and joint injuries due to excessive movement (Grandjean, 2001).

Table 1 shows that there is a relationship between workload and musculoskeletal disorders in traditional weaving workers on Semau Island, Kupang Regency, with the results of the Chi Square statistical test with a p value = 0.00 (p value <α). There are 23 (100%) workers who have a risk of workload and musculoskeletal disorders. In addition, from the results of the interviews, the weaving workers must complete the weaving according to the target so that it can be sold immediately to meet the economic needs of the family. This causes weaver workers to work up to 14 hours per day. This has an impact on the risk of workload so that workers are also at risk of experiencing Musculoskeletal Disorders.

This research is in line with (Rahmawati, 2020) that there is a relationship between workload and musculoskeletal disorders in freight workers at Panorama Market, Bengkulu City. This research is also in line with the results of other studies where there is a relationship between physical workload and musculoskeletal disorder among PT. Maruki International Indonesia, Makassar (Triwati et al., 2021). Research from Aprillia and Rifai (2022) showed similar results where there is a relationship between physical workload and musculoskeletal disorder in workers at the Roof Tile Industrial Center in Sidoluhur Village, Godean District. Putri, (2019) researched that there is a relationship between workload and subjective musculoskeletal disorder in cutting-section workers at a shoe factory in Nganjuk. Likewise, Rahmawati's research, (2020) showed a relationship between workload and musculoskeletal disorder in freight workers at Panorama Market, Bengkulu.

Work attitude is the action taken by the worker and everything that must be done by the worker, the result of which is proportional to the effort made. Work attitude is also interpreted as a tendency of mind and satisfaction towards work. Work attitude is an assessment of the suitability between the work tools used by workers in work with predetermined anthropometric measurements of workers (Ruliati et al., 2017). When working, a balanced work attitude must be paid close attention to in order to work comfortably and last a long time (Suma'mur, 2014).

Improper sitting posture leads to poor circulation in the lower body, which can lead to varicose veins, leg swelling, fatigue, and the risk of blood clots in the legs (Adnyani, et al., 2023). In addition, sitting too long causes muscle tension in the hips. Thus, there are many incorrect sitting positions that are very detrimental to each individual such as health disturbances and cause eye and muscle fatigue (Kozier, 1995). One of the most common ailments suffered from frequent sitting for a long time is lower back pain and eye fatigue (Suma'mur, 2014).

Table 1 shows a relationship between work attitude and complaints of musculoskeletal disorders in traditional weaving workers on Semau Island, Kupang regency. This is caused by workers who sit on the floor without using a backrest, neck that keeps looking down, body that bends forward, and legs that are straight forward. Such a static working attitude can cause various complaints to the neck, back, waist and legs. These complaints are felt by workers while working and after finishing work (Faridah & Junaidi, 2022).

This research is in line with research conducted by (Mallapiang et al., 2021) which showed a significant relationship between work attitude and musculoskeletal disorders in weavers of Lipa'Sa'be Mandar, South Sulawesi. This research is also in line with research conducted by (Krismayani & Muliawan, 2021) on weaving craftsmen in Klungkung Regency which shows various variables of work attitudes on the back which have a relationship with musculoskeletal disorders. There is research with similar results showing a significant relationship between work posture and musculoskeletal disorders in Freight Forwarders at the Komodo Grocery Store, Denpasar (Meliani et al., 2022). Another study that is in line shows a relationship between work posture and musculoskeletal disorders in bus drivers at the Regional Day Terminal, Makassar (Danur et al., 2022). In addition, there is a study that shares similar results of the relationship between work attitude and musculoskeletal disorders in Manual Handling workers at Warehouse X, South Tangerang (Azzahra et al., 2022).

4. CONCLUSION

The conclusion from the results of the analysis and discussion in this study is that there is an ergonomic risk in the form of work fatigue, workload, and work attitude associated with complaints of musculoskeletal disorders in traditional weaving workers on Semau Island, Kupang regency. In order to avoid OSH problems, workers can be given counseling regarding ergonomic and comfortable work, as well as increasing workers' knowledge regarding work fatigue, workload, and ergonomic work attitudes. Apart from counseling, pamphlets can also be given so that workers can work in a healthy, safe and comfortable manner.

Workers are expected to maintain and pay attention to work attitudes, working hours, and carry out stretching activities before and after weaving activities to reduce Musculoskeletal Disorders, as well as to increase work productivity. There are limitations in this study, namely the measurement of work fatigue which is still influenced by psychological work fatigue. Therefore, measuring physical work fatigue using instruments such as reaction timers and recommended for future researchers.

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R E S E A R C H   Open Access

Characteristics and Lifestyle Related to Blood Sugar Levels in Type 2 Diabetes Mellitus Patients

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Abstract

Type 2 diabetes mellitus has been a prominent public health issue today. Globally, an estimated 462 million people are affected by type 2 diabetes, equivalent to 6.28% of the world's population. Globally, an estimated 462 million people are affected by type 2 diabetes, equivalent to 6.28% of the world's population. In Asia, especially Indonesia, the number of cases is expected to increase to 21.3 by 2030 in Indonesia. Type 2 diabetes is determined by blood sugar level, which affected by many factors including patients' characteristics and lifestyle habits such as physical activity and diet. The Purpose of this research is to find the association between age, sex, education level, employment status, duration of disease, obesity, hypertension, diet, and physical activity with the blood glucose level of type 2 diabetic patients. This research used cross-sectional study design. The population is type 2 diabetes mellitus patients The population is type 2 diabetes mellitus patients who are spread over three areas of the city of Makassar, at the city center, suburban health center and coastal health center, total sample size of 273 patients The research was conducted sampling for 2 months via interview. The research instruments used were IPAQ and FFQ. The data analysis technique used is univariate and bivariate analysis, using chi-square. The results of this study indicate that found correlation between the variables. Lifestyle were found associated most with blood sugar level. Findings of the research found association between duration (p=0.003), obesity (p=0.000), hypertension (p=0.048), diet (p=0.000), and physical activity (p=0.000) with blood sugar levels. Meanwhile, age (p=0.461), gender (p=0.431), education level (p=0.357), working status (p=0.522), found not associated with blood sugar levels in patients with type 2 diabetes. The conclusion is duration Obesity, hypertension, diet, and physical activity were found associated with blood glucose level in type 2 diabetic patients. Patients with type 2 diabetes are expected to maintain blood sugar level by implementing healthy lifestyle. This includes regular physical activity and balanced diet.

Keywords: Diabetes Mellitus, Blood Sugar Level, Life Style, Characteristics.

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1. INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease affecting millions of people globally. World Health Organization (WHO) reported since 1980, the number of adults living with DM increased four times to 422 million people in 2021 (Veridiana & Nurjana, 2019). International Diabetes Federation (IDF) reported approximately 463 million adult suffers from diabetes which makes up 9,3% population of the world (International Diabetes Federation, 2019), (International Diabetes Federation, 2020). Within the same year, 4,2 million adults died from diabetes and its complications. Indonesia ranks seventh in countries with the highest cases of DM in the world, with 10.7 million patients (40 patients per 100.000 population) and 73,7% undiagnosed cases. There is an increase in DM prevalence according to blood sugar tests from 6,9% in 2013 to 8,5% in 2018 . Highest prevalence is in DKI Jakarta, followed by East Kalimantan, and Special Region of Yogyakarta (Kementerian Kesehatan Republik Indonesia, 2018), (World Health Organization, 2020). Estimates that the number of people with type 2 DM in Indonesia will increase significantly to 21.3 million people (70 patients per 10,000 population) by 2030 (World Health Organization, 2020) (Khan, 2020).

In South Sulawesi, proportion of DM still placed second for non-communicable disease after heart and blood vessel disease (15,79%) (Adri et al., 2020). Prevalence of DM increased from 1.6 % in 2017 to 1,7% in 2022 (Kementerian Kesehatan Republik Indonesia, 2018). Makassar is one of the areas of South Sulawesi with the highest number of DM patients, with the number of DM cases served as many as 18.305 (12,1 per 1000 population), and the number of DM disease targets of 79.608 (52,7 per 1000 population) (Dinas Kesehatan Kota Makassar, 2021).

Diabetes Mellitus (DM) is caused by a lack of insulin production by the pancreas. Insulin, a hormone produced by the pancreas, controls the glucose level in the blood by regulating its production and storage. Lack of insulin in the body can result in an increase in the concentration of glucose in the blood (hyperglycemia) (Tella et al., 2021). Blood sugar level is the amount of blood plasma glucose content used to establish the diagnosis of Diabetes Mellitus (Chaudhary & Tyagi, 2018). Diabetes mellitus has risk factors that are divided into two, namely modifiable factors and non-modifiable factors. Risk factors that cannot be modified are race, ethnicity, age, gender, family history of diabetes mellitus, history of giving birth to a baby >4,000 grams, and a history of Low Birth Weight (Isnaini & Ratnasari, 2018).

This research was conducted at Public Health Centre in Makassar. Report by Health Office Department of Makassar showed that three Public Health Centre has highest case of DM of 46 public health facility in Makassar (Dinas Kesehatan Kota Makassar, 2021). Based on the risk factors of type 2 diabetes previously mentioned, researcher concluded that characteristics of patients and daily habit plays a significant role in affecting blood sugar level, therefore this research aims to find the association between age, sex, education level, employment status, duration of disease, obesity, hypertension, diet, and physical activity with the blood glucose level of type 2 diabetes mellitus patients.

2. RESEARCH METHOD

The type of research used is observational analytics with a cross-sectional research design. This research was conducted in three Community Health Centers and was carried out for 2 months starting from early January to early March 2023. The population in this study were all Type 2 DM sufferers in the three working areas of the Makassar City Health Center with a total sample of 273 using a simple random sampling technique. Instruments used for this research are questionnaires adapted from *International Physical Activity Questionnaire 2005*) and *Food Frequency Questionnaire* (FFQ). Primary data was collected through interview via phone call, while the secondary data were collected from patients' medical record. The data analysis were univariate analysis and bivariate analysis using chi-square test. This research has

received ethical approval and its ethical number is 15655/UN4.14.1/TP.01.02/2022.

3. RESULTS AND DISCUSSION

Table 1. Distribution of Respondents based on Research Variables of Type 2 Diabetic Mellitus Patients Public Health Centre in Makassar.

Research Variables	Frequency (n)	Percentage (%)
Age		
Non-productive (>65 years)	132	48,4
Productive (15-65 years)	141	51,6
Sex		
Male	105	38,5
Female	168	61,5
Education Level		
Low (<High School)	210	76,9
High (≥High School)	63	23,1
Employment Status		
Employed	198	72,5
Unemployed	75	27,5
Duration		
Short Duration (0-5 years)	114	41,8
Moderate Duration (6-10 years)	159	58,2
Blood Sugar Level		
Normal (<200 mg/dl)	138	50,5
High (≥200 mg/dl)	135	49,5
Obesity		
Obese (≥27 kg/m^2)	33	12,1
Normal (18,5-24,9 kg/m^2)	201	73,6
Overweight (25-27 kg/m^2)	39	14,3
Hypertension		
Hypertension	195	71,4
Non-hypertension	78	28,6
Diet		
Good	165	60,4
Poor	108	39,6
Physical Activity		
Low/moderate Physical Activity	141	51,6
High Physical Activity	132	48,4
Total	273	100

Table 1 showed the distribution of respondents based on the research variables of Type 2 DM patients. Total of 273 respondents were interviewed during the research. In this study, more than half of the respondents belong to productive age group with 141 people (51,6%) and 132 people (48,4%) belong to non-productive age group. The average age of the respondents is 64,8 years with median of 64 years. There are 168 female respondents (61,5%) and only 105 male respondents (38,5%). Most respondents received low education level with 210 people (76,9%) and 63 respondents (23,1%) received high education level. Majority of respondents are employed as much as 198 people (72,5%), while 75 respondents (27,5%) are unemployed.

Based on the duration, in average the respondents have suffered from Type 2 DM for 6 years with median of 7 years, with 159 people (58,2%) in moderate duration and 114 people (41,8%) in short duration. More respondents have normal blood sugar level with 138 people (50,5%) than those with high blood sugar level as many as 135 people (49,5%), with the average of 195 mg/dl and median of 200 mg/dll. Most of respondents have normal weight as many as 201 people (73,6%), while 39 people (14,3%) are overweight and 33 people (12,1%) are obese, average of Body Mass Index (BMI) of the respondents is 23,2 kg/m^2 while the median is 22,8 kg/m^2. Most of the respondents as many as 195 people (71,4%) also suffers from hypertension while 1088 people (28,6%) does not. Based on diet, more respondents as many as 165 people (60,4%) have good diet, while 108 people (39,6%) have poor diet. More respondents are doing low/moderate physical activity with 141 people (51,6%), while 132 people (48,4%) are doing high physical activity.

Table 1. Bivariate Analysis of Independent Variables with Blood Sugar Level of Type 2 Diabetic Patients at Public Health Center Makassar.

Independent Variables	Blood Sugar Level				Total		p-value
	Normal		High				
	n	%	n	%	n	%	
Age							
Productive	66	46,8	75	53,2	141	100	0,461
Non-productive	72	53,3	60	46,7	132	100	
Sex							
Male	57	55,8	45	44,2	102	100	0,432
Female	81	47,3	90	52,7	171	100	
Education Level							
Low	114	54,2	96	45,8	210	100	0,357
High	24	38,1	39	61,9	63	100	
Employment Status							
Employed	96	48,4	102	51,6	198	100	0,522
Unemployed	42	56	33	44	75	100	
Duration							
Short Duration	60	52,6	54	47,4	114	100	0,003
Moderate Duration	78	49	81	51	159	100	
Obesity							
Obese	3	9,1	30	90,9	33	100	
Normal	126	62,6	75	37,4	201	100	0,000
Overweight	9	23	30	77	39	100	
Hypertension							
Hypertension	96	49,3	99	50,7	195	100	0,048
Non-hypertension	42	53,8	36	46,2	78	100	
Diet							
Good	114	69	51	31	165	100	0,000
Not Good	24	22	84	78	108	100	
Physical Activity							
Low/moderate Physical Activity	6	4,3	135	95,7	141	100	0,000
High Physical Activity	132	100	0	0	132	100	

Table 2 showed the independent variable of blood sugar level of type 2 diabetic patients. The results of bivariate analysis using chi-square showed the value of p=0,461 (p>0,05),

indicating there are no significant association between age and blood glucose level of type 2 diabetic patients in Public Health Centre at Makassar. This indication also applies to sex variable with the value of p=0,432 (p>0,05) analysed using chi-square test. The result of chi-square analysis for education level showed the value of p=0,357 (p>0,05), indicating no relation between education level and blood sugar level within this population. For employment status, the analysis result using chi-square showed the value of p=0,522 (p>0,05), showing no association between employment status and blood sugar level in type 2 diabetic patients in the Public Health Centre Makassar. In terms of duration of disease, the chi-square test showed the value of p=0,003 (p<0,05), indicating duration of disease is associated with blood glucose level in type 2 diabetic patients of the Pubic Health Centre Makassar. Obesity was statistically analysed using chi-square test showing the value of p=0,000 (p<0,05), which showed a the Public Health Centre Makassar. Hypertension was statistically analysed using chi-square test showed the value of p=0.0048 (p<0,05), indicating is significant association between hypertension and blood sugar level in type 2 diabetic patients of Public Health Makassar. Diet was statistically analysed using chi-square test showed the value of p=0,000 (p<0,05), showing a significant relation between diet and blood sugar level in type 2 diabetic patients of the Public Health Makassar. Physical activity was statistically analysed using fisher's exact test showed the value of p=0,000 (p<0,05), indicating physical activity is associated with blood glucose level in type 2 diabetic patients of the Public Health Makassar.

It is found that there is no significant difference of blood sugar level between productive age and non-productive age. Both age groups have the same chance of having higher blood sugar level. The result of statistical bivariate analysis showed that age was not associated with blood glucose level in type 2 diabetic patients at the Public Health Centre Makassar (p=0,461). However this findings are not in line with study conducted by Latifah, which found higher level of blood sugar level in non-productive age groups compared to their counterparts (Latifah, 2020). Increase in age lead to lower physiology, secretion, and insulin resistence so the ability to control hyperglycemia in body is not optimal (Chaudhary & Tyagi, 2018).

Female patients are more likely to have higher blood glucose level compared to male. The result of statistical bivariate analysis showed that there was no association between sex and blood sugar level in type 2 diabetic patients at the Public Health Centre Makassar (p=0,432). Study by Mauvais-jarvis & Orleans argued that blood sugar level tend to be higher in female because the premenstrual syndrome and other hormonal process plays a role in this factor, increasing the risk of increased blood sugar level for this gender (Mauvais-jarvis & Orleans, 2018). A similar study also conducted by Milita et al., (2021) found that blood sugar in the female gender was higher (55.4%) compared to the male gender. Other study suggests gender does not affect blood sugar level, as it varies depending on habits and lifestyles of type 2 diabetic patients (Boku, 2019). Contradicting study by (Komariah & Rahayu, 2020), however, found that female tend to have normal blood sugar level than male

Majority of patients completed high level of education. The result of statistical bivariate analysis showed education level is not associated with blood glucose level in type 2 diabetic patients in thePublic Health Centre Makassar (p=0,357). This finding is affected by other external factor. Patients may know how to control their blood sugar levels from medical examinations and pamphlets, but they also do not want to control their blood sugar levels. Other findings by Pahlawati & Nugroho found association between education level and blood glucose level (Pahlawati & Nugroho, 2019).

Employed patients have higher blood glucose level compared to their counterpart. The result of statistical bivariate analysis showed no association between employment status and

blood glucose level in type 2 diabetic patients in the Public Health Centre Makassar (p=0,522). This finding is in line with research by Zahroh, Ningtyas & Sawitri showing that patients with less work load tend to have higher blood sugar level compared to those with heavy work load, this is because of higher chances of obesity from less of physical activity often done while workin (Zahroh et al., 2018). Other study by Arania et al found contradicting result, however association found in this research was weak since blood sugar level can be suppressed if the person is working with a high level of physical activity (Arania et al., 2021).

Patients suffering with type 2 diabetes for moderate duration (6-10 years) tend to have higher blood glucose level. The result of statistical bivariate analysis showed is relation between duration of disease and blood sugar level in type 2 diabetic patients in Public Health Centre Makassar (p=0,003). This finding is in line with study conducted by Rahayu, Sataswati & Setyawan, which argues that blood sugar level will be controlled as long as therapy is done accordingly and healthy lifestyle is implemented regardless of how long one has suffered from diabetes (Rahayu et al., 2018). Previous study by Hariani et al showed that duration of disease is related to blood sugar level. This is due to the control of blood glucose is worsened as the duration of disease increase, this is due to a decrease in the ability of insulin secretion by pancreatic beta cells due to a long workload as compensation for an increase in glucose levels in blood (Hariani et al., 2020).

Patients with obesity have higher blood sugar level compared to those in normal weight and overweight. The result of statistical bivariate analysis showed significant association between obesity and blood sugar level in type 2 diabetic patients in the Public Health Centre Makassar (p=0,000). Another study conducted (Ardiani et al., 2021) showed that obesity has a significant influence on the incidence of diabetes mellitus. Previous research conducted by Masruroh showed significant relation between obesity and blood glucose level. This is due to insulin resistance, reducing the supply of glucose to the cells and stimulating pancreatic cells to produce and excrete excess insulin. The presence of high insulin levels can generally control blood sugar levels for several months. However, this can decrease productivity because the cells in the pancreas are too heavy to function. Finally, insulin production slows down and then stops. As a result, glucose accumulates in the blood and becomes high (Masruroh, 2018).

Most of patients with hypertension have higher level of blood glucose level. The results of statistical bivariate analysis showed that there was association between hypertension and blood sugar level of people with type 2 diabetes mellitus at the Public Health Centre Makassar (p=0,0488), previous study by Putra shown similar findings of significant relation between hypertension and blood sugar level. Based on this study, the relationship between hypertension and blood sugar levels is very complex, hypertension can reduce the sensitivity of cells to insulin (insulin resistant) which causes disturbances in blood sugar levels (Putra, 2018). Other studies have found that there is a relationship between hypertension and blood sugar levels (Choi et al., 2023).

Higher blood sugar level was found more prominent in patients with poor dietary habit. The results of statistical bivariate analysis showed a significant association between diet and blood glucose level in type 2 diabetic patients in the Public Health Centre Makassar (p=0,000). Previous study by Rahmawati, Wahyuningsih & Yalestyarini shown the two variables are associated, blood glucose level often affected by diet (Rahmawati, Wahyuningsih & Yalestyarini, 2018). Diet is an important determinant of obesity and insulin resistance. Excessive energy intake will increase insulin resistance even if there has not been a significant weight gain hence increase the risk of high blood sugar levels (Pratiwi et al., 2021). Food consumption based on the amount, type, and time of eating influences high blood sugar levels in a person (Komariah & Rahayu, 2020).

Patients with low/moderate physical activity were found with high blood sugar level compared to their counterpart. The results of statistical bivariate analysis showed a significant

association between physical activity and blood glucose level in type 2 diabetic patients in the Public Health Centre Makassar (p=0,000). This finding is in line with study by Sari & Purnama, which shown patients with less or no physical activity has higher blood glucose level and less controlled insulin sensitivity (Sari & Purnama, 2019). Individuals with light activity or rarely do sports result in food substances that enter the body being accumulated into fat and sugar. Regular physical activity or exercise is associated with an increase in the speed of recovery of muscle glucose. When doing physical activity or exercising, muscles take glucose from the blood to increase blood glucose control (Tella et al., 2021). Other study by Azitha, Aprilia, & Ilhami found contradicting findings, shown that patients with low physical activity have normal blood sugar level, this is due to majority of patients are elders hence unable to do high physical activity (Azitha et al., 2018). Therefore, quality of life has a relationship with diabetes mellitus (Zhang et al., 2023). The main limitations of our study include reliance on secondary secondary data, which in turn is affected by measurement accuracy, changes in case definitions. The sample in this study is also still quite small. Future research can expand the scope of the sample.

4. CONCLUSION

There was an association found between obesity, diet, and physical activity with blood sugar levels duration, hypertension. Meanwhile, age, gender, education level, working status, were factors that did not associated with blood sugar levels in patients with type 2 diabetes. It is recommended for people with Type 2 DM to always apply healthy lifestyle behaviors, especially maintaining a diet according to the recommendations for the type, amount, and time of eating as well as doing physical activity regularly so that blood sugar levels in the body are always controlled and prevent complications of diabetes mellitus.

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R E S E A R C H	**Open Access**

Does Effleurage Massage Reduce Dysmenorrhoea Pain in Adolescents?

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Abstract

Dysmenorrhea, commonly known as menstrual pain or cramps, affects some women and hampers their ability to carry out daily activities. In Indonesia, the incidence of dysmenorrhea among women is reported to be 64.25%, with a significant proportion lacking knowledge regarding its management. Non-pharmacological methods, such as effleurage massage, have been suggested as a viable approach to alleviate dysmenorrhea pain. This study aimed to investigate the impact of effleurage massage on the pain scale associated with dysmenorrhea in adolescents. A quasi-experimental approach utilizing a pre- and post-test for a two-group design was employed. The study population consisted of young women experiencing dysmenorrhea, with a total sample size of 44 respondents divided into intervention and control groups. The research findings revealed a decrease in the mean pain score in the intervention group from 5.1 ± 2.4 to 2.5 ± 1.8 with a p-value of <0.001. Thus, it can be concluded that effleurage massage effectively reduces the intensity of dysmenorrhea pain in adolescents. As a recommendation, adolescents are advised to consider non-pharmacological therapies like effleurage massage as an alternative to pharmacological drugs, and to learn the technique to perform effleurage massage independently at home.

Keywords: Effleurage Massage, Dysmenorrhea Pain, Adolescents.

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1. INTRODUCTION

Dysmenorrhea is a problem that arises during or before menstruation which occurs due to the increase of prostaglandin hormone, which increases uterine contractions as well (Andanawarih, Jannah, & Artanti, 2020), causing discomfort in carrying out daily activities for 1-3 days of menstruation period (Rahayu, Pertiwi, & Patimah, 2017; Sukmawati, Kurniawati, & Wahyuni, 2021). In the United States, dysmenorrhea is recognized as the most common cause of school absence in 29-44% of adolescent girls (Rusyanti & Ismiyati, 2019; Sari, et al., 2022). In cases of severe dysmenorrhea, there may be signs of depression, suicidal thoughts, increased anxiety, and feeling unwell (Azima, et al., 2015). The incidence of dysmenorrhea in the world is reported to be 25% -97% (Rusyanti & Ismiyati, 2019). In other words, almost 50% of women worldwide experience dysmenorrhea. In Indonesia, the incidence of women experiencing dysmenorrhea is 64.25% (Argaheni, 2021), 72.89% of primary dysmenorrhea and 21.11% of secondary dysmenorrhea (Syafriani, Aprilla, & Z.R, 2021).

The effect on adolescents who experience dysmenorrhea during menstruation is that they have more days off, and their performance at school decreases compared to adolescents who are not affected by dysmenorrhea. To avoid severe symptoms, dysmenorrhea in adolescents must be treated, even with self-medication or non-pharmacology. The impact that occurs if dysmenorrhea is left untreated, the underlying pathology (abnormality or disorder) can trigger an increase in mortality, including infertility. Apart from the impacts above, emotional conflict, tension and anxiety can all play a role and cause feelings of discomfort and strangeness. Menstrual pain felt by young women in the teaching and learning process causes them to have difficulty concentrating because of the discomfort they feel when they experience menstrual pain. Therefore, dysmenorrhea must be handled at a young age so that there are no impacts like the things above (Acheampong et al., 2019; Nurwana, Sabilu, & Fachlevy, 2017; Udayar, Jeergiyal, & K, 2022).

As many as 84.21% of adolescents with dysmenorrhea were treated with non-pharmacological methods, and only 15.79% were treated with medical personnel and used analgesia. Studies have assessed the management of primary dysmenorrhea and identified potential benefits and drawbacks for each therapy. Pharmacological treatments, such as nonsteroidal anti-inflammatory drugs (NSAIDs) and hormonal contraceptives, have proven effective in reducing menstrual pain and cramps, offering quick symptom relief (Chen, et al., 2019; Itani et al., 2022). However, medication use may entail side effects like gastrointestinal problems, headaches, and mood changes, while long-term effects on adolescents remain uncertain (Marjoribanks, et al., 2015). On the other hand, non-pharmacological treatments like heat therapy, exercise, and acupuncture have shown effectiveness in alleviating menstrual pain and cramps. They may be preferable for some adolescents concerned about medication side effects. Nevertheless, non-pharmacological treatments may take longer to provide relief, and concerns exist regarding their availability and accessibility (Aboualsoltani, et al., 2020; Armour, et al., 2019; Unnisa, et al., 2022). Complementary therapy (non-pharmacological methods) that are most often used by adolescents with dysmenorrhea (Dewi, Frafitasari, & Sari, 2023) include; Antalgic postures, warm compresses, using primrose oil, local massage, relaxation techniques, meditation, music therapy, acupressure, aromatherapy, and acupuncture (Fernández-Martínez, Onieva-Zafra, & Parra-Fernández, 2019). One way that can be used to reduce dysmenorrhea pain is effleurage massage.

Effleurage massage is the act of pressing with the hands on the soft tissues of the body without causing a shift or change in joint position. The movement in doing effleurage massage includes placing both palms on the stomach and simultaneously moving into the centre of the

circular direction to the symphysis or can also use one palm in a circular or one-way motion. With effleurage massage, hypoxia in the tissue will be reduced so that the level of oxygen entering the tissue increases, which causes reduced pain. In addition, effleurage massage can increase the release of endorphins so that the pain threshold increases (Argaheni, 2021; Jamhariyah, Karnasih, & Diaz Casitadewi, 2021).

The Pantoloan Health Center is one of three Community Health Centers in Palu City that has formed a youth Posyandu but is still lacking in activities related to disseminating information on adolescent reproductive health, especially related to menstrual disorders and how to deal with them (Sumiaty, et al., 2021). A preliminary study conducted on 30 adolescents at the Adolescent Integrated Health Center, Pantoloan Public Health Center found that 77% of adolescents ignored the problem of dysmenorrhea, 85% chose non-pharmacological therapies such as warm compress, ginger tea infusion, and exercise to treat dysmenorrhea, 90% did not understand how to deal with dysmenorrhea, and 82% were absent from school when experiencing dysmenorrhea (Sumiaty, Sakti, & Hasnawati, 2022). This study aimed to determine the effect of effleurage massage on the pain scale of dysmenorrhea in adolescents.

2.   RESEARCH METHOD

The method used in this research is quasi-experimental research design with the pre-test posttest control group design. This research was conducted in the Pantoloan Health Center Working Area. This research was conducted from September 6 to October 6, 2022. The population in this study were adolescents who experienced dysmenorrhea in the Pantoloan Health Center Work Area. The sample used in this study was 44 respondents for the control group, as many as 22 respondents and for the Intervention group, as many as 22 respondents. The sampling technique used in this study is purposive sampling, which involves selecting samples based on predetermined criteria. Inclusion criteria were adolescent girls aged 13-18 years with regular menstrual cycles. Adolescents who did not attend the adolescent integral health care were excluded.

The data collection process was carried out by providing a Numeric Rating Scale / NRS observation sheet, which was measured before and after the effleurage massage was carried out with the criteria for a scale of 0: no pain, scale 1-3: mild pain, scale 4-6: moderate pain, scale 7-9: severe pain, and scale 10: very severe pain. The procedure for effleurage massage involves the respondent assuming a comfortable position, either sitting or lying down, pouring olive oil onto both palms, using the entire palm surface, and starting the massage from the lower back to the upper back, always massaging upwards. Then, slowly push the hands to the sides of the respondent's back. Maintain contact with the respondent's back without applying pressure as you move the hands downward. The massage is performed until the fifth to sixth rib. Effleurage massage is given twice for 15 minutes each, with a 4-hour interval between the first and second sessions. After the massage, wait for 10 minutes for the respondent to fully relax. Then do a pain assessment again on the respondent to determine whether it is effective after the effleurage massage is done.

The analysis used to describe the characteristics of respondents using the frequency distribution, bivariate analysis using the Shapiro Wilk test for the normality test, to compare pain before and after in the intervention group using a paired t-test, while in the control group using the Wilcoxon test. to compare pain between the intervention and control groups before effleurage massage was performed using the independent t-test while after effleurage massage was performed using the Mann-Whitney test. This study had been subject to a research ethics agreement from KEPK Poltekkes Kemenkes Palu with the number: 0035.1/KEPK-KPK/V/2022.

3.   RESULTS AND DISCUSSION

Table 1. Frequency Distribution of Respondents' Characteristics.

Respondent characteristics	Intervention		Control	
	n (22)	%	n (22)	%
Age (years old)				
13	9	40.9	4	18.2
14	1	4.5	4	18.2
15	2	9.1	1	4.5
16	7	31.8	9	40.9
17	3	13.6	4	18.2
Education				
Junior High School	12	54.5	9	40.9
Senior High School	10	45.5	13	59.1
Pre				
No pain	0	0	0	0
Mild	8	36.4	1	4.5
Moderate	8	36.4	13	59.1
Severe	6	27.3	8	36.4
Post				
No pain	3	13.6	0	0
Mild	11	50	2	9.1
Moderate	8	36.4	16	72.7
Severe	0	0	4	18.2

As shown in Table 1, in the intervention group, the most respondents at the age of 13 were nine people (40.9%), with junior high school education of 12 people (54.5%). In the control group at 16, there were nine people (40.9%) with senior high school education, as many as 13 people (59.1%). In the intervention group, there was a decrease in the proportion of severe pain from 27.3% to 0%, whereas in the control group, it decreased from 36.4% to 18.2%.

Table 2. Analysis of the differences in dysmenorrhea in the intervention group and the control group.

Dysmenorrhea pain	Group		p-value
	Intervention	Control	
	n (22)	n (22)	
Pre			
Mean (SD)	5.1 (2.4)	6.0 (1.3)	0.150***
Median (Range)	6.0 (8)	6.0 (5)	
Post			
Mean (SD)	2.5 (1.8)	5.4 (1.2)	<0.001****
Median (Range)	2.5 (6)	6.0 (4)	
p-value	<0,001*	<0,001**	

Description test: *paired t-test **Wilcoxon test ***Independent t-test ****Mann-Whitney test

In the intervention group, the average before the effleurage massage was 5.1 and after the intervention was 2.5, while in the control group, the average pain intensity was 6.0, which decreased to 5.4. There was a difference in pain in the intervention group before and after being given effleurage massage with the result p <0.05, which means there was a significant difference in the dysmenorrhea pain scale before and after being given effleurage massage.

The majority of respondents experienced moderate to severe levels of pain before receiving the effleurage massage technique. This indicates that the level of pain response varies among respondents according to their own perceptions (Andriani & Yanti, 2020; Asmawariza & Nurwahida, 2021). This study addressed the research gap by examining the effectiveness of effleurage massage in reducing dysmenorrhea pain among adolescents. Dysmenorrhea pain, described as moderate to severe, significantly affects daily activities and learning abilities of young women (Azzahroh, Indrayani, & Lusiana, 2022; Karout et al., 2021). Pharmacological treatment, such as analgesic drugs, is commonly used, but non-pharmacological approaches are considered easier and have fewer side effects (Andanawarih et al., 2020; Jamhariyah et al., 2021; Nugraha, 2021; Sholihah & Azizah, 2020; Sibero, Sari, & Asmita, 2022; Sumiaty et al., 2022).

Effleurage massage, a non-pharmacological method, involves a light touch on the skin to stimulate nerve pathways and provide pain relief (Qonitun, 2020). The technique activates larger and faster sensory nerve fibers, reducing pain transmission through smaller fibers and closing the synaptic gate for pain impulses. Back massage, a common approach, improves blood circulation, reduces muscle tension, and induces relaxation, leading to pain reduction (Asmawariza & Nurwahida, 2021; Veronica & Oliana, 2022). Effleurage massage during menstruation effectively reduces pain by stimulating the release of endorphins, natural pain relievers, and creating a comfortable sensation (Dewi, Ariani, & Septiani, 2022; Prihatin, 2019; Suwanto & Islamiyah, 2018). It is a safe, affordable, and easily accessible technique that can be performed independently or with assistance.

The present study contributes to the existing body of knowledge by providing empirical evidence on the effectiveness of effleurage massage in reducing dysmenorrhea pain among adolescents. The findings support the integration of non-pharmacological interventions, like massage therapy, into the management of dysmenorrhea. Further research could explore the long-term effects, underlying mechanisms, and optimal implementation strategies of massage therapy for menstrual pain relief.

4. CONCLUSION

In conclusion, this study found that effleurage massage is effective in reducing dysmenorrhea pain in adolescents. It is recommended for adolescents to consider using non-pharmacological therapies like effleurage massage instead of relying solely on pharmacological drugs. However, it is important to note that the findings of this study may have limited generalizability due to its focus on a specific age range and gender. Additionally, the small sample size of the study may affect the statistical power and general applicability of the results. Further research is needed to explore additional factors and interventions that may influence the outcomes of dysmenorrhea treatment.

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R E S E A R C H	Open Access

Effectiveness of Online Mindfulness-Based Intervention on Depression in Pregnancy

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Abstract

The high prevalence of depression in developed and developing countries requires a relevant intervention to suppress its incidence. Mindfulness-based intervention is given online as a new complementary intervention that can help reduce symptoms of depression. This study aimed to determine the effectiveness of online mindfulness-based interventions in reducing depressive symptoms in pregnancy. This research method used a randomized control trial, with 66 participants consisting of the mindfulness-based Intervention (MBI) group of 33 participants and the control group of 33 participants. The MBI intervention was provided for eight weeks online. The study uses simple random sampling. Depression was assessed using DASS 42. Data were tested using the Mann-Whitney U Test and t-test and processed with SPSS version 23. The results showed that there was a significant decrease in depression levels in the online MBI group after being given intervention compared to the control group (7.55 ± 2.181 vs 11.00 ± 2.345) p=0.000. Mindfulness-based intervention online can reduce depressive symptoms in pregnant women, so that the intervention becomes a feasible, cheap and easy intervention for pregnant women in improving mental health. In the future, this research can develop other types of complementary interventions to improve maternal and fetal health.

Keywords: Online, Mindfulness, Depression, Pregnancy.

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1.   INTRODUCTION

World statistics in 2017 show that depressive disorders are among the top three causes of disability (James et al., 2018). The prevalence of prenatal depression in developed countries is smaller than in developing countries, which ranges from 10%–15%, and in developing countries, it is around 20% (Pereira et al., 2011). Compared to men, women have a higher prevalence and incidence of depression (Kuehner, 2017; Labaka et al., 2018; Lim et al., 2018). A study shows that groups of women are very vulnerable to anxiety and depression, 39-44% (Tsakiridis et al., 2019; Toscano et al., 2021). The prevalence of antenatal depression ranges from 15% to 65% worldwide (Dadi et al., 2020). Estimates of the prevalence of depressive symptoms increased by 8.1%, 10.1%, and 11.3% at 3, 6, and 18 months postpartum (Woolhouse et al., 2014). During pregnancy, depressive symptoms are 55%-78% prevalent (Liddle and Pennick, 2015; Dadi et al., 2020).

High stress can exacerbate symptoms of depression and anxiety (Biaggi et al., 2016). Some of the signs of perinatal depression are tiredness, anxiety for a long time, having difficulty concentrating, and difficulty sleeping (Moore, Ayers, & Drey, 2016). Classic symptoms of depression include feelings of sadness, anhedonia or lack of interest, and fatigue (O'Connor et al., 2021). Approximately 44.2% of women with severe illness report moderate to severe depressive symptoms during the third trimester of pregnancy (Vignato et al., 2020). A study states that depressive symptoms increase from 24 weeks of gestation to puerperium, Stress, anxiety, and depressive symptoms are correlated. In particular, women in late pregnancy and postpartum are prone to stress, anxiety, and depression. Prenatal anxiety can predict symptoms of postpartum depression. Active assessment and management of stress, anxiety, and depression is necessary and should begin early in pregnancy and continue postpartum (Cheng et al., 2021).

A systematic review and meta-analysis reported that the prevalence of depression was 7.4%, 12.8%, and 12.0% in the first, second, and third trimesters of pregnancy and 17.7% postpartum (Hahn-Holbrook, Cornwell-Hinrichs & Anaya, 2018). However, perinatal depression may not be recognized because of the physical and psychological changes during pregnancy and postpartum (ACOG Committee, 2018).

Depression and anxiety during pregnancy are associated with negative outcomes for both mother and child (Stein et al., 2014; Grigoriadis et al., 2018). Antenatal depression is linked to low birth weight babies and premature births (Szegda et al., 2014; Ding et al., 2014; Goodman et al., 2014; Zietlow et al., 2014; Jarde et al., 2016; Dadi et al., 2020; Li et al., 2020; Dowse et al., 2020; Nisar et al., 2020; Miller et al., 2022). Prenatal depression is associated with negative affective experiences with the fetus, premature, low Apgar scores, NICU admission, and postpartum maternal acceptance (Zhang et al., 2021; Hu et al., 2015; Dowse et al., 2020; Clapp et al., 2016). Children of mothers with postpartum depression are at risk for abuse and social, emotional, and behavioral problems (Choi et al., 2020). In particular, mothers who experience depressed mood during the first trimester or during pregnancy have higher levels of postpartum psychosocial difficulties (Zohsel et al., 2017), and those with postpartum depression have problems bonding with the baby (Rogers et al., 2020). In addition, maternal psychological distress has been associated with impaired mother-child interaction, childhood regulatory dysfunction, and impaired cognitive and psychomotor development. (Ding et al., 2014; Goodman et al., 2014; Zietlow et al., 2014). Untreated prenatal depression can devastate women, their babies, and their families (Taylor, Cavanagh, and Strauss, 2016; ACOG Committee, 2018)

A series of mindfulness-based interventions have shown evidence of treating perinatal

depression for mothers and babies. A meta-analysis of 17 studies with mindfulness-based interventions during the perinatal period found significant reductions in symptoms in the depression group from pre to post-intervention (ACOG Committee, 2018). MBSR and Mindfulness-based interventions (MBIs) are effective in reducing symptoms of depression and anxiety in pregnancy and postpartum (Dimidjian et al., 2015) and prevent relapse of depression (Duncan et al., 2017). Cognitive behavioral therapy integrated with mindfulness interventions is very useful for reducing depressive symptoms (Yazdanimehr et al., 2016). So mindfulness programs have effectively reduced stress, anxiety, and depression (Nejad et al., 2021).

Psychotherapy interventions, such as interpersonal psychotherapy and cognitive behavioral therapy (CBT), have proven effective in treating perinatal depression and anxiety (Van Ravesteyn et al., 2017). CBT is the intervention of choice for dealing with mental problems (Marchesi et al., 2016). Mindfulness-based interventions (MBIs) have recently become the focus of attention as an effective treatment for reducing symptoms of depression, anxiety, and stress in the general population (Lee et al., 2021) and pregnant women (Goodman et al., 2014; Dimidjian et al., 2015; Miklowitz et al., 2015; Dhillon, Sparkes, & Duarte, 2017), which combines elements of CBT and psychoeducation. According to a meta-analysis, there is no significant difference between MBI and CBT in treatment success for anxiety and depression (Lee et al., 2021). This is a motivation to conduct further research.

A study states that mindfulness-based interventions can be delivered online with the same efficacy as face-to-face classes in reducing stress, depression, and anxiety ((Spijkerman, Pots, & Bohlmeijer, 2016; Fish, Brimson ,& Lynch, 2016). Innovation with online mindfulness meditation for 6 weeks of pregnancy is a cost-effective intervention for a large number of pregnant women (Kantrowitz-Gordon et al., 2020)

Given the increasing Internet presence, MBI can also be offered electronically. The results of a meta-analysis show that electronic MBI (eMBI) positively impacts mental health (Spijkerman, Pots, & Bohlmeijer, 2016). However, there are few pregnancy-specific eMBI studies with small samples and a lack of randomized control trial approaches (Hall et al., 2016; Taylor, Cavanagh ,& Strauss, 2016; Dhillon, Sparkes & Duarte, 2017; Krusche, Crane, & Dymond, 2019). However, women have expressed interest and desire to participate in electronic MBI interventions in the perinatal period (Maloni, Przeworski, & Damato, 2013). Evidence supporting the effectiveness of eMBI has so far been lacking (Krusche, Crane and Dymond, 2019). The utility and acceptance of smartphone applications as a tool for delivering MBIs has not been well studied in the pregnant population. This is the basis for researchers interested in proving the effectiveness of eMBI interventions in overcoming depression in pregnancy. Taking into account the increasing presence of the internet everywhere, MBI can also be offered electronically which is cost-effective via computers (tablets) or smartphones (electronic-based MBI = eMBI). The study aimed to determine the effectiveness of online MBI in reducing depressive symptoms during pregnancy.

2.   RESEARCH METHOD

The study used a randomized control trial pretest-posttest with a control group. The research subjects were 66 pregnant women at the Kediri City Health Center from March to April 2023, which were divided into 2 groups. MBI online group (33 participants) and control group (33 participants). The MBI online intervention was provided for 8 weeks. Inclusion criteria: gestational age between 18-28 weeks, minimum age of 18 years and a maximum of 35 years, who have signed informed consent, who agree to use the application, who have pregnancies without problems. Exclusion criteria: multiple pregnancies, previous severe psychiatric problems, history of side effects, or missed effects of mindfulness practice. Depression assessment was carried out two times, namely pretest (initial data collection) and

posttest (week 8). Sampling technique using simple random sampling. Data analysis using t-test and Mann-Whitney U Test. The collected data was processed using SPSS version 23. Ethical clearance was obtained from the Malang Ministry of Health Poltekkes with No.303/V/KEPK POLKESMA/2023.

Table 1. Program online mindfulness-based intervention.

No	Module	Content	Mindfulness practices
1	Introduction	• Facts about pregnancy depression • Mental health in pregnancy • Introduction mindfulness programme	Mindfulness eating a raisin Awareness breathing
2	Depression in pregnancy	• Mindfulness and Depression	Body scan
3	Activity	• Mindful movement • Physical activity in pregnancy	Sitting meditation
4	Self-control	• Choices and control in labor • Accepting and letting go	Being with baby
5	Self-compassion	• Self-care and self-compassion	Loving-kindness meditation
6	Labour	• Mindfulness and labour • Pain in labour	Mindful walking
7	Postpartum	• Postpartum mindfulness	Being with baby

3. RESULTS AND DISCUSSION

Interviews were conducted with 66 participants. The next researcher collects data and answers to each question in the questionnaire. The characteristics of the respondents are described in Table 1, and the level of depression in the two groups is described in Tables 2 and 3.

Table 2. Characteristics at baseline in the MBI and control group.

Characteristics of respondents	Group						p-value
	MBI group			Control group			
	n	Mean / %	SD	n	Mean / %	SD	
Age	33	26,45	3,751	33	25,70	3,026	0,370
Gestational age	33	21,79	3,140	33	22,88	3,664	0,199
Parity							
Primigravida	16	48,5		18	54,5		0,625
Multigravida	17	51,5		15	45,5		
Marital status							

Not married yet	1	3,0	0	0		0,317
Marry	32	97,0	33	100,0		
Education						
Elementary school	10	30.3	5	15.2		
Secondary school	16	48.5	23	69.7		0,541
High School	7	21.2	5	15.2		
Work						
Doesn't work	14	42,4	18	54,5		0,328
Work	19	57,6	15	45,5		
Income						
Low	14	42.4	13	39.4		
Medium	15	45.5	14	42.4		0,640
High	4	12.1	6	18.2		
Depression (DASS)	33	12,24	3,27: 33	11,88	3,27(	0,648

Note: non-parametric tests (Mann-Whitney U Test)

Subject characteristics of each group (n=33) included the age of the MBI respondents (26.45±3.751) years, control (25.70±3.026) years p=0.370, and MBI gestational age (21.79±3.140), control (22.88±3.664) p=0.199, primigravida and multigravida parity in the MBI group (48.5 vs. 51.5), in the control group (54.5 vs. 45.5) p=0.625, marital status in the MBI group (12.24 ± 3.275) and control group (11.88 ± 3.270) education (p = 0.541), occupation (p = 0.328), income (p = 0.640), mean depression in the MBI group (12.24 ± 3.275), control group (12188 ± 3.270) p = 0.648, this shows that the research data is homogeneous.

Table 3. Depression level pretest and posttest in the MBI group after being given the intervention.

	Pretest		Posttest	
	Frequency	**%**	**Frequency**	**%**
Mild	24	72.7	5	15.2
Moderate	7	21.2	0	0,0
Normal	2	6.1	28	84.8
Total	33	100,0	33	100,0

Description: descriptive statistics test

The results of the analysis showed that there were differences in the levels of pretest and posttest depression after the intervention, mild (72.7% vs 15.2%), moderate (21.2% vs 0%), and normal (6.1% vs. 84.8%). The results of this study showed that the majority of depression at the pretest was at a mild level. After being given the intervention, the majority were at a normal level.

Table 4. Depression level pre-post pada control group

	Pretest		Posttest	
	Frequency	**%**	**Frequency**	**%**
Mild	25	75.7	24	72.7
Moderate	5	15.2	3	9.1
Normal	3	9.1	6	18.2
Total	33	100,0	33	100,0

Description: descriptive statistics test

The results of the analysis showed that there were differences in the levels of pretest and posttest depression after the intervention, namely mild (75.7% vs. %), moderate (15.2% vs 6.1%), normal (9.1% vs 18.2%). This shows that the majority of depression at the pretest was mild, and after eight weeks, the majority remained mild.

Table 5. Differences in depression before and after the intervention in the mindfulness-based intervention group.

Variable	Pretest	Posttest	p-value
	Mean (SD)	Mean (SD)	
Depression (DASS)	12.24 (3.279)	7.55 (2.181)	0,000

Description: Paired T-Statistics

The analysis showed a significant decrease in symptoms and levels of depression in the MBI group after being given intervention for eight weeks (12.24 ± 3.279 vs. 7.55 ± 2.181) p = 0.000.

Table 6. Differences in depression before and after mindfulness-based intervention in the control group

Variable	Pretest	Posttest	p-value
	Mean (SD)	Mean (SD)	
Depression (DASS)	11.88 (3.170)	11.24 (2,610)	0,153

Description: Paired T-Statistics

The analysis showed no significant reduction in symptoms and levels of depression in the control group for eight weeks (11.88 ± 3.170 vs. 11.24 ± 2.610) p=0.153.

Table 7. Differences in posttest depression levels in the MBI group and the control group

Variable	Posttest	p-value
	Mean (SD)	
Depression (DASS)	7.55 (2.181)	0,000
Depression (Kontrol)	11.24 (2.610)	

Description: Independent T- Statistics

The analysis results showed significant differences in symptoms and levels of depression in the intervention group and the control group after the MBI intervention (7.55 ± 2.181 vs 11.24 ± 2.610) p=0.000. This shows that the reduction in symptoms and levels of depression was greater in the intervention group than in the control group.

The online MBI intervention given for eight weeks greatly reduced symptoms and levels of depression during pregnancy. Depression levels decreased significantly in the MBI group compared to the control group. This is in line with some evidence showing that practicing mindfulness skills during pregnancy can reduce depressive symptoms in mothers (Nyklíček et al., 2018). Prenatal mindfulness training has long-term benefits for dealing with depressive symptoms during the transition to parenthood (Felder et al., 2018). Meditation that is taught

formally and informally provides the benefit of reducing depression in pregnant women. This is in line with other research that mindfulness meditation interventions can improve the prevention, remission, and reduction of depression during pregnancy and can be used as an adjunct measure for the clinical treatment of depression in pregnancy (Cai et al., 2022). Providing mindfulness exercises makes pregnant women more confident in carrying out their pregnancies because these exercises provide space for women to practice their independence in doing meditation at home. This is in line with research that conducted mindfulness interventions correlated with self-management components, including self-efficacy (Turner et al., 2016). In the past few years, mindfulness-based interventions (MBIs) have increasingly been the focus of attention because of their efficacy and low cost. By combining elements of cognitive behavioral therapy and psychoeducational content, MBI supports an effective approach to enhancing physical and mental well-being (Goldberg et al., 2018). Another program, namely mindfulness-based stress reduction (MBSR) is also suggested to promote women's mental health (Nasrollahi et al., 2022).

The participants accepted the mindfulness intervention provided in this online study as an intervention that was easy, cheap, accessible at any time, and effective. This is in line with study that mobile or web-based interventions are very well received in women with postpartum depression (PPD). Mindfulness interventions are well-received among women with moderate to moderate PPD symptoms. In the study, 69% of participants were very satisfied with the app, and all participants planned to continue their mindfulness practices after the study ended (Avalos et al., 2020). A meta-analysis with electronic awareness-based interventions (eMBI), including 97 RCTs, demonstrated increasing interest in implementing eMBI. This meta-analysis shows that eMBI significantly improve mental health (Spijkerman, Pots & Bohlmeijer, 2016). Other studies highlight the need for eMBI to support pregnant women, especially if hospitalized because of severe obstetric risk, and point to the need for larger randomized trials to demonstrate the efficacy and effectiveness of eMBI. The women reported positive experiences and indicated that they benefited from the program. A meta-analysis including 65 randomized controlled trials showed that online mindfulness interventions directly and significantly reduced depression, stress, and anxiety in nonclinical and clinical samples (Schumer, Lindsay & Creswell, 2018).

Mindfulness-based electronics can help improve mothers' physical and mental health with geographic, financial, and psychological problems. Therefore, Mindfulness-based electronic is a promising approach to providing effective and cost-effective assistance to pregnant women with psychological distress and reducing the negative impact on perinatal health. Several existing studies suggest that eMBI is useful (Krusche et al., 2018), feasible, and acceptable (Mendelson et al., 2018; Avalos et al., 2020) in the treatment of depression and anxiety in the perinatal period. There is evidence that women with high levels of depression, anxiety, or stress over time benefit more from MBI than the universal perinatal population (Taylor, Cavanagh & Strauss, 2016)

A study with smartphone-based MBI is a feasible, acceptable, and perceived intervention that benefits pregnant women with obesity (Ward et al., 2023). The research findings indicate a high MBA acceptance rate. Most of the respondents were satisfied with the usability and considered the eMBI program to help with problems during pregnancy (Schiele, et al., 2022)

Another thing to note is that psychotherapy, pharmacotherapy, physical exercise, and meditation interventions can also cause harm, it is important to consider negative effects such as increased anxiety and unpleasant experiences through the use of MBI (Baer et al., 2019). So this research requires further research to test the safety of the intervention. The strength of this study is that the mindfulness intervention was given online for eight weeks using a randomized control trial. The weakness of this research is the direct observation of the participants' meditation practice at home which cannot be seen directly by all the participants.

The online MBI research provides users with convenience and easy access to practice daily meditation and mindfulness exercises. This mindfulness training practice differs from traditional mindfulness interventions because it can be done alone and is inexpensive. To improve the quality of implementing online-based mindfulness programs, ongoing efforts are needed to assess the effectiveness of the application, satisfaction, and usefulness for users, increase the types of services that can be reached online to maximize services, for example, by using artificial intelligence and paying attention to the privacy of patient data storage properly.

4. CONCLUSION

Mindfulness-based interventions provided online provide the same benefits as face-to-face mindfulness interventions. MBI for eight weeks can reduce symptoms of depression during pregnancy. This intervention is effective for pregnant women who experience geographical, occupational, and other technical problems. Future research is needed to optimize and effectively implement prevention, screening, and treatment protocols for antenatal depressive symptoms as a strategy to prevent preterm birth. The implication of this research is to be applied in improving the primary health care system, especially midwifery, to improve mother and baby outcomes after giving this intervention.

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R E S E A R C H   **Open Access**

Development of Local Foodstuff-Based Complementary Food Porridge MP-ASI "SITOLE" Products as an Effort to Manage Stunting

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Abstract

One of the causes of stunting is poor nutritional intake in infancy and recurrent illnesses due to an unhealthy environment. Mothers of under-five children are the potential strategic target to be empowered to manage stunting. They have to be empowered to meet nutritional needs during infancy. Complementary breast milk food containing calcium, zinc, selenium, iodine, Fe, protein, and phosphorus can be developed using local foodstuffs. This study aimed to investigate the impact of community empowerment training on the knowledge improvement of mothers regarding the development of locally sourced complementary feeding products (MP-ASI) as an intervention to address stunting issues and to formulate a nutrient-rich complementary food product for infants aged 6-12 months. The research design employed was a quasi-experimental study with a pre-and post-test with a control group design. The study subjects were mothers with infants aged 6-12 months residing in Triharjo Village, Kapanewon Pandak, who met the inclusion criteria and were willing to participate. Mothers who were unable to read and write were excluded from the study. The study was conducted in Triharjo Village, Kapanewon Pandak, Bantul, from April to July 2022. A total of 54 respondents, selected through simple random sampling, were included as the study sample out of 100 families population. Knowledge data were collected using a questionnaire as the data collection instrument and analyzed using the Dependent T-Test and Independent T-Test at a 95% confidence level. The results indicated a significant difference in knowledge improvement (delta) between the treatment and control groups. A locally sourced complementary food product for infants aged 6-12 months, named "SITOLE" porridge, was developed as an outcome. The development data of the MP-ASI product (Sitole porridge) were compiled using a group discussion method.

Keywords: Empowerment, Under-Five Children, Nutritional Intake.

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1.   INTRODUCTION

Stunting is a major nutritional issue in Indonesia (Torlesse et al., 2016). Of the under-five children in Indonesia, 30.8% were stunted. In the Special Region of Yogyakarta, the prevalence of stunted babies born in 2018 was 28.7% (Dinas Kesehatan DIY, 2021). Furthermore, in the work area of Pandak II Community Health Center, Bantul Regency, there were 6.19 cases of stunting in 2019 (Dinas Kesehatan Bantul, 2019). The work area of the Pandak II CHC was considered a stunting locus. A lack of nutritional intake to meet nutritional needs during infancy is one of the causes of stunting. Stunting can cause irreversible disorders in children's physical development, which further cause a decrease in cognitive and motor abilities and work performance (Astutik, 2018). Stunted children have an average Intelligence Quotient (IQ) score of 11 points lower than the average IQ score of normal children (Picauly & Toy, 2013). Therefore, stunting remains a priority in the nutrition program in the Yogyakarta Special Region (DIY), which is in line with the Action Plan of the Directorate of Community Nutrition, Directorate General of Public Health, Ministry of Health of the Republic of Indonesia, as stated in the National Medium-Term Development Plan (RPJMN) 2020-2024. The plan highlights the "improvement of the nutritional status of the population" as one of the development priorities, with the main targets being to reduce the prevalence of stunting and wasting to 14% and 7%, respectively, by 2024 (Kementerian Kesehatan Republik Indonesia, 2020).

Without early intervention, growth and developmental disorders caused by malnutrition, including stunting, will persist into adulthood (Manggala et al., 2018). Based on the results of a preliminary survey in Kapanewon Pandak, Bantul Regency, 70% of mothers with toddlers had limited knowledge about preventing stunting through the provision of complementary feeding during the first two years of life, utilizing locally available food rich in nutrients such as animal protein, calcium, iron, vitamin D, zinc, selenium, phosphorus, and iodine, which support linear growth. One of the causes of stunting is inadequate nutritional intake and recurrent illnesses due to an unhealthy environment (Rothman, 2007). Adequate nutrition during fetal development is crucial for achieving the expected body weight and length at birth (Aguayo et al., 2016). Exclusive breastfeeding and the timely introduction of complementary feeding starting at six months of age are effective strategies for attaining average body weight and length (Rochmah, 2017). Thus, it is essential to implement a stunting prevention program that addresses the nutritional needs of children under two years of age, promoting optimal growth and preventing stunting.

Mothers are a strategic target for empowerment in meeting the nutritional needs of infants aged 6-12 months through complementary feeding. An approach to accomplishing this objective involves empowering the community to facilitate the development of complementary food products utilizing local resources. These efforts aim to provide essential nutrients to prevent stunting. The community of Triharjo Kapanewon Pandak Village, Bantul Regency, DIY, primarily relies on agriculture for their livelihood, cultivating various food crops such as long beans, kale, mustard greens, tomatoes, squash, carrots, peanuts, soybeans, cowpeas, and corn. Additionally, eggs, chicken, and fish are widely available in Kalurakan Triharjo Kapanewon Pandak. This study aims to examine the impact of community empowerment training on knowledge regarding the development of locally sourced complementary food products as an intervention for managing the issue of stunting. This research on developing locally sourced complementary food products has yet to be previously conducted.

2.   RESEARCH METHOD

This research follows a quasi-experimental design, employing a pre-post test with a control group. The study focused on mothers of toddlers, specifically those with children aged 6-12 months, residing permanently in Triharjo Village, Kapanewon Pandak, and willing to

participate as research subjects. Mothers who could not read and write were excluded from the study.

The research was conducted in Triharjo Village (treatment group) and Caturharjo Village (control group). The selection of study sites was based on a 2020 stunting measurement report, which indicated a 6.19% prevalence of stunting in the Bantul District, as reported by the Bantul Health Office (Dinas Kesehatan Bantul, 2020). The study population consisted of mothers from 100 families with fewer than two children, while families with two or more children were included as participants. The sample size was determined using the Vincent Gaspersz formula, resulting in 54 respondents for each group. The selection process employed a simple random sampling technique (Sugiyono, 2018). The distribution of subjects in the treatment and control groups was carried out by matching variables such as age, level of education, and employment status. The treatment variable in this study involved training and the development of recipes for locally sourced complementary food products for infants aged 6-12 months.

The implementation of the treatment/intervention in this study lasted for two months, starting with a 2-day training session on the development of local foodstuffs. Following the training, group discussions were conducted to identify local food resources. Subsequently, directed group discussions were held to identify the types of locally sourced complementary food products. The next stage involved formulating complementary food products for infants aged 6-12 months, specifically a porridge-type complementary food made from rice, eggs, and catfish, named "Sitole porridge." This research spanned two months, encompassing subject identification, training implementation, identification of local food resources, and discussions on the formulation of the complementary food product. The researchers and Nutrition Officers of Pandak II Community Health Center conducted the training for this study. Data analysis employed various tests for independent samples. T-tests (dependent and independent) were utilized as the data followed an interval scale and displayed a normal distribution, confirmed by the Smirnov-Kolmogorov test (Nursalam, 2020). The training materials focused on developing local foodstuff-based complementary food products as an intervention to manage stunting. The training sessions included lectures, question-and-answer sessions, demonstrations, discussions, and practical exercises, covering the development and preparation of complementary food using locally sourced foodstuffs rich in protein, calcium, iodine, selenium, zinc, iron, phosphorus, and vitamin D to meet the nutritional needs during infancy. The mothers' knowledge about stunting prevention was measured using a test method with a questionnaire consisting of 20 items, addressing the understanding of stunting, stunting indicators, the impact of stunting, stunting prevention measures, complementary feeding, local foodstuffs, nutrients to prevent stunting, and the role of the family in stunting prevention.

The development of locally sourced complementary food products in this study focused on porridge-type complementary food for infants aged 6-12 months. The product utilized local food resources from Triharjo Village, Kapanewon Pandak. Apart from rice, the main ingredients included eggs and catfish, resulting in the "Sitole porridge" as its name. Sitole is an acronym representing the main ingredients: rice, eggs, and catfish, with eggs and catfish serving as animal protein sources that support linear growth and prevent stunting. Farmers and livestock breeders locally produce these foodstuffs in the village. The composition of the Sitole porridge includes 20 grams of fried catfish, 50 grams of rice, 15 grams of boiled eggs, 10 grams of spinach leaves, one clove of garlic, one shallot, and a small amount of margarine. This study obtained ethical approval from the Yogyakarta Health Polytechnic through letter No. e-KEPK/POLKESYO/0386/IV/2022.

3. RESULTS AND DISCUSSION

Table 1. The frequency distribution of the characteristics of the research subjects.

Variable	Control		Treatment		p-value
	n	**%**	**n**	**%**	
Maternal Age					
< 20 Years	2	3,7	1	1,9	
20 – 35 Years	49	90,8	51	94,4	0,235
> 35 Years	3	5,5	2	3,7	
Educational Level					
Primary Educational Level (Elementary-JHS/MTs)	7	12,96	9	16,67	
Secondary Educational Level (SHS/VHS)	41	75,93	38	70,37	0,599
Higher Educational Level (Diploma/Bachelor/Master/Doctoral)	6	11,11	7	12,96	
Occupation					
Unemployed/Housewives	35	64,81	39	72,23	
Private Sector Employee	15	27,78	13	24,07	0,802
Civil Servant	4	7,41	2	3,7	

Table 1 presents the characteristics of the research subjects based on maternal age, educational level, and occupation. According to Table 1, 49 mothers (90.8%) aged 20-35 years were in the control group. In the treatment group, there were 51 mothers (94.4%) aged around 20-35 years old. The results of the proportion test indicated no significant difference in maternal age between the treatment and control groups. The characteristics of the research subjects based on maternal educational level revealed that 41 mothers (75.93%) had secondary education. In the treatment group, 38 mothers (70.37%) had secondary education. The proportion test results showed no significant difference in the mothers' educational level between the treatment and control groups. The characteristics of the research subjects based on employment status indicated that 35 mothers (64.81%) were unemployed/housewives in the control group. In the treatment group, 39 mothers (72.23%) were unemployed/housewives. The proportion test results showed no significant difference in the mothers' occupation type between the treatment and control groups.

Table 2. The Difference in knowledge (pre-test and post-test) of the research subjects in the treatment and control groups.

Groups	Pre-test				Post-test		
	n	**Mean**	**Std Deviasi**	**p-value**	**Mean**	**Std Deviasi**	**p-value**
Control	54	73,06	13,082	0,971	83,25	7,456	0,000
Treatment	54	72,97	11,508		90,76	4,411	

Table 2 shows the Pre-Test scores of the control group, with an average knowledge score of 72.87, while the treatment group scored 73.06. The statistical analysis using the independent sample t-test yielded a p-value of 0.971 (p-value > 0.05), indicating no significant difference in knowledge at the beginning of the intervention between the treatment and control groups. At the end of the intervention, the treatment group's knowledge score was higher than the control group's. Both the treatment and control groups experienced an improvement in knowledge. However, the increase in knowledge among the mothers in the treatment group was more significant than that in the control group (90.76 > 83.25). This difference was statistically significant based on the independent sample t-test, which yielded a p-value of 0.000 (p-value < 0.05). This indicates a significant difference in knowledge at the end of the intervention (Post-Test) between the treatment and control groups.

Table 3. The Increase in Knowledge among The Subjects Before and After the Intervention was Assessed within Each Group.

Groups	Pre-test			Post-test			p-value
	Mean	**Min-Max**	**Deviation Std**	**Mean**	**Min-Max**	**Deviation Std**	
Control	73,05	40-95	13,082	83,25	65-100	7,455	0,000
Treatment	72,97	50-100	11,508	90,75	85-100	4,410	0,000

Statistical analysis was performed using the Paired t-test to determine the increase in knowledge within each group. The statistical analysis results for the control group showed a p-value of 0.000 (p-value < 0.05), indicating a significant increase in knowledge before and after receiving counseling on the development of local food-based complementary food products to meet the nutritional needs of infants aged 6-12 months as an effort to combat stunting. Similarly, the statistical analysis results for the intervention group showed a p-value of 0.000 (p-value < 0.05), indicating a significant increase in knowledge among mothers before and after receiving training on utilizing local food for complementary feeding to combat stunting. Both the control and intervention groups experienced an increase in knowledge. However, the analysis showed a more significant increase in knowledge scores in the intervention group (17.78) compared to the control group, which experienced an increase of 10.25.

Table 4. The Difference between the Increase in Knowledge (Delta) regarding the efforts to address stunting problems through training on utilizing local food resources and counseling groups.

Groups	n	Mean	Deviation Std.	Difference	p-value
Treatment Group	54	18,03	8,434	7,35	0,000
Control Group	54	10,68	8,035		

Table 4 demonstrates the increase in knowledge regarding the development of locally sourced complementary feeding products as an attempt to address stunting issues. The knowledge gain in the treatment group is more significant compared to the control group. Both the treatment and control groups experienced knowledge improvement. However, the increase in knowledge among the mothers in the treatment group was more significant than that of the control group (18.03 > 10.68). The statistical analysis using an independent t-test yielded a p-value of 0.000 (p-value < 0.05), indicating a significant difference in knowledge improvement (delta) between the treatment and control groups. During the group discussion, as part of the training, local food resources were identified after equipping the mothers with knowledge and skills on developing locally sourced complementary feeding recipes to combat stunting. Locally available nutrient-rich food resources in Triharjo Village to prevent stunting include fish, liver, eggs, chicken, tofu, tempeh, pumpkin, and bananas. These local food resources were then utilized to create complementary feeding recipe products based on local ingredients. The development of complementary feeding products was targeted for infants aged 6 to 12 months, containing essential nutrients such as protein, calcium, phosphorus, zinc, iodine, iron, vitamin A, vitamin D, vitamin B12, and folic acid. The identified food resources were used to create recipes for complementary feedings, such as fish, potato patties, pumpkin porridge, and banana porridge.

The preparation method for "Sitole" locally sourced complementary feeding porridge for a single serving includes: 1) Prepare 50 g of soft rice, 20 tablespoons of fried catfish, 15 boiled

chicken eggs, 0.5 tablespoons of granulated sugar, one small piece of broccoli, and one small piece of boiled carrot. Blend all the ingredients until smooth, strain, and serve with the addition of margarine. The porridge is ready to be given to the child.

Table 5. Frequency Distribution of Characteristics of the Study Subjects.

Variable	Control		Treatment		p-value
	n	%	n	%	
Educational Level					
Primary Educational Level (Elementary-JHS/MTs)	7	12.96	9	16.67	0.599
Secondary Educational Level (SHS/VHS)	41	75.93	38	70.37	
Higher Educational Level (Diploma/Bachelor/Master/Doctoral)	6	11.11	7	12.96	
Occupation					
Unemployed/Housewives	35	64.81	39	72.23	0.802
Private Sector Employee	15	27.78	13	24.07	
Civil Servant	4	7.41	2	3.7	

Table 5 shows the characteristics of the study subjects by the level of formal education. It was known that there were 41 mothers with secondary education levels (75.93%) in control, while in the treatment group, there were 38 women (70.37%) with secondary education. The results of the proportion difference test showed no significant difference in the education level between mothers in the treatment group and the control group. Furthermore, based on employment status, 35 mothers in the control group (64.81%) were unemployed or housewives. Meanwhile, 39 women (72.23%) were unemployed or housewives in the control group. The proportion difference test results showed no significant difference in employment status between mothers in the treatment and control groups.

Table 5 shows the characteristics of the study participants based on their formal education level. Forty-one mothers with secondary education levels (75.93%) were in the control and treatment groups (70.37%). The statistical results showed no significant difference in the level of education between mothers in the treatment and control groups (p> 0.05). Furthermore, based on employment status, 64.81% were unemployed or housewives, whereas, in the control group, it was 72.23%. There was no difference in employment status between mothers in the treatment and control groups (p > 0.05).

Table 6. Differences in the data in Knowledge (Pre-Test) of the Study Subjects in the Treatment and Control Groups.

Group	n	Mean	Std. Deviation	Difference	p-value
Treatment	54	72.97	11.508	0.09	0.971
Control	54	73.06	13.082		

Table 6 revealed that the mean pre-test score for the control group was 72.87, while in the control group, it was 73.06. The statistical test results using the independent sample t-test technique showed a p-value of 0.971 (p-value > 0.05), meaning there was no significant difference in knowledge at the pre-test between the treatment group and the control group.

Table 7. Difference in Knowledge (Post-Test) of the Study Subjects in the Treatment and Control Groups.

Group	n	Mean	Std. Deviation	Difference	p-value
Treatment	54	90.76	4.411	7.51	0.000
Control	54	83.25	7.456		

Table 7 revealed that the mean post-test value of knowledge in the treatment group was higher than in the control group. Mothers in the treatment group and the control group similarly experienced increased knowledge. However, the increase in mothers' knowledge in the treatment group was higher than in the control group (90.76 > 83.25). In addition, the statistical test results using the independent sample t-test showed a p-value of 0.000 (p-value <0.05). Such findings indicated a significant difference in knowledge after treatment (Post-Test) between the treatment and control groups.

Table 8. Increase Knowledge of the Study Subjects Before and After Treatment in Each Group.

Group	Pre-test			Post-test			p-value
	Mean	**Min-Max**	**Std. Deviation**	**Mean**	**Min-Max**	**Std. Deviasi**	
Control	73.05	40-95	13.082	83.25	65-100	7.455	0.000
Treatment	72.97	50-100	11.508	90.75	85-100	4.410	0.000

A statistical test using the Paired t-test was conducted to determine the increase in knowledge in each group. Statistical test in the control group obtained a p-value of 0.000 (p-value <0.05), which indicated that there was an increase in knowledge before and after being given counseling regarding recipes for local foodstuff-based complementary food products to meet the nutritional needs of under-five children as an effort to manage the stunting issue. Furthermore, statistical tests in the treatment group obtained a p-value of 0.000 (p-value <0.05), indicating an increase in mothers' knowledge before and after training on the use of local foodstuff-based complementary food products to manage stunting issues. Even though both groups (control and treatment) experienced an increase in knowledge, based on the results of analysis, it was found that the increase in the treatment group (mothers who were given training on the development of local foodstuff-based complementary food products) was higher (17.78) when compared to the control group which experienced an increase by 10.25.

Table 9. The Difference in the Increase in Knowledge (delta) regarding Efforts to Manage Stunting through Training on the Utilization of Local Foodstuff and Counseling Groups.

Group	n	Mean	Std. Deviasi	Difference	p-value
Treatment	54	18.03	8.434	7.35	0.000
Control	54	10.68	8.035		

Table 9 shows the increased knowledge regarding developing local foodstuff-based complementary food products to manage stunting issues. Both the treatment group and the control group experienced an increase in knowledge. However, the increase in mothers' knowledge in the treatment group was higher than in the control group (18.03 > 10.68). The result of the statistical test using the independent t-test showed a p-value of 0.000 (p-value <0.05), which indicated that there was a difference in the increase in knowledge (delta) between the treatment group and the control group.

There was a group discussion as part of the training after mothers were provided with knowledge and skills regarding developing local foodstuff-based complementary food products to manage problems. Such discussion was held to identify easy-to-obtain foodstuffs in Triharjo Village that are rich in protein, vitamins, and minerals to prevent stunting, such as fish, liver, eggs, chicken, tofu, soybean cake, pumpkin, and bananas. Local foodstuffs were prepared for the complementary food recipes intended for infants between 6-12 months old, which contain many protein, nutrients, and micro minerals including calcium, phosphorus, zinc, iodine, iron,

vitamin A, vitamin D, vitamin B12, and folic acid. The foodstuffs identified were prepared for complementary food recipes such as fish, cakes, pumpkin puree, and banana puree.

Such findings indicated that the treatment of community empowerment and training on the development of local foodstuff-based complementary food was more effective than the control group, which was only given counseling treatment. Community empowerment in the form of the development of local foodstuff-based complementary food is a strategy for managing the problem of stunting. It is an effort to increase the community's knowledge, attitude, and awareness, especially among mothers of under-two children. Empowerment is a reasonable effort to increase public knowledge to prevent stunting (Olsa et al., 2018). In this study, the community, especially mothers, was empowered to be willing and able to deal with stunting independently. Mothers of under-two children were provided with knowledge about 1) nutritional adequacy in the First 1000 Days of Live, especially 0-2 years, as an effort to overcome stunting, 2) the role of mothers in the prevention of stunting, 3) Complementary food recipes to meet nutritional needs at the age of 6 to 12 month, 4) Identification of local foodstuffs that contain lots of nutrients to prevent stunting, and 5) development of recipes for local foodstuff-based complementary food products to meet the nutritional needs of infants to under-two children.

Local foodstuff-based complementary food products contain nutrients to meet the nutritional needs of infants so as to support growth and prevent stunting. Skilled mothers will choose local foodstuffs containing protein, calcium, iodine, selenium, zinc, Fe, Phospor, vitamin D to prevent stunting (García Cruz et al., 2017). The training materials provided could improve skills in selecting local foodstuffs to develop complementary food recipes. An increase in knowledge of mothers in the treatment group is in accordance with the result of previous study (Aulia, et al., 2021), yang menyimpulkan, tingkat pengetahuan yang baik membantu pemilihan makanan dengan bijak dan tepat, serta penanganan gangguan kesehatan dengan baik. Porridge MP-ASI "Sitole" ini mengandung gizi seimbang yang diperlukan pada mas usia bayi. Nilai gizi produck MP-Asi tersebut: energi 200,9 kkal, protein 7,6 g, calsium 39,5 mg, Fe 0,6 g, zink 0,8 g, lemak 9,9 g, karbohidrat 20,3 g, Vitamin 349,8 µg, asam folat 25,1 µg, Vitamin D 539,2 µg, phospor 120,1 mg, yodium 34,5 mg. A good level of knowledge helps mothers ti choose food wisely and appropriately, as well as supporting the good management of health problems.

Mothers are the main subject in managing stunting by developing local foodstuff-based complementary food products (Zikria, Masrul & Bustami, 2018). In empowerment to develop local foodstuff-based complementary food products, there were three main elements: input, process, and output. The input aspect concerned the subject or target, namely mothers of under-two children. The process aspect involved the process of changing the ability of subjects who were trained to develop local foodstuff-based complementary food products. Furthermore, the output aspect involved the results of training/empowerment in the form of increased knowledge and skills in choosing local foodstuffs and preparing complementary food recipes. The training was performed through lectures, questions, answers, demonstrations, discussions, and cooking practice. Complementary food should be prepared to meet the nutritional needs in the First 1000 Days of Live, especially at the age of 6 to 12 months (Salman et al., 2017)

The study findings are in line with the theory explained by Notoatmodjo (2014) regarding factors that influence the learning process, namely material, environmental, instrumental, and individual conditions of learning subjects. Material factors are things being learned. Environmental factors are grouped into two, namely, the physical and social environment. Instrumental factors refer to methods and learning media. In addition, individual condition factors involve physiological conditions and the five senses. The intervention in this study focused on instrumental factors by conducting education using audiovisual media.

The results of this study indicated that implementing nutritional fulfillment at the age of 6 to 12 months by developing local foodstuff-based complementary food recipes was an effective way to manage stunting. Training could help mothers quickly, appropriately, and efficiently improve their knowledge about preventing stunting through nutritious foods (Sinha et al., 2018). The increasing knowledge about the development of complementary food is expected to encourage mothers to practice preparing complementary food to meet nutritional needs, which can further prevent stunting. Direct application practice of health education aims to generate attention to a problem and recall the information conveyed to cause changes in knowledge and skills.

The training was performed through lectures, questions, answers, demonstrations, discussions, and practice to increase knowledge, comprehension, and application. This is in accordance with Bloom's theory cited by Notoatmodjo (2012), who explains that the level of knowledge consists of Know (interpreted as remembering a material that has been studied previously), comprehension (defined as an ability to explain correctly about objects that are previously known), and application (defined as the ability to use materials that have been studied in actual situations and conditions).

The level of knowledge which showed an increase in this study consisted of knowledge and comprehension, as well as application (Wulandari et al., 2016), regarding the management of stunting based on community empowerment, especially among mothers of under-five children.

After participating in the training, there was an increase in the knowledge and skills of mothers regarding the development of recipes for local foodstuff-based complementary food products to meet the nutritional needs of infants, especially at the age of 6 to 12 months. Training could increase the role of the family. Mothers play a role and participate in the management of stunting independently. Good participation of the mother will support efforts to manage stunting from the beginning of life (Crookston et al., 2010).

The prominent role of the family, especially mothers, is to provide food that contains lots of nutrients in the form of calcium, iodine, zinc, selenium, protein, and vitamins to support linear growth (body length) (Andari et al., 2020). The fulfillment of growth-supporting nutrients can be achieved through mothers' actions in providing food for under-five children. Nutritious dishes served by mothers are considered the main action in efforts to prevent stunting (Kartini, 2016).

The role and participation of community groups (mothers together with Integrated Healthcare Post and PKK cadres) in efforts to manage stunting in the village can be performed by monitoring height/length to determine the role of mothers in meeting the nutritional needs of under-five children (Kusumawati et al., 2013). Nutritional adequacy at the family level is assessed through the increase in height/length for age. Suppose it is found that the results of measurements of body length/height for age are not in accordance (stunting). In that case, counseling is immediately carried out so that families/mothers pay more attention to balanced nutritional dishes for children.

Efforts to manage stunting problems performed by community groups at Integrated Healthcare Post align with Green in Notoatmodjo (2014), which explains that community empowerment in the health sector is the primary goal of health promotion. Community empowerment in the health sector is an effort or process to raise awareness, willingness, and the ability of the community to determine, manage, maintain, protect, and improve people's welfare. A specific community is considered independent in the health sector if the people can

determine health problems and the factors that influence health problems, especially in their neighborhood (Kementerian Desa Pembangunan Daerah Tertinggal, 2017).

The community has a specific role in managing, both as an object and a subject. As the object, it can be interpreted that the community is a directed target and strives to have the strength to manage to stunt independently (Wulandari et al., 2016). On the other hand, as the subject, the community determines all actions and efforts to prevent the incidence of stunting. Officers from the sub-district level (CHC) act as facilitators, in this case, the nutrition officer at the Pandak CHC, who directs and monitors the activities of efforts to manage stunting in the community so that efforts made by the community are under predetermined objectives.

An increase in knowledge of mothers in meeting nutritional needs during infancy can foster positive behavior as an effort to prevent stunting independently at the family level. This aligns with Rogers' theory, as cited in Wawan & Dewi (2011), that before a person adopts a new behavior, a sequential knowledge process occurs, including Awareness, Interest, and Evaluation—trial and Adoption (Accept). The dimensions of remembering and understanding can be obtained by memorizing more efficiently in certain circumstances. Certain cognitive processes will be needed in community empowerment to manage stunting, namely realizing, feeling interested, considering, and making efforts to manage stunting by mothers at the household level.

The findings align with the results of a case-control study conducted by Yanti, Kartinawati, & Darwata, (2022), which concluded that exclusive breastfeeding and maternal education were risk factors for stunting. Pregnant women with low education had a risk factor for giving birth to stunted children by 8.6 times. Low education had an impact on knowledge regarding nutritional intake. In fact, training/empowerment on developing local foodstuff-based complementary food products is an effort to increase mothers' knowledge to prevent stunting.

The study findings are in line with the results of a study conducted by Dubois et al. (2012), which explained that environmental factors could strengthen the effects of genetic factors. Environmental factors, especially meeting nutritional needs early in a child's life, could maximize a child's genetic potential. Optimal intake of nutritional needs at the beginning of a child's life has a positive impact, wherein children can achieve optimal height according to their genetic potential. Height is accumulated over the years. So, childhood height can affect adulthood (Ratu et al., 2018). Local foodstuff-based complementary food products that resulted in this study were rich in protein, minerals, and vitamins as an effort to manage stunting among infants and under-two children.

The results of this study support the study conducted by Latif & Istiqomah (2017), which concluded that there was a relationship between generations to the incidence of stunting through the result of interactions between genetic factors and environmental conditions of the mother, such as nutritional intake, especially during pregnancy. To reduce the risk factors for stunting among children born to short mothers, feeding during infancy/under two years of age must be optimized by providing complementary food products that contain many proteins, micro minerals, and vitamins needed for this growth period. The limitations of this study are as follows: 1) Inability to control/ascertain the mothers' experiences in providing complementary feeding, and 2) Inability to control the role of the head of the household and other family members in providing complementary feeding to the target population.

4.   CONCLUSION

Based on the analysis results, it can be concluded that there was an increase in mothers' knowledge regarding the development of local foodstuff-based complementary food products to meet the nutritional needs of infants and children under two in an attempt to reduce stunting rates. The increase in knowledge (delta) of the treatment group in Triharjo Village was higher

than that of the control group in Caturharjo Village. Porridge MP-ASI "SITOLE" recipes for local foodstuff-based complementary foods rich in proteins, minerals, and vitamins have been prepared to manage stunting. Further studies should focus on implementing recipes for local foodstuff-based complementary food to meet the nutritional needs of children aged 6 to 12 months among families with fewer than two children.

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R E S E A R C H	Open Access

Difference of Cycle Threshold Value, Oxygen Saturation and D-dimer to COVID-19 Vaccination

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Abstract

Many factors can affect the prognosis of COVID-19 patients, and Cycle Threshold value can be used to estimate the amount of virus in the body. Oxygen saturation and D-dimer are important components in determining the severity. This study aims to analyze the difference of CT value, oxygen saturation, D-dimer, and degree of severity on vaccination state. This study is the observational analytic study of patients admitted to the isolation ward of a referral hospital in Surakarta, Indonesia. The analysis covered assessing the normality of the data, the Kruskal-Wallis correlation test, and ANOVA to assess the differences between variables. A total of 154 patients with, 65.6% of them did not participate in the full vaccination program. The results of the analysis showed a significant difference between the D-dimer and the degree of severity with a p-value of < 0.05, while the CT value and oxygen saturation had no significant difference with the vaccination state. Vaccination showed a significant difference with D-dimer and the degree of severity of COVID-19 infection, so giving a complete vaccine can reduce the severity of COVID-19 patients, and we recommended to be able to complete the vaccine for the whole community.

Keywords: CT Value, Oxygen saturation, D-dimer, Degree of severity, COVID 19 Vaccination.

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1.   INTRODUCTION

Corona Virus Disease 2019 (COVID-19) infection caused by Novel Beta Coronavirus (SARS-CoV-2), and having similar phylogenetic properties to SARS-CoV, is currently a global health problem (Hu et al., 2021; Matheson & Lehner, 2020; Yuen et al., 2020). The disease COVID-19, caused by infection with SARS-CoV-2, is associated with a series of physiopathological mechanisms that mobilize a wide variety of biomolecules, especially immunological ones (Costela-Ruiz et al., 2020; Li et al., 2020). The gold standard for infection diagnosis is real-time reverse transcriptase PCR (RT-PCR) (Kevadiya et al., 2021; Rao et al., 2020; Younes et al., 2020). Following the emergence of the COVID-19 pandemic, D-dimer was established as a possible predictor of prognosis for COVID-19 patients. Several studies have shown that D-dimer values at admission can predict disease severity (Soni et al., 2020; Tian et al., 2020; Zhang et al., 2020; Zhou et al., 2020). It has been reported that about 50% of patients have elevated D-dimer levels and abnormal D-dimer levels are associated with a poor prognosis (Guan et al., 2020; He et al., 2021; Wang et al., 2020).

Infectious illnesses, including COVID-19, are not immune to the wide-ranging impacts of climate change on health. By directly affecting the biological features of pathogens (e.g., growth, survival, and virulence) and their vectors, as well as indirectly favoring transmission through ecosystem modification and changes in human behavior, climatic conditions are becoming increasingly suitable for the transmission of multiple infectious diseases (Baker et al., 2022; Microbe, 2021). Infectious diseases ranging from vector-borne diseases (e.g., malaria, dengue fever, and leishmaniasis) to enteric infections and diarrhea (e.g., cholera, vibriosis, and rotavirus infection) to parasitic diseases like schistosomiasis and zoonotic disease like anthrax and also COVID-19 disease can all be exacerbated by rising temperatures and increased precipitation (Microbe, 2021; Redhono & Dirgahayu, 2016). SARS-CoV-2 growth and survival in the environment are more closely linked to environmental temperature and relative humidity. The combined temperature and humidity spectrum is critical for predicting COVID-19 outbreaks. COVID-19 infections are more common in areas with a greater population number (McEwen et al., 2022; Sasikumar et al., 2020).

Vaccination is one of the efforts to prevent COVID-19 infection. In Indonesia, vaccination coverage for dose one has reached 54.90%, which is 115.502.524 people and dose two has reached 33.18%, which is 70.113.618 people from the total population of Indonesia (Kementrian Kesehatan Indonesia, 2021). This study aims to analyze the relationship between vaccination history against D-dimer, CT value, oxygen saturation, and degree of infection.

2.   RESEARCH METHOD

This study is a retrospective study on inpatients in the isolation room of RSUD dr. Moewardi Surakarta, Indonesia, during the second wave of the COVID-19 pandemic in July to September 2020 and was approved by the ethics committee of RSUD Dr. Moewardi no. 729/VII/HREC/2021.   Vaccination history is known through history taking on each patient admitted. Research subjects were divided into three groups based on vaccination history. Vaccination history is divided into complete vaccination, namely people who have received two doses of vaccination, incomplete vaccination if they only received one dose of injection, and no vaccination if they have never received the first or second dose of vaccination.

The statistical analysis begins by assessing the normality of the data from four variables, namely D-dimer, CT value, saturation, and disease degree. Statistical analysis was carried out with a computer application using ANOVA correlation test on normally distributed data and Kruskal Wallis on abnormally distributed data to assess differences between variables.

3.   RESULTS AND DISCUSSION

Data on COVID cases obtained was 154 cases with a mean age of 46.77 ± 14.74 where 65.6% (n=95) had never received a complete vaccination and vaccinated 34.3% (n=53). A non-parametric ANOVA test was performed to determine the difference between CT values and vaccination history. The mean in each group was complete vaccination 24.6 ± 6.6; incomplete vaccination 20.6 ± 3.7; and unvaccinated 25.2 ± 6.1 as shown in Table and Figure 1. The ANOVA test showed no significant difference (Asymp. Sig. = .24) in the three groups based on the vaccination history. The post hoc test also found no significant difference between groups. The Ct value represents the number of PCR cycles required to identify a SARS-CoV-2 positive patient. The presence of more copies of viral RNA in the sample is indicated by fewer cycles. As a result, we used the Ct value as a semiquantitative measure of viral load (Regev-Yochay et al., 2021). Our study showed no differences in CT values in the three observed groups.

Table 1. Analysis of the difference of the CT value with vaccination state

	Mean	SD	p-value[a]
Complete vaccine	24.6	6.6	= 0.24*
Vaccine once	20.6	3.7	
No Vaccine	25.2	6.1	

[a]*One-way ANOVA, α = 5%*
Significance (p<0.05)
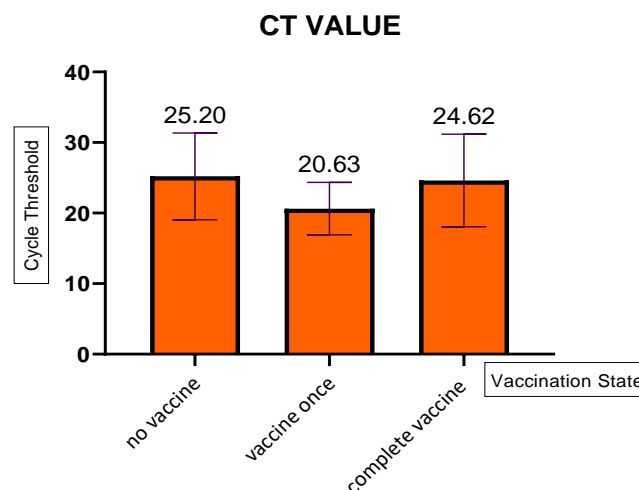
Figure 1. Mean of CT Value between each group.

The results of the analysis of age on the history of vaccination with nonparametric measurement Kruskal Wallis showed that there was a significant difference (Asymp. Sig. = .012) against the three groups based on the history of vaccination with a confidence interval of 95%, where p-value <0.05 was considered significant.

The results of the D-dimer analysis of the history of vaccination with Kruskal Wallis' non-parametric measurement showed that there was a significant difference (Asymp. Sig. = .001) where the p-value < 0.05 was considered significant, with different mean in each group (complete vaccination = 1237.8 ± 2903; incomplete vaccination = 798.83 ± 514; and unvaccinated = 2637.6 ± 4220) as shown in Table 2 and Figure 2. D-dimer is one of the variables that is often used as a predictor of the severity of COVID-19. D-dimer is a specific degradation product produced in the hydrolysis of fibrin (Gorjipour et al., 2019). This may reflect the effect of coagulation during infection in infectious diseases. Several studies reported increased levels of D-dimer in patients with pneumonia, indicating a state of blood

hypercoagulability and indicating the presence of thrombosis (Arita et al., 2016; Tian et al., 2020).

Table 2. Analysis of the difference of D-dimer with vaccination state.

	Mean	SD	p-value[a]
Complete vaccine	1237.8	2903	= 0.001*
Vaccine once	798.83	514	
No Vaccine	2637.6	4220	

[a]*One-way ANOVA, α = 5%*
Significance (p<0.05)
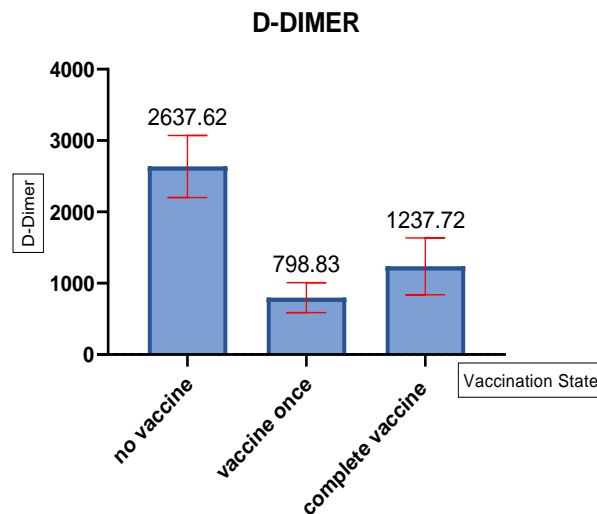
Figure 2. Mean of D-dimer value between each group.

D-dimer in critically ill patients with COVID-19 was significantly increased, with frequent clotting disorders and microthrombotic formation in peripheral blood vessels (Jin et al., 2020). The increase in D-dimer in the literature on viremia and cytokine storm is due to an increase in pro-inflammatory cytokines (IL-2, IL-6, IL-8, IL-17, TNF-α) that cannot be controlled by anti-inflammatory factors that will cause inflammation, leads to overactivation of the coagulation cascade (Wool & Miller, 2021). A recent study found that the development of laboratory results, particularly D-dimer, in hospitalized patients accurately predicts mortality and severity of COVID-19 (Qeadan et al., 2021). We also analyzed the relationship between vaccination history and D-dimer level and obtained a p-value of .001 which can be concluded that vaccination history is closely related to the D-dimer level in COVID-19 patients.

The results of the saturation analysis of the history of vaccination obtained a p-value of 0.202, which means that there was no significant difference between the history of vaccination and the saturation at admission. The mean saturation between each group are complete vaccination = 97.91 ± 1.7; incomplete vaccination = 98.7 ± 0.52; and unvaccinated = 96.44 ± 5.7 as shown in Table 3 and Figure 3. COVID-19 has various clinical manifestations, with 80% of cases being mild, 15% having lower respiratory tract diseases such as pneumonia, and less than 5% having severe symptoms (Deming & Chen, 2020). In patients with severe symptoms, there is often damage to the respiratory system, which causes oxygen saturation to decrease, this is then used as a component in assessing the severity of COVID-19. Parameters of the progression of this infection can also be assessed by examination of D-dimer.

Table 3. Analysis of the difference of oxygen saturation with vaccination State

	Mean	SD	p-value[a]
Complete vaccine	97.91	1.7	= 0.202*
Vaccine once	98.7	0.52	
No Vaccine	96.44	5.7	

[a]*One-way ANOVA, α = 5%*
*Significance (p<0.05)
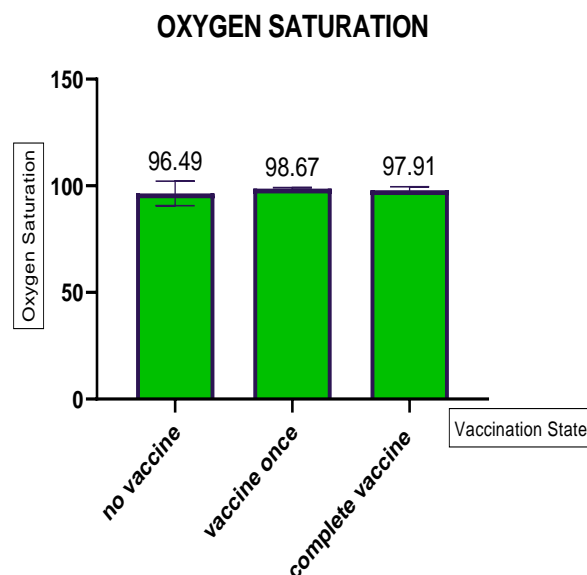
Figure 3. Mean of oxygen saturation between each group.

COVID-19 vaccination is an important effort in controlling the pandemic. It is hoped that by carrying out complete vaccinations, the transmission rate of COVID-19 can be controlled, but there are still some cases with complete vaccinations, still infected with COVID-19 and must be hospitalized in a hospital isolation room. In several studies, vaccination has been shown to reduce the risk of hospitalization. Understanding the relation on the effectiveness of vaccines in protecting individuals needs to be further deepened. Vaccination was not one hundred percent able to protect individuals against COVID-19, given the many discoveries and developments of new virus variants, especially Variant of Concern B.1.1.7 (alpha variant) (Graham et al., 2021).

The results of our study analysis found that vaccination can reduce the severity of COVID-19 disease ($p = 0.001$) with a 95% confidence interval. The mean in each group was complete vaccination 1.25 ± 0.48; incomplete vaccination 1.67 ± 0.52; and unvaccinated 1.81 ± 0.72 as shown in Table 4 and Figure 4.

Table 4 Analysis of the difference of degree of severity with vaccination state

	Mean	SD	p-value[a]
Complete vaccine	1.25	0.48	= 0.001*
Vaccine once	1.67	0.52	
No Vaccine	1.81	0.72	

[a]*One-way ANOVA, α = 5%*
*Significance (p<0.05)
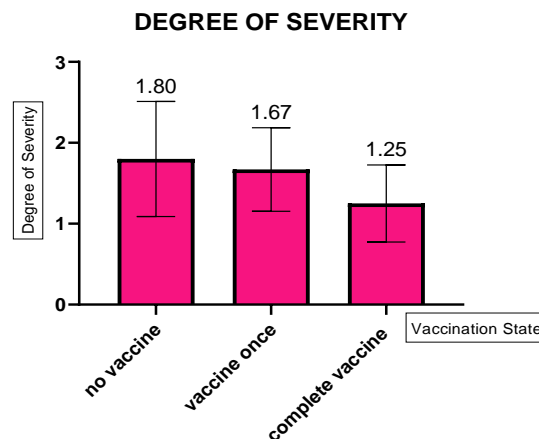
DEGREE OF SEVERITY

Figure 4. The mean of Degree of Severity between each group.

However, due to the emergence of climate change, a virus could also spread faster and the chance of mutation could be concerning. Several new variants of interest have been shown to increase in reducing the neutralizing effect of the vaccine taken from in vitro samples (Kustin et al., 2021) and lead to increased infection rates in vaccinated individuals compared to the first variant in the initial findings from a case-control study (McEwen et al., 2022).

The weakness of this study is the nature of the study, which is a retrospective study, so that selection bias is the main weakness of our study. Only hospitalized individuals were included in the study, excluding asymptomatic patients with high oxygen saturation who were not hospitalized according to hospital regulations. Incomplete laboratory testing and medical records so that some cases were declared eligible for rejection. The duration between the onset of the disease course and admission to the hospital can impact the outcome of the variables studied. This study was also only carried out at one hospital center so that it could reduce the ability to provide an overview in general.

4. CONCLUSION

Vaccination showed a significant difference with D-dimer and the degree of severity COVID-19 cases, so giving a complete vaccine can reduce the severity of COVID-19 patients and we recommended to be able to complete the vaccine for the whole community.

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R E S E A R C H   Open Access

Spatial Analysis of the Occurrence of Multi-Drug Resistance (MDR) Escherichia coli in Pet Dogs in Kupang City

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Abstract

Antibiotic resistance is an important health problem and a threat to public health. Dogs as pets can be both spreaders and reservoirs of antibiotic-resistant bacteria. Based on spatial analysis, this study aims to determine the distribution pattern of multidrug resistance (MDR) Escherichia coli found in pet dogs in Kupang City. The spatial analysis method used is based on the convex hull technique, elementary analysis of disease, and the Nearest Neighbour Index (NNI). Information on antibiotic-resistant E. coli has been obtained from the laboratory analysis results and secondary data obtained for spatial analysis. The results of this study have shown that the distribution pattern of the incidence of MDR E. coli in the City of Kupang in 2020 is a clustered pattern with the Nearest Neighbor Index (NNI) value of 0.783 which is higher than the NNI AMR E. coli in the City of Kupang of 0.763. The incidence of MDR E. coli that has occurred in domesticated dogs takes place with a prevalence rate of 35% in an area of 5079 Ha. These results have shown that the incidence of MDR E. coli has spread to several areas in Kupang City and is a threat to public health. It requires appropriate prevention and control measures by implementing good hygiene and sanitation in the relationship between humans and their pets.

Keywords: Escherichia coli, Kupang City, MDR, Pet dog, Spatial Analysis.

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1.   INTRODUCTION

Antibiotic resistance has become an important issue again at the beginning of the 21st century (O'Neill (2016) predicts the tendency of AMR to become a threat to world health in 2050. This condition is accelerated and expanded by the misuse and overuse of antibiotics (Gochez, 2019), (Awosile et al. 2018), (Patel et al. 2020). Another reason for the spread of resistant bacteria is the increasing interaction between humans and pets by not prioritizing hygiene and sanitation in the surrounding environment (Bouki et al. 2013). Pets such as dogs are known to have a close relationship with humans (Budinegara 2018) and tend to spread resistant bacteria to humans and others (Pomba et al. 2017). Increasing antibiotic resistance in society and the world of animal health is a very important public health problem at this time (Laxminarayan et al. 2013).

Many people keep pets as pets, one of the most common types is dogs besides cats.. Dogs have shown better interactions with humans when compared to other pets (Westgarth, et al. 2019). The social aspects of the community that support the existence of dogs in the environment encourage many people to keep dogs in their home environment. The number of dogs and the degree of closeness between dogs and humans is an aspect of health studies related to resistance that is important to know (Butaye et al. 2003). Several zoonotic health threats can arise from this interaction, if hygiene and sanitation are not considered in the maintenance of these animals. Diseases caused by parasites, bacteria and those caused by other microorganisms can be transferred from animals to humans (WHO 2014).

The more intensive maintenance of dogs as pets has resulted in more and more attention being paid to handling dog health, on the other hand, the use of antibiotics is increasingly being used in animals. This tendency is one of the factors for the emergence of resistant bacteria in dogs (Carvalho et al. 2016). The emergence of resistant bacteria in dogs is not only due to the use of antibiotics but can also occur due to contact with humans. The incidence of resistance can increase with the emergence of bacteria that are resistant to more than 3 classes of antibiotics which are often called Multidrug resistance (MDR) (Magiorakos et al. 2012), (Sweeney et al., 2018).

A spatial approach is used to improve the analysis of animal diseases further, this is done using Geographic Information System (GIS) software (Samkhan et al. 2013); (Davis et al. 2014). Monitoring through disease mapping can provide information about the incidence of disease in an area, especially the incidence of antibiotic resistance (Achmad, 2005) or environment-based (Nuckols et al., 2004), (Sunaryo, 2015). This research aims to determine the spread of MDR E. coli in pet dogs based on a spatial approach.

2.   RESEARCH METHOD

The research was carried out using the cross-sectional study method which will be carried out in April-November 2020. Rectal swab sampling/dog feces samples have been carried out on pet dogs in the Kupang City community. Laboratory testing, namely the isolation and identification of antibiotic-resistant E. coli as well as antibiotic sensitivity tests were carried out at the Laboratory of Bacteriology and Veterinary Public Health, Faculty of Veterinary Medicine Universitas Nusa Cendana.

Sampling has been done by simple random sampling (simple random sampling). Data collection was carried out through direct observation of swab/dog feces samples obtained from dog-owning households in Kupang City. Swab/feces samples have been taken as much as one sample per farm household and come from sick or healthy dogs. The feces samples that have been obtained are then isolated and identified to determine the presence of E. coli. The E. coli

isolates obtained were then confirmed by biochemical tests (Kallau et al. 2020). Testing the sensitivity of E. coli to antibiotics using the Kirby-Bauer method (CLSI 2014).

After going through the data collection stage, the data that has been collected will be analyzed using a descriptive analysis model to link whether there is an incidence of antibiotic-resistant E. coli contamination in dogs in Kupang City. The data is presented in the form of tables and figures to describe the point of spread of antibiotic resistant E. coli, extent, and pattern of spread of E. coli resistance in pet dogs in Kupang City. Spatial data has been analyzed to determine the distribution (elementary analysis of disease), pattern of distribution (nearest index/NNI), and extent of distribution (convex hulls) of E. coli on pet dogs in Kupang City. Furthermore, the classification of the prevalence rate of E. coli, the assessment of the pattern of spread of resistance, and the assessment of the extent of the spread of E. coli have been carried out according to Kallau et al. (2019).

3.   RESULTS AND DISCUSSION

This research was conducted on 57 samples of domestic dogs in the city of Kupang, with the location of the distribution of samples as shown in Figure 1. Researchers have obtained an overview related to the results of laboratory tests for antibiotic resistance shown by Kallau *et al.* (2020) earlier.
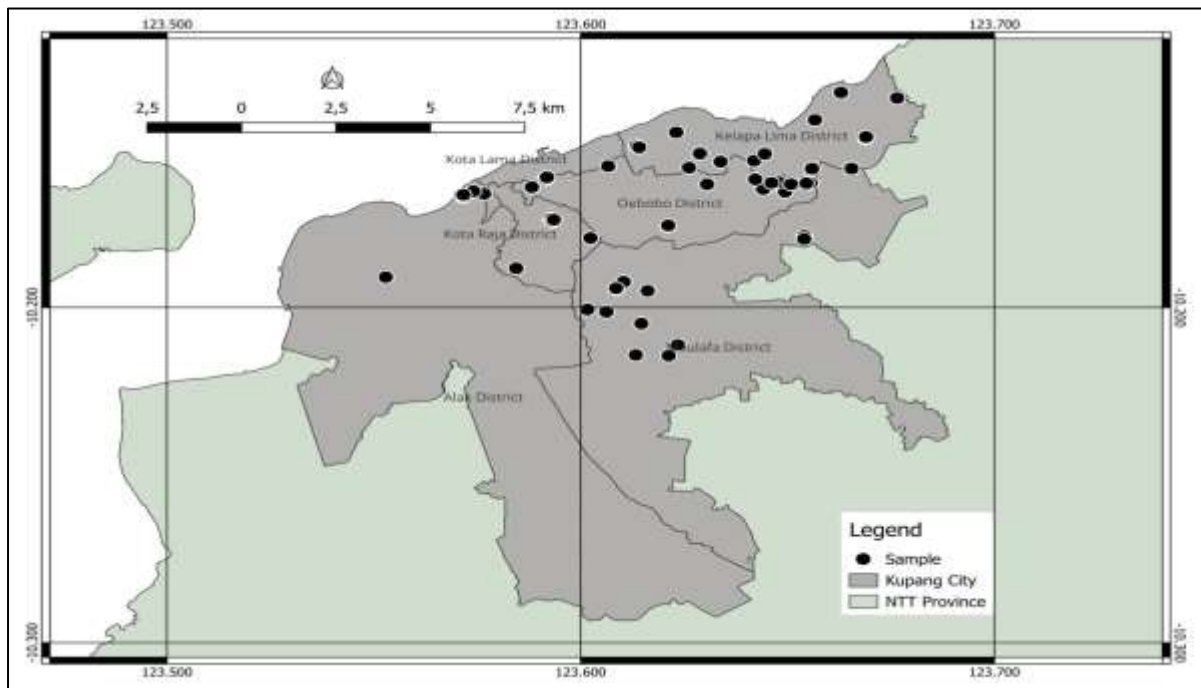
Figure 1. Sampling locations in Kupang City (Elementary analysis of disease).

Based on Figure 1, it has been shown that pet dogs can be found throughout the City of Kupang which are spread over 6 Districts (Kepala Lima District, Kota Lama District, Oebobo District, Kota Raja District, Maulafa District, and Alak District).

Test results data that has been carried out in Kallau et al. (2020), shows that E. coli has a prevalence of 65% (37/57). The spread of E. coli in domestic dogs in Kupang City can be seen in Figure 2a. E. coli has been found in Kelapa Lima District, Oebobo District and Maulafa District. The spatial analysis results of the spread of E. coli, shown in table 1. the area of distribution based on the convex ull test was 5983 Ha, and the NNI value was 0.763, which illustrates the distribution pattern being random. Z-score value of -2.821. The results of spatial analysis of AMR E. coli in Table 1 and Figure 2b have also shown the same value. All E. coli samples that have been tested have varied resistance from 1-7 types of resistance (Kallau et al.

2020). These results are almost similar to data from E. coli research on pigs (Kallau et al. 2018a).

Spatial analysis data on MDR E. coli in table 1 and figures (2c and 3) provided information on the distribution area of 5079 Ha which covered 13 positive samples for MDR E. coli. The results of the NNI value have shown a value of 0.783 with a random distribution pattern, as well as a Z-score result of -1.495.
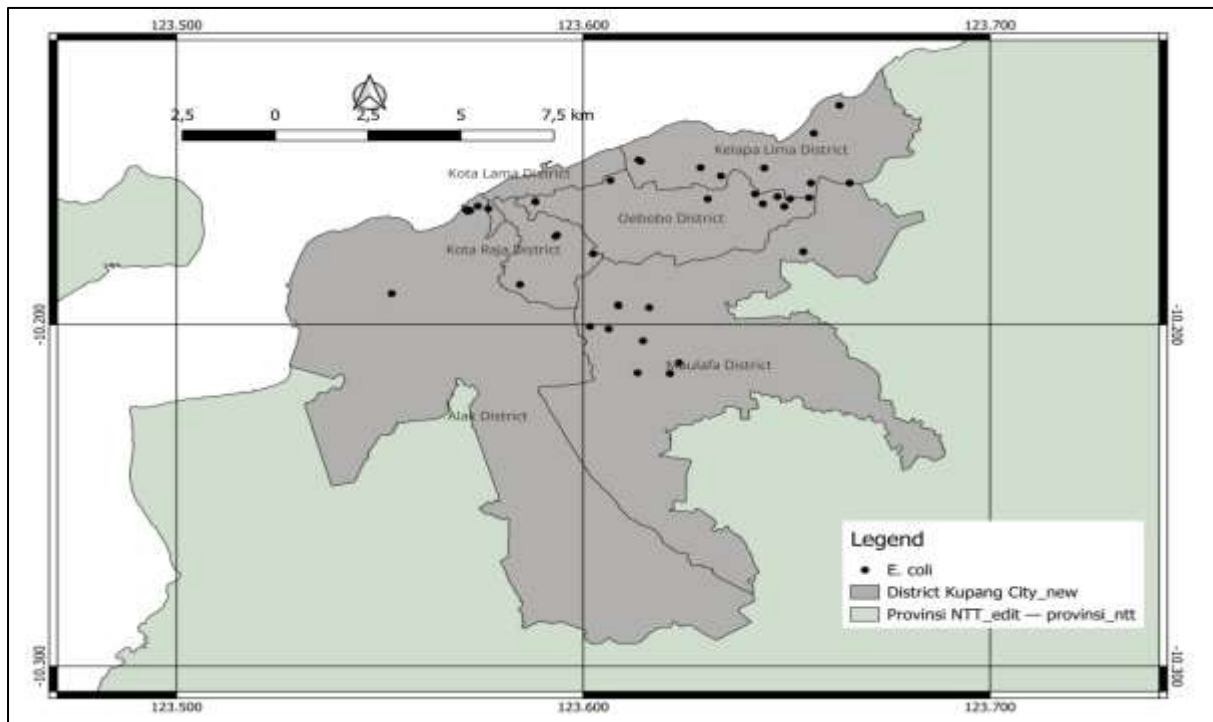
(a)
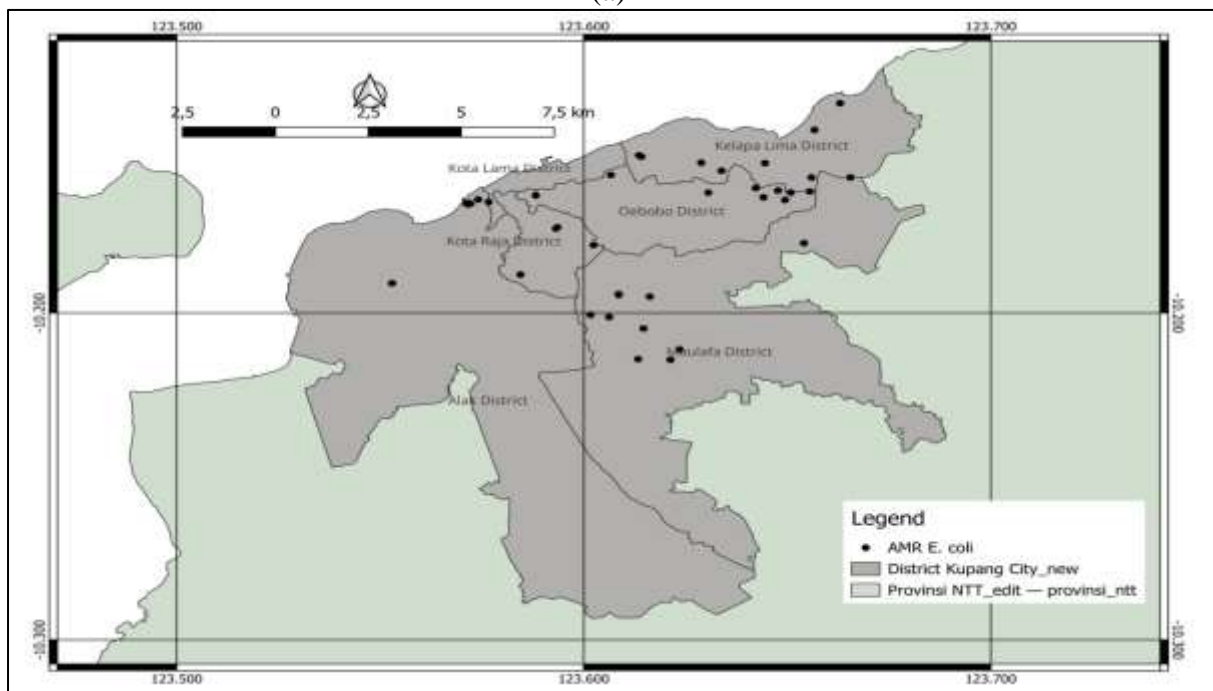
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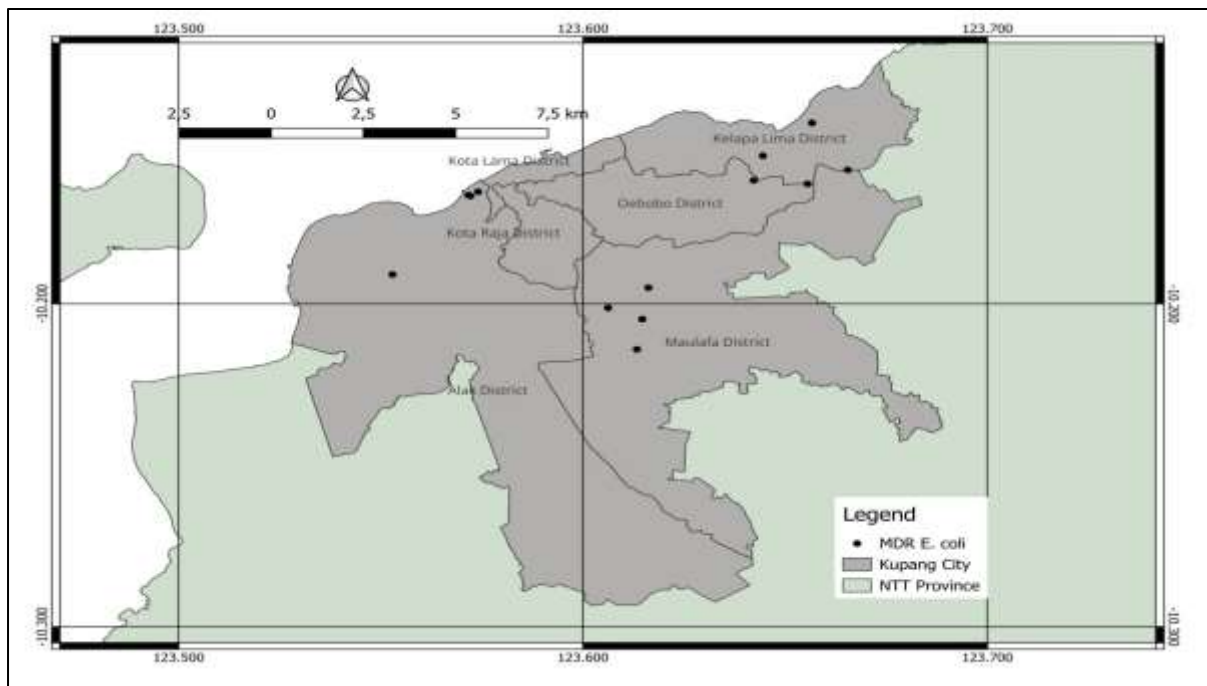
(c)

Figure 2. Map of the distribution of E. coli (a), AMR E. coli (b), and MDR E. coli (c) in domestic dogs in Kupang City (Elementary analysis of disease).

Table 1. The pattern of results of spatial analysis of the spread of E. coli, AMR E. coli, and MDR E. coli in pet dogs in Kupang City.

Parameters	E. coli	AMR E. coli	MDR E. coli
Distribution area (Ha)	5983	5983	5079
Number of AMR E. coli case points	37	37	13
NNI	0,763	0,763	0,783
Spread pattern	Random	Random	Random
Z-score	-2,821	-2,821	-1,495

Data on the distribution of E. coli in domestic dogs in Figure 2a shows that E. coli is spread over six subdistricts in Kupang City, with the highest levels found in Kelapa Lima District (13 points) and Maulafa District (10 points). The results of the distribution of E. coli did not differ much from the AMR E. coli data shown in Table 1 and Figure 2b. This study has shown that the occurrence of AMR occurs in every sample of E. coli (37 samples) that has been found. The results are in line with research conducted by Kallau et al. (2018b), (Kallau et al. 2019), and (Kallau et al. 2020). The incidence rate of antibiotic resistance in Kupang City can be influenced by several factors, such as the high level of dog ownership, as it has been shown by ownership of local dogs and breeds that continue to grow in Kupang City (Yanuartono 2008); (Kallau et al. 2020). The number of pet shops and veterinary clinics that have sprung up indicates that more and more people are raising animals and are starting to prioritize the health quality of their pet dogs.

The results of the z-score for AMR E. coli have shown negative results, this has shown that the level of resistance events that occurred at that location is lower than the general average in the same area. This is also related to areas with a lower level of risk or areas where effective interventions have started in the use of antibiotics to control the incidence of antibiotic resistance. Intervention using antibiotics in animal hospitals/animal clinics and practicing veterinarians can help reduce the incidence of resistance (Wayne et al. 2011).
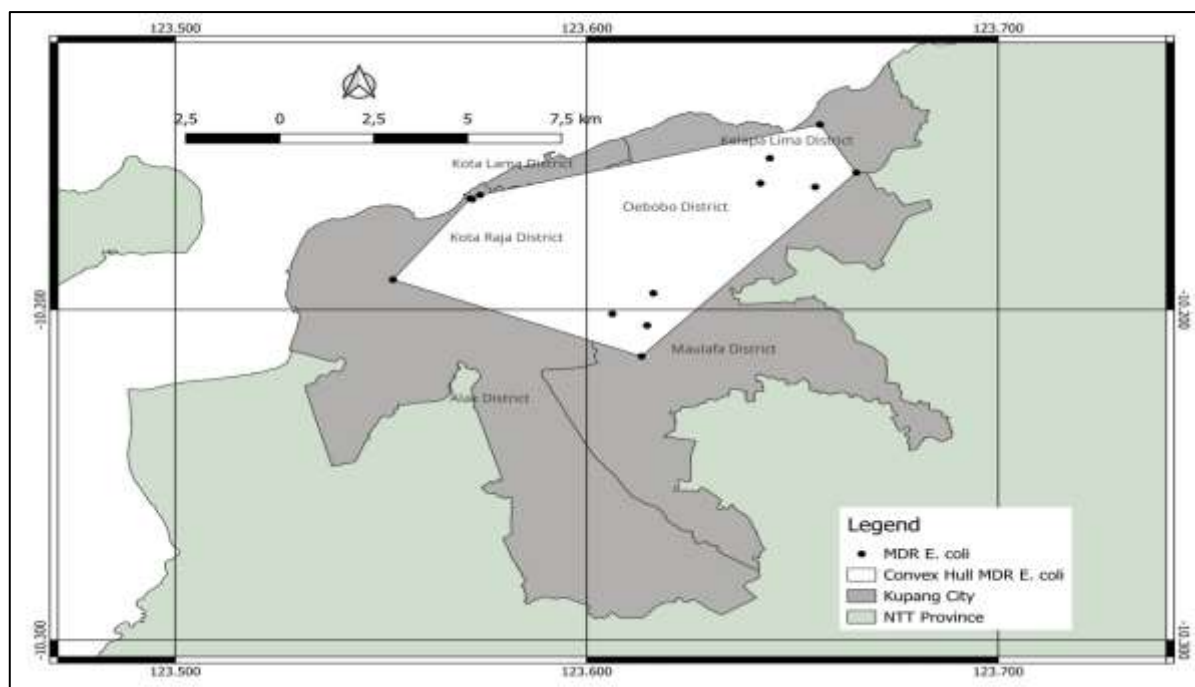
Figure 3. Map of MDR E. coli distribution area in domestic dogs in Kupang City (convex hull analysis).

The MDR E. coli data displayed in this study illustrates the distribution of the number of points of occurrence of MDR E. coli with a low level of 13/37 (35% prevalence).. The distribution area of MDR E. coli is 5.079 Ha with a random distribution pattern based on NNI. Z-score value has shown -1.495. The area of distribution can be seen in Figure 3. The area of distribution of MDR E. coli is still lower than the AMR of E. coli, but this has shown a tendency that the point of presence of MDR E. coli is in a large area pattern. This is almost in line with the research conducted by Kallau et al. (2019) on pig farms. Srivani et al. (2017) showed that geographic disease distribution patterns can vary due to differences in location and management of animal rearing. Besides that, there are also differences in resistance patterns related to the use of types of antibiotics, regional differences and different management systems (Bywater et al. 2004).

As with the results of the z-score for the AMR E. coli, the Z-score results that the spread of MDR E.coli has shown show a negative result (-1.495), this has provided information that the level of resistance events that occurred at that location was higher lower than the general average within the same area. This is also related to the existence of areas with a lower risk of occurrence of resistance or the existence of certain areas with effective interventions in controlling the incidence of antibiotic resistance. Management of animal diseases from pets can be supported by implementing dog population control management as part of planning and implementation (Acosta-Jamett et al. 2010).

Spatial studies that have been shown in this study indicate the distribution of MDR E. coli which is close to the human population. Interaction between humans and pets (dogs) has provided a higher chance of contact and encouraged wider spread. In general, the risk of spreading resistant bacteria from domestic dogs to humans is still difficult to predict and the pattern of spread is complex and requires further research (Pomba et al. 2017). Several patterns of the spread of zoonotic diseases of animal origin to humans can be through several ways,

namely direct contact with resistant animals or indirect contact such as through vectors, consuming contaminated food (specific diseases of bacterial origin) (Khairiyah 2011), The spread of MDR E. coli has been expanded in Kupang City due to the sale of tank water originating from groundwater sources, and the possibility of spreading that occurs with access to water sales throughout Kupang City through water tankers (Kallau et al. 2019). Hygiene and sanitation measures need to be implemented to reduce this rate of spread (Kallau et al. 2018a). This research needs to be continued by looking at other risk factors that encourage the emergence of multidrug resistance in relation to the relationship between pet dogs and dog owners.

4. CONCLUSION

MDR E. coli has a low number of events (35% prevalence) with a distribution area of 5079 Ha with a random distribution pattern. The observed Z-score value has shown -1.495. Results This dissemination has provided information for the implementation of preventive measures to suppress the wider spread of MDR by increasing understanding of the prudent use of antibiotics and the principles of hygiene and sanitation that need to be properly applied between animal owners and their pets.

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R E S E A R C H   **Open Access**

The Influence of Service Quality on BPJS Health Patient Satisfaction in the Outpatient Unit at Mitra Siaga Hospital, Tegal

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Abstract

Good health services provide services that are effective, safe, and of high quality. Efforts that have been made by the management of Tegal MS Hospital in maintaining and improving the quality of service, namely by holding training and simulation of excellent service, socializing BPJS Health related to a tiered referral system, equipping medical and non-medical equipment, repairing infrastructure, and carrying out standardization according to accreditation guideline assessments. This research was conducted to determine the effect of service quality on BPJS Health patient satisfaction in the outpatient unit of Tegal MS Hospital. This type of research is observational research with a quantitative approach. The population in this study were BPJS Kesehatan patients in the outpatient unit of Tegal MS Hospital who met the inclusion criteria of this study. Based on calculations with the Slovin formula above, a research sample of 99.9 was obtained, and the results were rounded up to 100 respondents. Data analyzed use univariate analysis, bivariate analysis, and multivariate analysis. The infrastructure variable positively and significantly influences patient satisfaction with a p- value of $0.026 < 0.05$. Research results from Infrastructure variable, variable Personnel Quality, Clinical Care Process Variables, Administrative Procedure Variables, Variables Patient Safety Indicator, Hospital Image Variable, Social Responsibility Variable, Trust Variable to House Sick has a positive and significant effect on patient satisfaction variables with the results of p- values each variable < 0.05. To examine patient satisfaction, apart from using service quality as the dependent variable, future researchers are also expected to be able to add other dependent variables such as hospital cost factors, patient emotional factors, or family economic conditions and even other variables that might affect the level of patient satisfaction.

Keywords: House Pain, Quality Service Dimensions Quality Service, Satisfaction Patient.

1. INTRODUCTION

Hospitals are health service institutions that provide complete individual health services which include medical services, medical rehabilitation and nursing services, these services are carried out through emergency units, outpatient units and inpatient units (Andriani, et al., 2022). Outpatient services are the provision of outpatient health services in hospitals that are organized through the services of specialist doctors-subspecialists. As a community service institution, hospitals are required always to provide quality health services (Meara et al., 2015). The success of a hospital is not only seen from the completeness of the equipment facilities developed in the service, but the attitude of health workers in providing services is a factor that influences patient satisfaction with hospital services (Rifai et al, 2022).

In regulating health problems, a special agency is needed responsible for administering health insurance, where the agency must provide good quality service to achieve service satisfaction. House Siaga Partner Hospital (RS MS) Tegal in service cooperate with BPJS Health, with a large number of BPJS participants National Health and as a large and new system takes place in a relatively short time, where there are problems in its application, many people do not know the technique get services in accordance with BPJS Health rules, so there are many BPJS participants Health who complains about the tiered referral service system implemented by BPJS Kesehatan. This tiered referral service system is also a challenge that is often faced by BPJS Health patients in various hospitals, with this system BPJS Health patients before going to a hospital or specialist doctor must first go to the designated First Level Health Facility (FKTP), namely the puskesmas, family doctors or clinics that work with BPJS Health to get referral letters, this can be affect the quality of service or the quality of health services (Murtiana, 2016). According to Toliaso, et al., (2018) quality health services are health services that can meet patient expectations, so that patients will feel satisfied, comfortable and very grateful because everything that is expected is in accordance with what they want (Toliaso, et al., 2018). The quality of hospital services can be assessed from three things, namely: 1) structure, which includes: physical facilities, equipment, funds, health workers, support and patients; 2) process, which includes hospital management both interpersonal and technical which is reflected in medical and non-medical actions for patients; 3) outcome , which includes services that can provide patient satisfaction (Widadi, 2020).

With BPJS Health, the quality of services provided to patients has been determined, where there are differences in contributions that make health services provided to BPJS participants also differentiated based on their membership, (Syaputra, 2016) most of these things affect the level of patient satisfaction BPJS Health participants. Quality health services is one aspect of health services and an important factor in achieving patient satisfaction (Murtiana, 2016). Patient satisfaction is a person's feeling of pleasure or disappointment that arises after comparing the performance of the product in question with the expected results (Soumokil, et al., 2021). Service quality cannot be separated from customer satisfaction (Padma et al., 2009). The impact of patient dissatisfaction with services, namely dissatisfied customers will switch to other service providers and they will never return, dissatisfied customers will convey their dissatisfaction with others so that they get justice and compensation.

Quality encourages patients to form strong bonds with health care providers (Chinintyas & Manalu, 2020). Patients who get optimal quality service from the hospital will automatically create satisfaction for their customers. In addition, patient satisfaction can be used as a benchmark for the success of the quality of service in a health facility. Patient satisfaction will be created when what is obtained is greater than expected. In everyday experience patient dissatisfaction is often expressed in relation to the attitudes and behavior of hospital staff, including: delays in doctor and nurse services, doctors are difficult to find, length of admission

process, limited drugs and equipment, availability of facilities and order and cleanliness of the hospital. According to Nursalam, (2014), factors that influence patient satisfaction are product or service quality, price, emotional, performance, aesthetics, product characteristics, service, location, facilities, communication, atmosphere and visual design .

Tegal Mitra Siaga Hospital is a type C private hospital in Tegal Regency which provides services for BPJS Kesehatan patients , both outpatients and inpatients. Based on data for 2021, public visits using BPJS Health payments are in the range of 70% -80%, while general payments (non BPJS Health) occupy a portion of 13%. Tegal MS Hospital has advantages in terms of facilities so that it gains high enough trust from the people of Tegal City and Tegal Regency.

The management of Tegal MS Hospital has made various efforts to maintain the quality of outpatient services, including 1) Conducting excellent service training and simulations. 2) Socializing BPJS Health, management conducts socialization regarding the tiered referral system, actions and diseases that can be borne by BPJS Health through direct exposure while waiting for queues, leaflets and social media, but from these activities there are still quite a lot of patients who do not understand this this, so that patients have unfavorable views regarding BPJS Health and especially with Tegal MS Hospital; 3) Complementing medical and non-medical equipment, this effort is carried out by management in order to upgrade the inventory of old equipment and balance the development of knowledge both in the health sector which is developing quite rapidly and outside the health sector; 4) Carry out routine maintenance on the tools they own, these efforts are made to ensure that the equipment they have functions optimally and is proper; 5) Improving infrastructure, this is realized by improving waiting rooms, examination rooms, these efforts are made to provide comfort to patients and patient companions; and 6) Carry out standardization according to the assessment of accreditation guidelines, this is done to meet hospital accreditation standards.

Even though various efforts have been made, in fact there are still complaints experienced by patients related to patient satisfaction, such as the waiting time for doctor's services is quite long because the doctor does not arrive on time, medical or non-medical staff lack of empathy and sympathy, lack of communication between staff and patients, murky water, toilets for the elderly still using squat toilets, queues for medicines at the pharmacy are quite long, the amount of drugs received does not match the doctor's prescription. These complaints were obtained from Google reviews, criticism and suggestion boxes available in the corners of the room. The existence of these complaints can affect patient satisfaction in assessing the hospital. Data obtained in the last three years in 2019 Tegal MS Hospital had a patient satisfaction rate of 75%, in 2020 it was 74%, and in 2021 it was 75%. These results are still below the minimum service standard that has been determined, the Ministry of Health of the Republic of Indonesia sets a minimum service standard for patient satisfaction of more than 95%.

Refers on the results of research conducted by Padma et al., (2009), dimensions of quality can shape service quality which can be used as service quality parameters, such as: infrastructure, personnel quality, clinical care processes, administrative procedures, patient safety indicators, hospital image, hospital social responsibility and trust in hospital. Research conducted by Singh and Dixit, (2021) entitled " Impact Of Service Quality Dimensions On Patient Satisfaction And Behavioral Intentions : A Study Of Indian Public Hospitals ", the results of this study indicate that the dimensions of infrastructure, clinical care processes, trust in the hospital and social responsibility of the hospital significantly affect patient satisfaction, while behavioral intention or intention to return is significantly influenced by the dimensions of infrastructure, quality of personnel and social responsibility of the hospital.

Ali and Kodikal, (2021) conducted research related to patient perceptions of service quality at the Dakhsina hospital Kannada , this study uses 5 dimensions of service quality, namely as follows infrastructure, personnel quality, administrative processes, patient safety and

reliability , of the five dimensions of service quality, all of which have an influence on customer perceptions. Nugroho, (2021) in his research entitled "Evaluation of Quality of Health Services at Solo Eye Hospital". This study examines the effect of the 8 service quality dimensions on patient satisfaction. The results of this study, of the 8 dimensions that become variables, 6 of them have a significant effect on patient satisfaction, while what is not significant is the dimensions of administrative procedures and patient safety indicators.

Research conducted by Tan et al., (2019) who measured the effect of service quality on patient satisfaction in Malaysia using the service quality dimensions developed by Padma et al (2009), the research results show that the 8 dimensions affect patient satisfaction. The dimension of personnel quality has a stronger influence than the other dimensions. Georgiadou and Maditinos (2017) with the title "Measuring the quality of health services provided at a Greek Public Hospital through patient satisfaction. Case Study: The General Hospital of Kavala", in this study using the 8 dimensions proposed by Padma et al., (2009). From this study, the 5 dimensions of service quality have a significant impact on patient satisfaction, the 5 dimensions are clinical care, hospital social responsibility, staff quality, infrastructure and hospital case studies conducted by Wardani, (2019) with the title "The Influence of Service Quality on Customer Satisfaction From the Perspective of Patients and Patient Companions". The study uses the 8 dimensions proposed by Padma et al (2009). From the results of this study, service quality variables jointly influence customer satisfaction from the patient's point of view and service quality variables jointly influence customer satisfaction from the patient companion's point of view. This research was conducted to determine the effect of service quality on BPJS Health patient satisfaction in the outpatient unit of Tegal MS Hospital.

2.   RESEARCH METHOD

This type of research is observational research with a quantitative approach. In terms of data collection, this research is classified as *cross research sectional* . The population in this study were BPJS Kesehatan patients in the outpatient unit of Tegal MS Hospital who met the inclusion criteria of this study. The sample collection method used is *Stratified Sampling*. Determining the size of the sample is carried out using the Slovin formula proposed by (Suryoto, 2013). The required size or sample size of all BPJS Kesehatan patients in the outpatient unit of Tegal MS Hospital is taken from the number of outpatient visits in September 2021-October 2021, namely 23,347 BPJS Kesehatan patients in the outpatient unit at MS Tegal Hospital. Based on calculations with the Slovin formula, a research sample of 99.9 was obtained, the results were rounded up to 100 respondents.

Data collected from the results of filling out questionnaires by respondents which are primary data are then processed and analyzed using statistical analysis to prove the hypothesis using the techniques Univariate data analysis was carried out to describe, explain/describe the characteristics of each of the variables studied such as the independent variables (Dimensions of Service Quality: Infrastructure, quality of personnel, treatment process, administrative procedures, patient safety indicators, hospital image, hospital social responsibility, and trust in the hospital), the dependent variable (patient satisfaction). Bivariate data analysis was carried out using the Chi- square test with a significance level of 0.05 to see whether there is a relationship between each of the variables studied, namely the independent variables (Dimensions of Service Quality: Infrastructure, personnel quality, treatment process, administrative procedures, patient safety indicators, hospital image, hospital social responsibility, and trust in the hospital), the dependent variable (patient satisfaction). Multivariate analysis used in this study aims to determine the significant independent variables

to dependent, and the selection of regression tests binary logistics due variable dependent form categorical with 2 categories.

3. RESULTS AND DISCUSSION

Table 1. Characteristics Respondents.

Characteristics Respondents Based on Age

	Average	Standard deviation	Min	Max
Age	46.75	14,19	17	75

Characteristics of Respondents by Gender

No	Type Sex	Frequency	Percentage
1.	Man	29	29%
2.	Woman	71	71%
	Amount	100	100%

Characteristics of Respondents Based on Education

No	Education	Frequency	Percentage
1.	SD / SMP	47	47%
2.	Senior High School	38	38%
3.	College	15	15%
	Amount	100	100%

Characteristics of Respondents Based on Occupation

No	Work	Frequency	Percentage
1.	IRT	37	37%
2.	Employee Private	19	19%
3.	Self-employed	12	12%
4.	Other	12	12%
5.	No Work	20	20%
	Amount	100	100%

Characteristics of Respondents Based on BPJS Membership

No	BPJS membership	Frequency	Percentage
1.	Non PBI	55	55%
2.	PBI	44	44%
	Amount	100	100%

Table 1 show the average age of the patients was 46.75 years with a standard deviation of 14.19, and with a minimum age of 17 years and a maximum of 75 years. 100 respondents studied, the majority of respondents were female, 71 respondents (71%) , while male respondents amounted to 29 respondents (29%). From the 100 respondents studied, respondents who had an elementary/junior high school education level totaled 47 respondents (47%), respondents who had a high school education level totaled 38 respondents (38%), and respondents who had a college education level amounted to 15 respondents (15%). From the 100 respondents studied, the majority of respondents who were dominated by women who worked as housewives totaled 19 respondents (19%), respondents who worked as entrepreneurs amounted to 12 respondents (12%), respondents who did not work amounted to 20 respondents (20%), and 12 other respondents have jobs such as high school administration staff, retirees, and others. From the 100 respondents studied, most of the respondents were non-BPI BPJS participants, totaling 55 respondents (55%), while 44 respondents or 44% were BPJS BPI participants.

Table 2. Analysis Univariate.

Infrastructure Variables

No	Infrastructure	Frequency	Percentage
1.	No Good	52	52%
2.	Good	48	48%
	Amount	100	100%

Personnel Quality Variables

No	Quality Personnel	Frequency	Percentage
1.	No Good	44	44%
2.	Good	56	56%
	Amount	100	100%

Clinical Process Variables

No	Treatment Process Clinical	Frequency	Percentage
1.	No Good	46	46%
2.	Good	54	54%
	Amount	100	100%

Administrative Procedure Variables

No	Procedure Administrative	Frequency	Percentage
1.	No Good	45	45%
2.	Good	55	55%
	Amount	100	100%

Patient Safety Indicator Variables

No	Indicator Safety Patient	Frequency	Percentage
1.	No Good	43	43%
2.	Good	57	57%
	Amount	100	100%

Hospital Image Variables

No	Home Image Sick	Frequency	Percentage
1.	No Good	49	49%
2.	Good	51	51%
	Amount	100	100%

Social Responsibility Variables

No	Social Responsibility	Frequency	Percentage
1.	No Good	58	58%
2.	Good	42	42%
	Amount	100	100%

Trust Variables To House Sick

No	Social Responsibility	Frequency	Percentage
1.	No Good	63	63%
2.	Good	37	37%
	Amount	100	100%

Patient Satisfaction Variables

No	Social Responsibility	Frequency	Percentage
1.	No Satisfied	28	28%
2.	Satisfied	72	72%
	Amount	100	100%

Table 2 show from the 100 respondents studied, the majority of respondents thought that the hospital infrastructure was still not good, namely 52 respondents (52%), while 48 respondents or 48% thought the infrastructure was good. The majority of respondents considered that the quality of personnel at the hospital was good, namely 56 respondents (56%), while 44 respondents or 44% thought the quality of personnel was not good. From the 100 respondents studied, the majority of respondents considered that the clinical care process at the hospital was good, namely 54 respondents (54%), while 46 respondents or 46% thought the clinical care process was not good. The majority of respondents considered that the administrative procedures at the hospital were good, namely 55 respondents (55%), while 45 respondents or 45% thought the administrative procedures were not good. The majority of respondents considered that the Patient Safety Indicators at the hospital were good, namely 57 respondents (57%), while 43 respondents or 43% thought the Patient Safety Indicators were not good. Most of the respondents considered that the image of the hospital was good, namely 51 respondents (51%) , while 49 respondents or 49% thought the image of the hospital was not good. The majority of respondents considered that social responsibility in hospitals was still not good, namely 58 respondents (58%), while 42 respondents or 42% others considered social responsibility to be good. Most of the respondents considered that trust to hospitals are still not good, namely 63 respondents (63%), while 37 respondents or 37% others consider trust in House Sick already well. Most of the respondents were satisfied with the services at the hospital, namely 72 respondents (72 %) , while 28 respondents or 28% were not satisfied.

Table 3. Analysis Bivariate.

Test of the Relationship Between Infrastructure and Patient Satisfaction

Infrastructure	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	20 (38.5%)	32 (61.5%)	52	
Good	8 (16.7%)	40 (83.3%)	48	0.015
Total	28	72	100	

Test of the Relationship Between Personnel Quality and Patient Satisfaction

Personnel Quality	Patient Satisfaction		Total	p- value
	Not satisfied	Satisfied		
Not good	19 (43.2%)	25 (56.8%)	44	
Good	9 (16.1%)	47 (83.9%)	56	0.003
Total	28	72	100	

Test of the Relationship Between Clinical Treatment Process and Patient Satisfaction

Clinical Treatment Process	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	22 (47.8%)	24 (52.2%)	46	0.000
Good	6 (11.1%)	48 (88.9%)	54	
Total	28	72	100	

Test of the Relationship Between Administrative Processes and Patient Satisfaction

Administrative Process	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	22 (48.9%)	23 (51.1%)	45	
Good	6 (10.9%)	49 (89.1%)	56	0.000
Total	28	72	100	

Test of Relationship Between Indicators of Patient Safety and Patient Satisfaction

Patient Safety Indicator	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	19 (44.2%)	23 (55.8%)	43	
Good	9 (15.8%)	48 (84.2%)	57	0.002
Total	28	72	100	

Test the Relationship Between Hospital Image and Patient Satisfaction

Hospital Image	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	21 (42.9%)	23 (57.1%)	49	
Good	9 (13.7%)	44 (86.3%)	51	0.001
Total	28	72	100	

Test of the Relationship Between Social Responsibility and Patient Satisfaction

Social Responsibility	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	22 (37.9%)	36 (62.1%)	58	
Good	6 (14.3%)	36 (85.7%)	42	0.009
Total	28	72	100	

Test the Relationship Between Trust Against House Sick and Patient Satisfaction

Trust	Patient Satisfaction		Total	p-value
	Not satisfied	Satisfied		
Not good	23 (36.5%)	40 (63.5%)	63	
Good	5 (13.5%)	32 (86.5%)	37	0.013
Total	28	72	100	

Table 3 shows that of the 48 respondents who considered the hospital infrastructure to be good, 40 of them or 83.3% were satisfied with hospital services, while the other 8 respondents or 16.7% said they were not satisfied with hospital services. The results of the hypothesis test obtained $p\text{-}value$ (0.015) $< \alpha(0.05)$, it can be concluded that there is a significant relationship between infrastructure and patient satisfaction. 56 respondents who considered the quality of hospital personnel to be good, 47 of them or 83.9% were satisfied with hospital services, while the other 9 respondents or 16.1% said they were not satisfied with hospital services. The results of the hypothesis test obtained $p\text{-}value$ (0.003) $< \alpha(0.05)$, so it can be concluded that there is a significant relationship between the quality of personnel and patient satisfaction. 54 respondents considered the hospital's clinical care process good, 48 of them or 88.9% were satisfied with hospital services, while the other 6 respondents or 11.1% said they were dissatisfied with hospital services. The results of the hypothesis test obtained $p\text{-}value$ (0.000) $< \alpha(0.05)$, so it was concluded that there was a significant relationship between clinical care processes and patient satisfaction. 56 respondents who considered the hospital's Administrative processes to be good, 49 of them or 89.1% were satisfied with hospital services, while the other 6 respondents or 10.9% said they were dissatisfied with hospital services. The results of the hypothesis test obtained $p\text{-}value$ (0.000) $< \alpha(0.05)$, so it is concluded that there is a significant relationship between Administrative processes on patient satisfaction. 55 respondents who considered the hospital's Patient Safety Indicators to be good, 48 of them or 84.2% were satisfied with hospital services, while the other 9 respondents or 15.8% said they were dissatisfied with hospital services. The results of the hypothesis test obtained $p\text{-}value$ (0.002) $< \alpha(0.05)$, so it can be concluded that there is a significant relationship between Patient Safety Indicators and patient satisfaction. 51 respondents who considered the image of the hospital to

be good, 44 of them or 86.3% were satisfied with hospital services, while the other 9 respondents or 13.7% said they were dissatisfied with hospital services. The results of the hypothesis test obtained *p- value* (0.001) < α(0.05), so it can be concluded that there is a significant relationship between hospital image and patient satisfaction. 42 respondents who considered Social Responsibility at the Hospital to be good, 36 of them or 85.7% were satisfied with hospital services , while the other 6 respondents or 14.3% said they were dissatisfied with hospital services. Sick. The results of the hypothesis test obtained *p- value* (0.009) < α(0.05), so it can be concluded that there is a significant relationship between Social Responsibility and patient satisfaction. 37 respondents who considered trust in the hospital to be good, 32 of them or 86.5% were satisfied with hospital services, while the other 5 respondents or 13.5% said they were dissatisfied with hospital services. The results of the hypothesis test obtained *p- value* (0.013) < α(0.05) so it is concluded that there is a significant relationship between trust to House Sick on patient satisfaction.

Table 4. Goodness Results of Fit.

Goodness - of -Fit		
Chi- Square	**Df**	**Sig .**
5,855	8	0.663

Table 4 obtained from the results of the regression analysis shows that the results of the *goodness test of fit Hosmer* and *Lemeshow* gives a *chi-square value* of 5.855 with a significance level of 0.663. The test results show that the probability value (*P- value*) ≥ 0.05 (significant value), the *Hosmer value and Lemeshow* 0.663 ≥ 0.05, then H0 is accepted, this indicates that there is no significant difference between the model and the data, so the regression model in this study is valid and can predict the observed value.

Table 5. Coefficient of Determination.

Pseudo R- Square	
Nagelkerke	0.645

Table 5 obtained from the results of the regression analysis shows that taking into account the *Nagelkerke's R- square* value, the coefficient of determination is 0.645, this indicates that the ability of the independent variables to explain the dependent variable is 64.5%. The rest is explained by other variables outside the research model.

Table 6. Hypothesis Testing.

Independent Variable	B	Wald	Sig .	Exp (B)	Lower	Upper
Constant	-16.75	20.84	0.00	0.00		
Infrastructure	1.67	4.94	0.026	5,33	1.22	23,29
Personnel Quality	1.47	4.01	0.045	4,34	1.03	18,22
Clinical Treatment Process	1.51	3.97	0.046	4.53	1.02	20.07
Administrative Procedures	1.50	3.89	0.049	4.48	1.01	19,92
Patient Safety Indicator	1.56	4.81	0.028	4.76	1.18	19,23
Hospital Image	1.54	3.89	0.049	4.64	1.01	21.35
Social Responsibility	1.62	4.62	0.032	5.06	1.15	22,18
Trust in Hospitals	1.73	4,15	0.042	5,63	1.07	29,74

Based on a partial test to find out which independent variables really have a significant effect on the dependent variable. The series of hypothesis testing for each explanatory variable is infrastructure variable has a positive and significant influence on patient satisfaction with a p- value of 0.026 <0.05. Personnel quality variable has a positive and significant effect on patient satisfaction with a p- value of 0.045 <0.05. Clinical care process variable has a positive

and significant effect on patient satisfaction with a p- value of 0.046 <0.05. Administrative Procedure variable has a positive and significant effect on patient satisfaction with a p- value of 0.049 <0.05. Patient safety indicator variable has a positive and significant influence on patient satisfaction with a p- value of 0.028 <0.05. Hospital image variable has a positive and significant effect on patient satisfaction with a p- value of 0.049 <0.05. Social Responsibility variable has a positive and significant influence on patient satisfaction with a p- value of 0.032 <0.05. Trust Variable To House Sick has a positive and significant effect on patient satisfaction with a p- value of 0.042 <0.05.

Based on the binary logistic regression test the resulting model is as follows: $Y=-16,75+1,67X_1+1,47X_2+1,51X_3+1,50X_4+1,56X_5+1,54X_6+1,62X_7+1,73X_8$. Based on the equation above it can be concluded that infrastructure variable with Exp(B) 5.33, so that people who think the infrastructure is good are 5.33 times more likely to be satisfied with hospital services than people who think the infrastructure is not good. B value is positive, this shows that infrastructure has a positive influence on patient satisfaction. The variable quality of personnel with Exp(B) 4.34, so that people who think the quality of personnel is good, are 4.34 times more likely to be satisfied with hospital services than people who think the quality of personnel is not good. B value is positive, matter it shows that personnel quality has a positive influence on patient satisfaction. The clinical care process variable with Exp(B) 4.53, so that people who think the clinical care process is good are 4.53 times more likely to be satisfied with hospital services than people who think the clinical care process is not good. B value is positive, it shows that clinical care process has a positive influence on patient satisfaction. Administrative procedure variable with Exp(B) 4.48, so that people who think administrative procedures are good are 4.48 times more likely to be satisfied with hospital services than people who think administrative procedures are not good. The value of B is positive, this shows that Administrative procedures have a positive influence on patient satisfaction. Patient safety indicator variable with Exp(B) 4.76, so that people who think patient safety indicators are good are 4.76 times more likely to be satisfied with hospital services than people who think patient safety indicators are not good. B value is positive, it shows that Patient safety indicators have a positive influence on patient satisfaction. Hospital image variable with Exp(B) 4.64, so that people who think the hospital's image is good are 4.64 times more likely to be satisfied with hospital services than people who think the hospital's image is not good. B value is positive , it shows that Hospital image has a positive influence on patient satisfaction. Social responsibility variable with Exp(B) 5.06, so that people who think social responsibility is good are 5.06 times more likely to feel satisfied with hospital services as much as compared to people who think social responsibility is not good. The value of B is positive, this shows that social responsibility has a positive influence on patient satisfaction. The variable trust in the hospital with Exp(B) 5.63, so that people who think trust in the hospital is good, 5.63 times more likely to feel satisfied with hospital services as much as compared to people who think trust in the hospital is not good. B value is positive, it shows that Trust in the hospital has a positive influence on patient satisfaction.

The results of Influence Infrastructure To Satisfaction Patient the hypothesis test stated that the significance value between infrastructure and patient satisfaction was 0.026 which was smaller than the value of α (0.05), this indicated that infrastructure variables had a significant effect on patient satisfaction variables, by therefore, hypothesis in this research namely " There is a positive influence between infrastructure on patient satisfaction at MS Tegal Hospital " is declared accepted. People who think the infrastructure is good are 5.33 times more likely to be satisfied with hospital services than people who think the infrastructure is not good. Infrastructure is of course one of the most important facilities to support hospital equipment,

ranging from health facilities used to public facilities for visitors or patient families, which are seen as a means to achieve certain goals or fulfill certain satisfactions and needs. Infrastructure is defined as public facilities and infrastructure. According to Aji, et al., (2021) infrastructure is a physical resource that must exist before a service can be delivered to consumers. Infrastructure can also be anything that facilitates customer satisfaction, because the form of service cannot be seen, smelled or touched, then the appearance of the physical form becomes important as a measure of service. Customers assess service quality by using their visual senses so that customers feel satisfied, this is reinforced by the research by Setyawati *et al* (2018), Russell *et al.,* (2015), and Suyitno, (2018) who found that infrastructure has a positive and significant effect on patient satisfaction .

The results of the Influence Quality Personnel To Satisfaction Patient hypothesis test stated that the significance value between the quality of personnel on patient satisfaction was 0.045 which was smaller than the value of α (0.05) , this indicated that the variable quality of personnel had a significant effect on patient satisfaction variables , by therefore, hypothesis in this research namely " There is a positive influence between the quality of personnel on patient satisfaction at MS Tegal Hospital " is declared accepted. People who think the quality of personnel is good, are 4.34 times more likely to be satisfied with hospital services than people who think the quality of personnel is not good. This research is in line with that conducted by Miftah, (2022) regarding the effect of service quality, employee performance and facilities on BPJS patient satisfaction at ABC Hospital with the result that the quality of hospital employee performance is a factor influencing patient satisfaction. This research is also in line with that conducted by (Luan *et al.,*2018) concerning the Relationship between Nurse Performance and Patient Satisfaction in the Inpatient Room of Dr. Soetarto Yogyakarta with the results obtained that the better the nurse's performance, the patient's satisfaction with hospital services will also increase. Patient satisfaction is determined not only by the quality of service, but also by the performance of each health worker. Evaluation performance officer health neither lost important in evaluation patient satisfaction. Health worker performance appraisal is a job performance evaluation process used by management to inform individual health workers about the quality of their work from the perspective of their best interests. institution or agency. The role of health workers is very important to support the success of a hospital. Health workers have the power to influence patient perceptions of hospital quality, health workers are part of the service itself, for patients health workers are ambassadors and representatives of the image of the hospital. services provided to patients so that hospitals can assess the quality of services provided by their health workers. The key to better service quality is meeting or exceeding patient expectations.

4.   CONCLUSION

The results Influence of Treatment Process Clinical To Satisfaction Patient of the hypothesis test stated that the significance value between clinical care processes on patient satisfaction was 0.046 which was smaller than the value α (0.05) , this indicated that the clinical care process variables had a significant effect on patient satisfaction variables o, by therefore, hypothesis in this research that is " There is a positive influence between the process of clinical care on patient satisfaction at MS Tegal Hospital " is declared accepted. People who think the clinical care process is good are 4.53 times more likely to be satisfied with hospital services as much as people who think the clinical care process is not good. This research is in line with that conducted by Singh and Dixit (2021) entitled *Impact of service quality dimensions on patient satisfaction and behavioral intentions : A study of Indian public hospitals* with the results stating that the process of clinical care determines whether patients are satisfied or not because the professionalism of nurses when carrying out clinical processes is very important for patient satisfaction. Research conducted by Ali and Kodikal, (2021), with the result that

there is a positive influence between the process of clinical care on patient satisfaction. Health workers, especially nurses, have an important role in optimizing patient satisfaction which is currently growing and developing, where the role of nurses is more focused on fundamental factors. the knowledge and information they have about how to behave and good skills or abilities to manage care services where patient safety is a priority. The skills of every health worker can always be trained and developed to enable individuals to become experts or professionals in a particular field. These skills can be developed through a continuous process of learning and training so that they can be applied to any activity and practice. at workplace.

The results Influence Procedure Administrative To Satisfaction Patient of the hypothesis test stated that the significance value between administrative procedures on patient satisfaction was 0.049 which was smaller than the value of α (0.05) , this indicated that the administrative procedure variable had a significant effect on patient satisfaction variable, by therefore, hypothesis in this research namely " There is a positive effect between administrative procedures on patient satisfaction at Tegal MS Hospital " is declared accepted. People who think administrative procedures are good are 4.48 times more likely to be satisfied with hospital services than people who think administrative procedures are not good. Administrative and financial services include administrative services, one of which is administration such as registration, medical records and management, while the financial sector includes the payment of ambulance and hospital fees, when patients feel comfortable in hospital administration services, this comfort affects patient satisfaction and encourages patient to return to treatment. Comfort and pleasure can make someone loyal to seek treatment at the same health service again. The research is in line with that carried out by Ali and Kodikal, (2021), entitled *Patients Perception Of Service Quality Towards In Hospitals Of Dakshina Kannada District Of Karnataka* with the result that the administrative process of a hospital is one of the factors of patient satisfaction.

The results Influence Indicator Safety Patient To Satisfaction Patient of the hypothesis test stated that the significance value between patient safety indicators on patient satisfaction was 0.028 which was smaller than the value of α (0.05) , this indicated that the patient safety indicator variable had a significant effect on patient satisfaction variable , by therefore, hypothesis in this research namely " There is a positive influence between patient safety indicators on patient satisfaction at MS Tegal Hospital " is declared accepted. People who think patient safety indicators are good are 4.76 times more likely to be satisfied with hospital services than people who think patient safety indicators are not good. Patient safety is one measure of the quality of service in hospitals. Quality improvement and patient safety are interrelated, the higher the patient safety, the better the quality of the hospital. Patient safety and hospital quality are positively correlated. Patient safety in Indonesia is regulated by the Hospital Law. Number 44 of 2009 Article 43 which requires hospitals to pay attention to patient safety standards. More complete regulations regarding patient safety are regulated in the Regulation of the Minister of Health of the Republic of Indonesia Number 11 of 2017 which requires every health institution to maintain patient safety. Patient safety is far more important than just service efficiency. The behavior of nurses with nursing expertise plays an important role in the implementation of patient safety. Unsafe behavior, forgetfulness, lack of attention/motivation, carelessness, imprecision, and lack of skill and care for patient safety all risk mistakes and result in patient injury in the form of near misses. or unwanted events (Unexpected Events (KTD)), further error reduction can be achieved by changing behavior. In terms of service, companies need to ensure that employees and customers feel safe and comfortable, if you feel threatened, it has a psychological effect on both of you. Security is very important because it relates to survival issues and basic needs of individuals. If a service

company cannot make its customers feel safe, it quickly loses customers and becomes a failure. This research is in line with Handayani, (2019) with the title patient satisfaction with the implementation of patient safety in hospitals with the results obtained that there is a significant relationship between patient safety measures and patient satisfaction. This research is also in line with research Tan *et al* (2019), with the title *Measuring the influence of Service Quality on patient Satisfaction in Malaysia* with the result that of the 8 dimensions of service quality seen in the variable work safety indicators have a significant effect on patient satisfaction.

The results The Effect of Home Image Sick To Satisfaction Patient of the hypothesis test stated that the significance value between hospital image and patient satisfaction was 0.049 which was smaller than the value α (0.05), this indicated that the hospital image variable had a significant effect on patient satisfaction variable, by therefore, hypothesis in this research namely " There is a positive influence between the image of the hospital on patient satisfaction at MS Tegal Hospital " is declared accepted. People who think the image of the hospital is good are 4.64 times more likely to be satisfied with hospital services than people who think the image of the hospital is not good. Study this is also in line with research conducted by Ramli, (2017), in their research obtained home image results Sick influential positive and significant to patient satisfaction. Study another conducted by Yulianto and Yosepha (2022) is safe in the research conducted obtained results that image House Sick influential positive to patient satisfaction. Study this is also aligned reluctantly research conducted by Adriyanto and Tabrani (2018) concerning the Effect of Hospital Image and Service Quality on Patient Loyalty Through Patient Satisfaction (Study at Tegal Kardinah General Hospital) with the results showing that hospital image has a significant effect on patient satisfaction and loyalty. Image is a function of consumer experience and expectations. When consumers construct expectations and realities in technical and functional terms and these are perceived as fulfilling the image, the image is strengthened and even grows. Image has a major impact on management, negative and unclear image has a negative impact on employee performance and customer relations. On the other hand, a clear positive image, for example an excellent organizational image, conveys clear values internally and reinforces positive attitudes towards the organization, hence the importance of a positive hospital image in patient perceptions to create patient loyalty towards hospital .

The results Influence Responsibility Against Satisfaction Patient of the hypothesis test stated that the significance value between social responsibility and patient satisfaction was 0.032 which was smaller than the value of α (0.05), this indicated that the social responsibility variable had a significant effect on patient satisfaction variables, by therefore, hypothesis in this research namely " There is a positive influence between social responsibility on patient satisfaction at MS Tegal Hospital " is declared accepted. people who think social responsibility is good, 5.06 times more likely to be satisfied with hospital services as much as people who think social responsibility is not good. One way to increase patient satisfaction is the social responsibility of health workers for their work for the benefit of patients. Several previous studies have shown that excellent service must be implemented in every hospital as a prerequisite for increasing patient satisfaction. Responsible for excellent service affects patient satisfaction. Research conducted at Muhammadiyah Babat Hospital, Lamongan Regency also shows that excellent service by medical staff is significantly related to patient satisfaction. The better the nursing staff is held accountable for the services offered, the happier the clients will be. The most important thing for excellent service to achieve patient satisfaction is communication and a friendly attitude.

The results Influence Trust To House Sick To Satisfaction Patient of the hypothesis test stated that the significance value between trust in the hospital and patient satisfaction was 0.042 which was smaller than the value of α (0.05) , this indicated that the trust variable in the hospital had a significant effect on the patient satisfaction variable , by therefore, hypothesis in this

research namely " There is a positive influence between Trust in the hospital on patient satisfaction at Tegal MS Hospital " is declared accepted. People who think their trust in the hospital is good are 5.63 times more likely to be satisfied with the hospital's services as much as people who think their trust in the hospital is not good. The results of this study are in line with those conducted by Purba, Halim, and Widyatsari (2021) with the results of the study showing that trust in the hospital has a significant effect on satisfaction, which means that the higher the trust in the hospital given to patients, the more satisfied the patient is in using hospital health services. The results of this study are also supported by research conducted by Rizkiawan (2019) and Rizaq, (2019) who both state that trust in hospitals has a positive and significant effect on customer satisfaction. Building trust is one of the successes of the marketing process, because good trust in principle can be seen as recognition and appreciation of the usefulness of products or services provided by service providers that meet customer expectations, because trust is directly related to the patient's view of the reputation of the hospital, patient receiving services that meet expectations, pleasant services, services can be felt useful, patients are satisfied after using the service and feel safe or comfortable after using hospital products, and patients trust the hospital, this causes patients to continue using the hospital's services and finally recommending to others because they are satisfied with the hospital's services.

4.   CONCLUSION

Based on research for see The Influence of Quality of Service on Patient Satisfaction of BPJS Health in the Outpatient Unit of Mitra Siaga Hospital Tegal, the following conclusions are obtained variable Infrastructure have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Variable Quality Personnel have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Treatment Process Variables Clinical have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Variable Procedure Administrative have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Variable Indicator Safety Patient have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Home Image Variables Sick have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Variable Social Responsibility have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal. Variable Trust to House Sick have influence positive and significant to variable satisfaction patient BPJS Health in the Outpatient Unit at Mitra Siaga Hospital, Tegal.

Based on the results of testing on eight dimensions of satisfaction, it can be seen that the infrastructure dimension and the trust dimension are the dimensions with the most dominant odd ratio, so that the management of MS Tegal Hospital is expected to maintain these two dimensions and improve other dimensions so that patient satisfaction can be maximized.

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R E S E A R C H	**Open Access**

Prenatal Covid-19 on Toddler Development

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Abstract
Along with the spread of the COVID-19 pandemic, there has been an increase in reports of confirmed cases of pregnant women with COVID-19. Exposure to the virus in pregnancy can affect the fetus and result in long-term vulnerability to abnormalities in the child's brain development. This study aimed to determine the impact of prenatal Covid-19 on the development of toddlers. The research method uses observational cross-sectional analysis. Secondary data on confirmed Covid-19 mothers were obtained from Prof. RD Kandou General Hospital, Wolter Monginsidi Hospital, and Manado Adventist Hospital. Primary data on toddler development using the KPSP Development Questionnaire instrument were obtained from 10 Community Health Centers in Manado City with a total of 92 respondents for two, 46 respondents were born to mothers with Covid-19 during the prenatal period and 46 toddlers were born to mothers who were not confirmed to have Covid-19 during the prenatal period. The results showed that there was no significant effect with a p-value of 0.562 for toddlers born to Covid-19 mothers on impaired gross motor, fine motor, socialization, independence, speech, and language development. Based on the results of the study it can be concluded that both toddlers born to Covid-19 mothers and toddlers who were not born to Covid-19 mothers are at risk of experiencing growth disturbances, especially toddlers born during the Covid-19 pandemic because there could be long-term effects that could occur in infants who are exposed to the virus during the prenatal/intrauterine period.

Keywords: Covid-19, SARS-CoV-2, Prenatal, Toddler Development.

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1. INTRODUCTION

Novel Coronavirus Disease 2019 (COVID-19) caused by severe acute respiratory syndrome 2 (SARS-CoV-2) has caused a major pandemic that started in Wuhan worldwide and is still a global problem. Till September 2022 infected more than 614 million confirmed cases and caused more than 6.5 million deaths globally (Kementerian Kesehatan Republik Indonesia, 2022). The world's first case occurred in China in December 2019, COVID-19 was detected in Indonesia on March 2, 2020, and on April 9, 2020, it spread to 34 provinces in Indonesia (Direktorat Jenderal Pencegahan dan Penanggulangan Penyakit, 2021). The COVID-19 pandemic has caused quite high morbidity and mortality, September 2022 in Indonesia a total of 6.42 million cases and 158 thousand deaths (University of Oxford, 2022) (Kementerian Kesehatan Republik Indonesia, 2022).

Along with the spread of the COVID-19 pandemic, reports of COVID-19 cases in pregnant women have also increased. SARS-COV-2 infection is associated with an increased risk of maternal morbidity and mortality (Ahmad et al., 2022), (Metz et al., 2022). It has been reported that pregnant women are more susceptible to severe COVID-19 than non-pregnant women, especially in the second and third trimesters of pregnancy (Badr et al., 2021), (Zambrano et al., 2020)

Meta-analysis studies suggest that vertical transmission is from mother to infant low (Goh et al., 2021). However, some literature states that SARS-CoV-2 infection in pregnant women in the second and third trimesters increases obstetric and neonatal risks and improves baby care in the NICU (Neonatal Intensive Care Unit) (Badr et al., 2021) (Wei et al., 2021). This is in line with a retrospective cohort study of infants born to mothers with severe COVID-19 associated with NICU care and growth retardation (Hamidi et al., 2022)

Toddlers born during the COVID-19 pandemic show a significant or low overall verbal, non-verbal, motor, and cognitive decline compared to toddlers born before the COVID-19 pandemic (Deoni et al., 2021) (Dyer, 2021). According to (Naidu et al., 2022) the cytokine storm induced during COVID-19 in Pregnancy can cause severe inflammatory damage to the fetus, and if not controlled, can later lead to disorders such as autism spectrum and brain development abnormalities in the neonate. And activation of the mother's immune response, increased inflammation, and changes in cytokine expression has been suggested as some of the mechanisms that cause long-term effects in infants (Shook et al., 2022)

Studies that further discuss the consequences of the impact of COVID-19 on mothers' prenatal care for babies who are born while developing, require careful monitoring of the baby born to mothers diagnosed with COVID-19 so that they can be detected earlier if there are developmental disorders. Toddlerhood is a golden period where rapid brain development occurs, so early detection is needed for the development of toddlers, especially those born during the COVID-19 pandemic because some literature states that toddlers exposed to the intrauterine virus can experience developmental delays. This study aimed to determine the impact of prenatal Covid-19 on the development of toddlers.

2. RESEARCH METHOD

This type of research is observational research with a quantitative approach. In terms of data collection, this research is classified as cross-sectional research. A cross-sectional design, inclusion criteria for toddlers born during the pandemic to mothers with positive prenatal PCR COVID-19, toddlers born to mothers not confirmed for COVID-19, and exclusion criteria for toddlers with congenital abnormalities. The research was conducted from December 2022 to February 2023. Data on toddlers born during the COVID-19 pandemic from July 2020 to

November 2023 were obtained retrospectively through medical record data at Prof RD Kandou Regional General Hospital, Wolter Monginsidi Hospital, and Manado Adventist Hospital which are Hospitals for Pregnant Women Care, Delivery, and postpartum confirmed COVID-19.

Primary data for toddler development was carried out at 10 Puskesmas in the city of Manado, measuring the development of toddlers using the Developmental Pre Screening Questionnaire instrument, this questionnaire is the standard set by the Ministry of Health. The questionnaire consists of 10 questions for each age, if the answer is yes 9-10 the development is appropriate, the answer is yes 7-8 the development is doubtful, and if the answer is yes < 6 the development is a deviation. Toddler development is measured during toddler visits to the Health Center and direct visits to toddler homes. The purposive sampling technique consisted of 92 respondents who were divided into two groups 46 toddlers born to Covid-19 mothers and 46 toddlers born to mothers who were not confirmed to have Covid-19. Toddler development data was tested using SPSS 25 and analyzed using the *chi Square* statistical test with a p-value *<0.05* to determine the relationship between Covid-19 and toddler development. This research has received research ethics from the ethics committee of the Faculty of Public Health, Hasanuddin University number 14737/UN4.14.1/TP.01.02/2022, and ethics from Prof. RD Kandou Hospital 005/EC/KEPK-KANDOU/I/2023.

3. RESULTS AND DISCUSSION

Table 1. Prevalence of Under-fives born during the Covid-19 pandemic.

Toddlers born during a pandemic	n	%
Toddlers born to Covid-19 mothers	46	50
Toddlers born to mothers not confirmed for Covid-19	46	50
Total	92	100

Table 1 illustrates that 46 (50%) toddlers were born to prenatal Covid-19 mothers and the control group of toddlers who were not born to mothers who were confirmed to have Covid-19 prenatal period were 46 (46%) toddlers.

Table 2. Characteristics of mothers with confirmed Covid-19 and mothers of toddlers who are not confirmed with Covid-19.

Characteristics of mothers	Mother Covid-19		Mother is not confirmed Covid-19	
	n=46	%	n=46	%
Age				
20 – 35 years	41	89.1	43	93.5
> 35 years	5	10.9	3	6.5
Work				
Work	41	89.1	40	87
Doesn't work	5	10.9	6	13
Parity				
Primipara	17	37.0	18	39.1
Multipara	26	56.5	26	56.5
Grande Multipara	3	6.5	2	4.3
Labor Method				
Spontaneous	14	30.4	15	32.6
Sectio Caesarea	32	69.6	31	67.4

Table 2 describes the characteristics of mothers under five born to mothers with Covid-19 aged 20-35 years 41 (89.1 %), as well as mothers born to mothers not confirmed to have

Covid-19 aged 20-35 years (93.5%). Mother's occupation, both mothers with confirmed Covid-19 41 (89.1%) and mothers not confirmed with Covid- 19 40 (87%), the majority did not work. The parity of mothers under five with confirmed Covid-19 was 26 (56.5%) and not confirmed with Covid-19, the majority of whom were multipara, namely 26 (56.5%). Delivery Method The majority of deliveries were by Sectio Caesarea, the group of mothers with confirmed Covid-19 sectio caesarea was 32 (69.6%) and mothers under five who were not confirmed with Covid-19 were 31 (67.4%).

Table 3 Characteristics of Respondents Toddlers born to mothers with Covid-19 and Toddlers born to mothers who were not confirmed to have Covid-19 during the prenatal period.

Characteristics of Toddlers	Toddler Mother Covid-19 prenatal period		Toddler Mothers were not confirmed for Covid-19 during the prenatal period	
	n=46	**%**	**n=46**	**%**
Age				
0-12 months	21	45.7	21	45.7
>12 months–36 months	25	44.3	25	44.3
Gender				
Boy	28	60.9	22	47.8
Girl	18	39.1	24	52.2
Age When the toddler was born				
Preterm	3	65	3	6.5
Term	43	93.5	43	93.5
Nursing Room at Birth				
Rooming-in	6	13.0	44	95.7
Neonate	27	58.7	2	4.3
Nicu	13	28.3	0	0

Table 3. The age characteristics of the respondents, both those born to Covid-19 mothers and toddlers born to mothers who were not confirmed to have Covid-19, both of whom were the majority aged > 12 months-36 months, namely 25 (44.3%). Based on gender, the majority of respondents born to mothers with prenatal Covid-19 were male, 28 (60.9%) respondents and the majority of respondents born to mothers who were not confirmed to have Covid-19 were female, namely 24 (52.2%) respondents. Based on age at birth, the majority of respondents who were born to mothers with Covid-19 and from mothers who were not confirmed to have Covid-19 were both born at term, namely 43 (93.5%) as well as the majority of toddlers who were not confirmed to have Covid-19, the majority were born at term, namely 43 (93.5 %) of respondents. Based on the treatment room for toddlers born to mothers with Covid-19, the majority were treated in the neonate/observation room, namely 27 (58.7 %) respondents and toddlers born to mothers who were not confirmed to have Covid-19, the majority were rooming in, 44 (95.7%) respondents.

Table 4. Distribution of the Frequency of Toddlers born during the Covid-19 pandemic based on toddler development.

Toddlers born during the Covid-19 pandemic	Development					
	A Deviation Occurred		Doubtful		Appropriate	
	n	%	n	%	n	%
Toddler mother Covid -19 prenatal period	1	2.2	7	15.2	38	82.6
The mother's toddler was not confirmed for Covid-19 during the prenatal period	0	0	7	15.2	39	84.4

Table 4 shows that there were 7 (15.2%) respondents born to Covid-19 mothers who had doubtful developments, and 1(2.2%) respondent had the possibility of deviation. and respondents who were born to mothers who were not confirmed to have Covid-19, there were 7 (15.2%) respondents who experienced doubtful developments.

Table 5. Association of toddlers born to Covid-19 mothers during the prenatal period on toddler development.

Toddlers born during the Covid-19 pandemic	Development				p=values
	Doubtful + Deviations Occur		Appropriate		
	n	%	n	%	
Toddler mother Covid -19 prenatal period	8	17.4	38	82.6	0.562
The mother's toddler was not confirmed for Covid-19 during the prenatal period	7	15.2	39	84.4	

Table 5 shows the results of the statistical test using chi-square, the result is p 0.562, which means that there is no association between toddlers born to Covid-19 mothers on toddler development. The results of a study conducted in Kuwait, the majority (90%) of infants aged 10-12 months born to mothers with SARS-CoV-2 infection during pregnancy had good outcomes and only 10% showed developmental delays, and toddlers who experienced a risk of delays development is that toddlers born to mothers infected with SARS-CoV-2 during the first and second trimesters are compared to the third trimester (Ayed et al., 2022).

Infections experienced by pregnant women in the first trimester are important because these are the stages of brain development such as primary neuralation (3-4 weeks), prosencephalic development (2-3 months), and neuronal proliferation (3-4 months), occur in early stage. stage (Rashighi & Harris, 2014). Infection with several common pathogens, such as cytomegalovirus (CMV), Zika virus, Rubella virus, *Mycobacterium tuberculosis* (TB), and *Toxoplasm*, during the first and early second trimesters, increases the risk of symptomatic infants, up to 32% having neurologic manifestations (Curcio et al., 2020). In the third trimester, viral infections can cause premature birth, and pre-eclampsia with hypertension, regardless of the severity of Covid-19 (Wang et al., 2020), (Wang, et al., 2022).

Likewise, with research conducted in China (Wu et al., 2021) SARS-CoV-2 during late pregnancy does not increase the risk of developmental delays in the child 3 months after delivery. Results of a recent meta-analysis by (Pinheiro et al., 2023) stated that there is no evidence to confirm the relationship between prenatal/gestational exposure to SARS-CoV-2 and delays in child neurodevelopment that can affect child development. This is also in line with a study conducted in Spain (Vázquez et al., 2021) showing normal psychomotor

development at 6 months follow-up. This is supported by a study conducted in New York by (Shuffrey et al., 2022) There were no significant group differences between exposed and unexposed infants on any of the 5 ASQ-3 subdomain scores (communication, gross motor, fine motor, problem-solving, or social-personal skills) at 6 months of age.

The study states that children born in 2019 before the COVID-19 pandemic did not experience a decrease in developmental scores, compared to children born in 2020 at the start of the COVID-19 pandemic and in 2021 measurements of gross motor, fine motor, visual and language development were carried out. children have developmental deficiencies (Dyer, 2021). Likewise toddlers born to mothers confirmed to have COVID-19 at the age of experiencing developmental disorders in communication, gross motor, fine motor, problem-solving, and social (Shah et al., 2023) (Cheng et al., 2021).

Gestational exposure negatively impacts gross motor skills, fine motor communication, and problem-solving (Huang et al., 2021) (Pinheiro et al., 2023) . In addition, a child's developmental disorder can involve various factors such as environmental, emotional, cognitive, nerve function, and psychological emotions experienced by a mother both prenatally and postnatally which can affect parenting (Papadopoulos et al., 2022) (Soetjiningsih, & Gde Ranuh, 2022) . It can be concluded that Covid-19 can indirectly affect the development of toddlers, namely through parenting from parents, babies born with low weight, and early delivery.

According to researchers, both toddlers born to Covid-19 mothers and not both have a risk of developmental disorders, although not significantly. A child's development is inherently shaped by the environment in which they learn, grow and play. genetic factors, nutrition, and stimulation, the stress experienced by the mother during the perinatal period is a factor that supports the growth and development of the fetus and especially the brain (Soetjiningsih, & Gde Ranuh, 2022), (Provenzi et al., 2021).

Researchers assume that even though a child's development begins in the womb and the problems experienced with or without SARS-Cov-2 infection, environmental exposures related to the COVID-19 pandemic can affect developing babies and children through various factors such as the environment, stimulation, parenting style, in this study most of the mothers of toddlers did not work so they had more time with their children so that they could provide more stimulation with the children so that the researchers assumed that this was one of the good factors for the group of toddlers born to mothers with Covid-19 and the control group did not experience significant developmental delays. And according to (Miguel et al., 2019) Prenatal, peripartum, and postnatal difficulties affect child behavior and neurodevelopment. Exposure to environmental enrichment and positive influences can reverse this effect.

The development of children under five must be monitored according to their age development, especially toddlers born during a pandemic because some literature states that toddlers who are exposed to COVID-19 since in the womb are more at risk of developmental disorders, as well as toddlers who have not been exposed since birth. pregnant women with COVID-19 because they are also at risk of developing developmental disorders as studies conducted in New York, toddlers born during the COVID-19 pandemic, both exposed and not exposed to COVID-19 in the womb when compared to toddlers born before the COVID-19 pandemic, namely those born in 2018 – June 2020, toddlers born during the COVID-19 pandemic had significantly lower gross, fine motoric, and personal social development scores (Shuffrey et al., 2022)

The limitation of this study is that most of the infants born to COVID-19 mothers during the third prenatal period because they represent 95.6% of the sample, therefore our observations

cannot be translated to those born to infected mothers in the early period of pregnancy, who are theoretically more at risk.

4. CONCLUSION

Based on the results of the study, there was no significant difference between toddlers born during the COVID-19 pandemic, both those who were exposed to COVID-19 during the prenatal period and toddlers who were not exposed to COVID-19 during the prenatal period, both of whom were at risk for developmental disorders but not significantly. Toddlers who are at risk for a decrease in developmental disorders are toddlers born to COVID-19 mothers in the prenatal period, there is 1 toddler who experiences developmental deviations. studies on the effects of intrauterine exposure to SARS-CoV-2 are still developing so it is necessary to carry out prospective studies with larger samples to determine the long-term effects caused by exposure to COVID-19 in the prenatal period. It is recommended for health practitioners to monitor the development of children under five so that if health complications occur, they can be handled earlier.

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R E S E A R C H   **Open Access**

The Effectiveness of Web-Based Education Women Health (E-WoHealth) on The Level of Skills of Pregnant Women About Breast Care

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Abstract

The report from the Bone Bolango District Health Office shows that the prevalence of exclusive breastfeeding for the last 3 years has decreased, namely in 2019 by 28.3%, in 2020 by 16%, and in 2021 it has decreased by 12.7%. Many factors cause the low rate of exclusive breastfeeding in children, one of which is caused by poor knowledge about breastfeeding. Based on these problems, media is needed to increase the skills of pregnant women regarding breast care. This research aims to create a web platform called E-WoHealth which can improve pregnant women's skills regarding breast care. This research used Research and Development (R&D) methods. Then to see the difference before and after the use of Web-based E- WoHealth on the skill level of pregnant women in performing breast care using the Pre-Experimental Design (One group pretest-posttest design). This study was carried out in the working area of the Kabila Health Center, Oluhuta, Kec. Kabila, Bone Bolango Regency, Gorontalo. Population in research tian namely third-trimester pregnant women in the working area of the Kabila Health Center, Bone Bolango Regency, as many as 60. Data collection techniques, documentation, questionnaires, tests, and observations. The results showed that the results of the web-based E-WoHealth feasibility test were in the very feasible category, and the statistical test results showed that the web-based E-WoHealth was effective in increasing pregnant women's skill regarding breast care with a p-value of 0.000 ($p<0.05$). Thus, education on breast care using web-based E-WoHealth is feasible and effective in increasing the skills of pregnant women before and after the intervention. It is hoped that the health office can socialize this platform with pregnant women to raise awareness about breast care.

Keywords: E-WoHealth, Skills Mother Pregnancy, Breast Care.

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1.   INTRODUCTION

Exclusive breastfeeding can reduce the mortality rate of children under the age of five by up to 13-15%, especially in environments with middle and low incomes (Hossain et al., 2018). Children who are not exclusively breastfed are at risk of getting sick more easily, experiencing nutritional response disorders, having difficulty eating, and being vulnerable to malnutrition, which can hinder development and growth (Latifah et al., 2020). If nutritional problems are not handled properly, they can cause stunting (Raiten & Bremer, 2020). Therefore, breast care is very important for the success of exclusive breastfeeding, and must be done early (Dewi et al., 2021). Breasts need to be prepared since pregnancy so that pregnant women can provide and provide the milk their babies need (Hayati et al., 2020). Actions in caring for the breast are better carried out during pregnancy, namely the gestational age entering the third trimester and not after giving birth (Maharani et al., 2018).

In 2020, the prevalence of exclusive breastfeeding in Gorontalo will reach 25% and increase to 27% in 2021. This figure clearly shows that it is still far from the national target. The highest rate of exclusive breastfeeding in 2021 is in the city of Gorontalo at 43.6% and the lowest is in the area of Bone Bolango Regency, namely at 12.7% (Dinas Kesehatan Provinsi Gorontalo, 2021). Researchers conducted a preliminary study at the Kabila Health Center, Bone Bolango Regency in September 2022 and found that 10 pregnant women checked their pregnancies regularly, 2 pregnant women had inverted nipples, 5 pregnant women had unclean conditions on their breasts and 3 pregnant women at the level of the third trimester where colostrum is still inside. So, it can be concluded that pregnant women in the area around the Kabila Health Center cannot perform breast care properly (Dinas Kesehatan Bone Bolango, 2022).

Many factors cause the low rate of exclusive breastfeeding in children, one of which is caused by poor knowledge about breastfeeding (WHO, 2014). Lack of awareness of the importance of breastfeeding, and the benefits of breastfeeding for children and themselves (Fartaeni et al., 2018). Factor nipples that do not protrude or the wrong position in breastfeeding. Apart from these technical factors, breastfeeding is of course also influenced by food intake and the psychological state of the mother (Triana, 2017).

Expertise or the ability to do a job properly is called a skill (Wadu, Ladamay, & Dadi, 2018). Lack of skills is the reason women who are pregnant are reluctant to care for their breasts (Septikasari, 2018). According to research Sutama, Arifin, and Yuliana, (2020) lack of skills includes low understanding, lack of explanation and direction, and inactivity in health briefing and guidance activities related to breast care (Sulistyowati et al., 2017). The forms of counseling that have been carried out so far related to breast care are using leaflets, breast phantom media, booklets, and lectures (Elis et al., 2021), (Gustirini, 2021).

The E-Module used in this study is defined as a web-based E-Module. This type of E-Module is said to be a module that is designed, implemented, and used by utilizing web media, which provides various information for pregnant women about breast care and is called E-WoHealth. E-WoHealth stands for Education Women Health which is a resource or study guide in electronic form on a website that contains animated videos and material about breast care in pregnant women. According to the studies conducted (Daeng et al., 2017) discussed how successful cell phones are in supporting activities and tracking changes in information that is already available. Using a computer or smartphone to display text, photos, graphics, music, animation, and video, e-module media is used as a learning tool in breast care health education (Pasili,Widyastutik & Rohmatika, 2019). Compared to printed modules, E-Modules facilitate navigation, allowing researchers to load or display materials, images, audio, and animated videos about breast care and are equipped with tests or quizzes so that pregnant women can understand, know and be able to perform breast care techniques (Pasili,Widyastutik & Rohmatika, 2019).

Based on the characteristics and advantages of the media, a medium that is quite effective for increasing knowledge is the use of health e-modules (Rofi'ah & Widatiningsih, 2021). E-Modules are learning media packaged in digital or electronic formats (Purwaningsih et al., 2022). The E-Module is equipped with instructions that can be filled with various materials and animated videos (Sidiq et al., 2021) The use of E-Modules as a media for counseling can stimulate one's thoughts, attention, and willingness to improve skills (Jaenudin et al., 2017). The e-module used in this study is a web-based module called E-WoHealth. E-WoHealth stands for "Education Women Health" and is an electronic learning resource in the form of a website that contains animated videos and material about breast care in pregnant women This platform includes many standard learning platforms used in the medical world because it is based on Chamilo. In addition, this platform is also responsive because it can be opened from any gadget. Pregnant women will be given account access to be able to study videos and materials as well as test their ability of pregnant women before and after online learning. This study aims to design and produce a web-based E-WoHealth in order to improve the skills of pregnant women regarding breast care.

2.   RESEARCH METHOD

This study uses the Quantitative Research and Development (R&D) method, which is a research method that is still in the process of being developed, then to see the difference before and after use. After that, using the Experimental Design research design (one group pretest-posttest design) to evaluate the level of skills of pregnant women before or after using Web-based E-Modules for breast care. The following is the step-by-step process that Borg and Gall went through in terms of strengthening or perfecting their research method, such: 1). Analysis of educational media needs related to breast care, 2). Educational media development design, 3). Educational media development, 4). Expert validation, 5). One-way test one, 6). Small group test, 7). Large group test, 8). The final product of educational media (Baso, 2018).

The Pre-experimental Design method uses the type of design used by One Group Pretest-Postest Design, namely conducting a pretest to determine the initial status of the subject before treatment so that researchers can determine the status of the subject before or after treatment, compare results or see changes (Sugiyono, 2020). This study was conducted in the working area of the Kabila Health Center, Oluhuta, Kec. Kabila, Bone Bolango Regency, Gorontalo.

The time when study was carried out for 2 (two) months was in December 2022 and ended in February 2023. Based on statistical data, the population in this study consisted of 60 pregnant women in their third trimester and lived in the area served. by the Kabila Health Center, Bone Bolango Regency, which was obtained by the author when carrying out pre-research, namely the month of October 2022, the number of which was estimated from the register of pregnant women.

1. Research Sample Researchers will select a small portion of the total number of people and then group them based on certain criteria. This research sample can be described as 1. Sample needs analysis In development research activities, needs analysis is first carried out. In this activity, the researcher interviewed 10 pregnant women to obtain information about the research to be carried out so that the research problem in this case could be clarified.

2. Samples for web-based E-WoHealth media design validation a) IT expert The purpose of this study is to increase the knowledge or ability of pregnant women regarding breast care by utilizing two people who are specialists in the field of information technology. Those who are said to be "IT experts" are lecturers whose authority is recognized in their respective fields of information technology. The assessment focuses on the adequacy of the quality of

web-based media for use in third-trimester pregnant women. In addition, the IT expert's assessment also focuses on media packaging materials that meet the eligibility criteria and provides suggestions for improvements regarding the product. b) Material Expert To validate the contents of this product material, the researcher has two material experts. Material experts defined in this study are experts in related materials. Material experts will assess the material arranged in the media. Evaluation does not only refer to the components of the material, but assesses the systematics and organization in presenting the material. In addition to evaluation, material experts also provide information in the form of suggestions for improving the presentation of the material.

3. Samples for web-based E-WoHealth media design trials, namely:
   1) One-on-one Trial Samples A one-on-one trial was conducted on two graduate midwifery students at Hasanuddin University
   2) Sample Small Group Trial In a small group experiment conducted on 10 pregnant women at the Tapa Bone Bolango Health Center;
   3) Large Group Trial Sample In a large group experiment conducted on 30 pregnant women at the Suwawa Bone Bolango Health Center

4. Sampling Techniques. The sampling method used in this study is said to be complete sampling, this is because the number of samples obtained is similar to the number of the population studied (Arikunto, 2014).

During this study, a total of 60 people acted as participants, the sample was taken because it was in accordance with predetermined criteria in the study. And, in this study, we used ethical approval.

3. RESULTS AND DISCUSSION

The following shows the results of the development of web-based women's health education (e-wohealth) on the skill level of pregnant women regarding breast care at the Kabila Bone Bolango Health Center.

Figure 1. Initial Web Display

Information:

a. *Home Page* is the first page that appears when we access a website. Serves as a gateway for visitors to access the content available on the website.

b. *User name* is the name or identity used by the user to be able to access *E-WoHealth* , *the user* used by the respondent is the email of each respondent.

c. *Password* is the password used to access *E-WoHealth* after entering the *user name.*
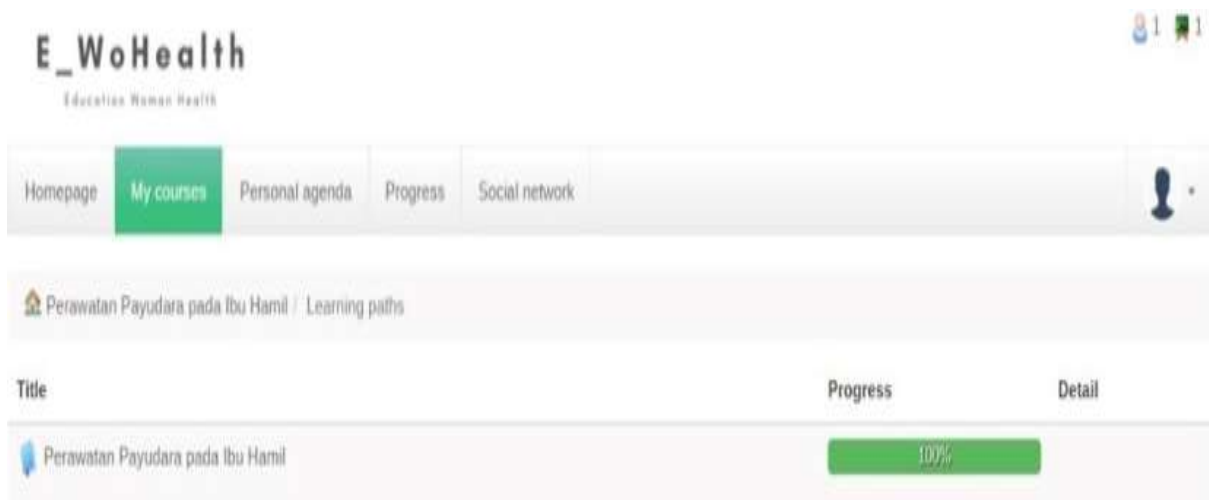
Figure 2. Content on the Web.

Information:

a. List of *My courses* is a page that contains *learning path* .

b. *Learning Path* is *an icon* that contains about breast care in pregnant women .
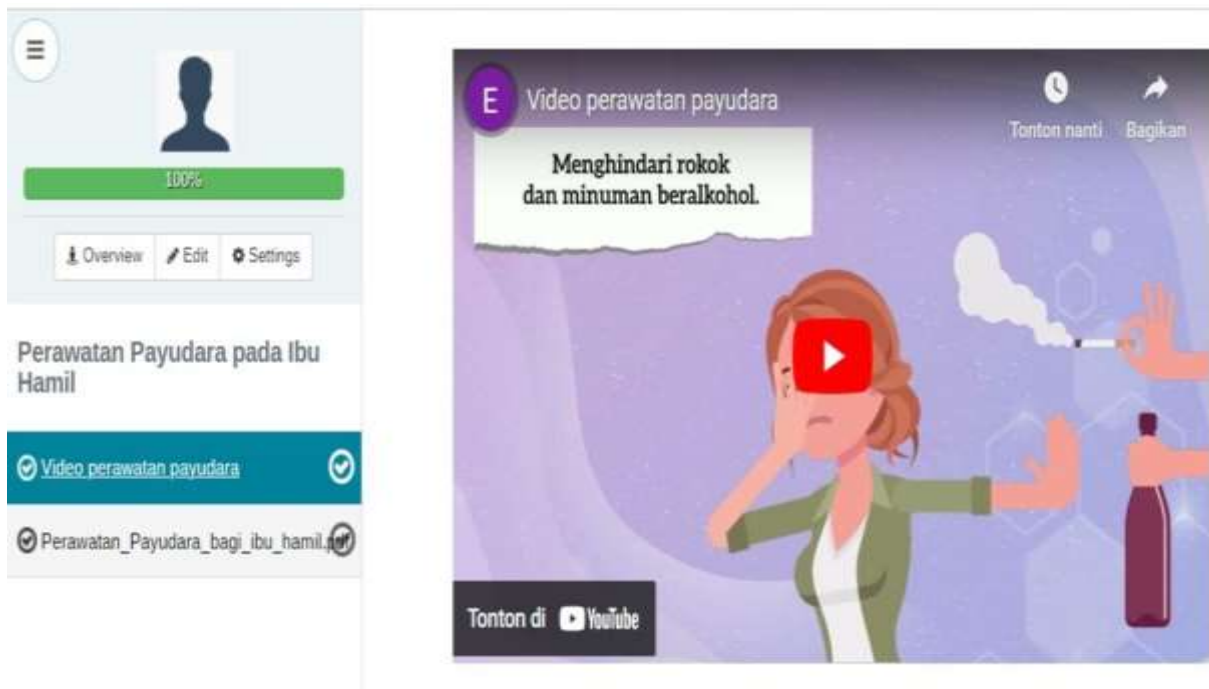
Figure 3. Display of Video Content and Educational Materials.

Information

a. If the video and educational material have been watched and read, the display of the video and educational material will be checked.

b. If videos and educational materials are not read and not watched until they are finished, the display of videos and educational materials will not be checked .
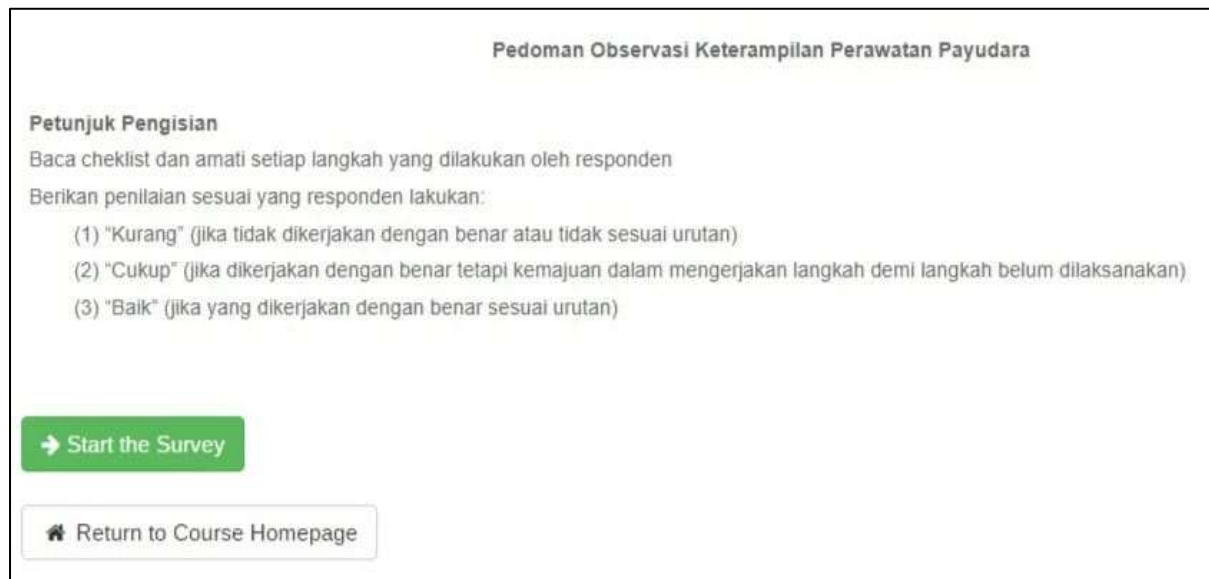
Figure 4. Display Skills.

Information
a. After the respondent watched the video and read the educational video material, it was carried out evaluation assessed skills by researcher .
b. The researcher clicked *start the survey* then will appear *checklist* evaluation breast care skills which contains 10 skills about maintenance breast of mother pregnant .
c. After all the steps are done (*pre test* skills , watching videos , reading educational and assessment materials *post-test* skills) you will see a 100% progress display , but if one of the stages is skipped, the progress does not reach 100%.

a) Product Validation by Experts

The web-based learning model for pregnant women's breast care has gone through a validation test conducted by experts to determine whether it is appropriate or not. The expert exam is carried out by submitting initial drafts in the form of educational modules or films as well as web-based E-WoHealth which are then evaluated by each expert based on validation instruments provided by the BSNP (National Education Standards Agency). Both quantitative and qualitative data forms were included in the research conducted to build a web-based breast care teaching model for pregnant women. In the online model, quantitative data is provided in the form of validation questionnaire findings filled out by material experts or media experts. The criteria for evaluating and making decisions about the web model are as follows:
1. Value 80.00% -100%   : Very Worthy
2. Mark 70.00%-79.99%   : Decent
3. Value 60.00% -69.99% : Enough Worthy
4. Value 50.00% -59.99% : Insufficient Worthy
5. Value 0% -49, 99 %   : Very No Worthy

The criteria for feasible and very feasible indicate that web-based *E-WoHealth* is feasible to use with or without revision, while the criteria for sufficient and insufficient indicate that web-based E-WoHealth is not feasible and must be revised. The qualitative data, it consists of input or suggestions provided by material experts and media experts on the web model being developed. The data will be presented in the form of an implementation of the validation results of the material expert and media expert tests on web-based E-WoHealth:

a) Material Expert

A validation test was conducted to determine the feasibility of breast care education using the developed Web-based E-WoHealth.
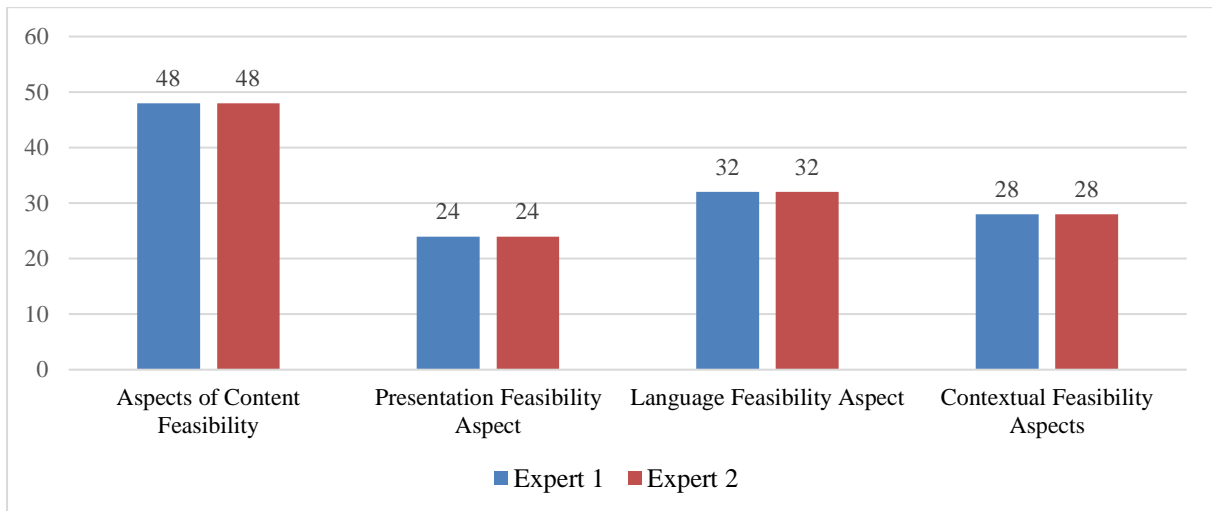
Figure 5. Graph of material expert test results on breast care education using web-based E-WoHealth for pregnant women

The results of the validation of material experts on breast care education using web-based E-WoHealth for pregnant women show that of the 2 experts involved, a total of 132 (100%) aspects of the appropriateness of the content, presentation, language, and context of E-WoHealth are categorized as very feasible. Therefore, no revision is needed and the E-WoHealth web can be used properly.

b) Media Expert

Two experts conducted a validation test on breast care education using the developed web-based E-WoHealth. Validation is carried out to evaluate the appropriateness of the content, presentation, language, and context of the material. After being tested, the validation results show that E-WoHealth is feasible to use without revision because it meets the set criteria.
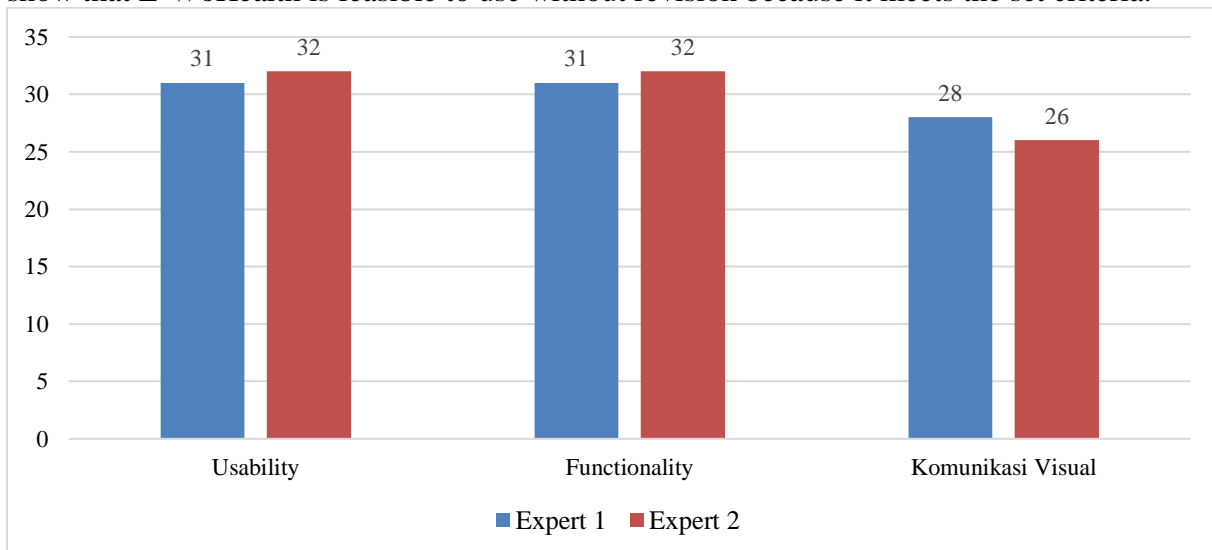
Figure 6. Graph of media expert test results on breast care education using web-based E-WoHealth for pregnant women.

Expert validation data shows that breast Care education using *Web-* based *E-WoHealth* for pregnant women is very feasible, with a total of 90 (98%) from 2 media *experts* involved in the study. The content, presentation, language & contextual feasibility of *the E-WoHealth web* has been assessed as very appropriate, so it does not require revision.

1)   E-WoHealth Trial

This study obtained the results that web-based breast care education for pregnant women is feasible to use and has the potential to be developed in improving the skills of pregnant women. The trial results are described as follows:

a)   Small Group

Prior to its widespread use, a small group trial was conducted using the Technology Acceptance Model (TAM) instrument to understand the general description of the web. A small group trial was conducted on 10 pregnant women with the same characteristics Here is an overview of the website.

Table 1 . Small Group Web Trial Results (n= 10)

| Aspect	Min	Max	Means	SD
convenience Use	4.00	5.00	4.55	0.31
Benefit Application	3.33	5.00	4.50	0.55
Attitude	4.00	5.00	4.20	0.31
Desire	3.00	5.00	4.20	0.59
Awareness User	4.00	5.00	4.25	0.35

Table 1 shows the ease of use, the average respondent's answer: 4.55, indicates agreement that using the web is easy. Meanwhile, in the aspect of application benefits, the average respondent's answer: 4.50, respondents agree that the web has benefits. In the attitude aspect, the average respondent's answer: 4.20, indicates agreement on the use of the web . In the desire aspect, the average respondent: 4.20, indicates the respondent's desire to use the web . In the aspect of user awareness, the average respondent's answer: 4.25, means that the respondent is aware of using the web.

b)   Big Group

Before using the web, a large group trial was conducted using the *TAM* instrument to provide an overview of the web . The trial was conducted on 30 pregnant women with almost the same characteristics as the study sample. The characteristics is good to web overview is as follows:

Table 2. Small Group Web Trial Results (n = 30)

Aspect	Min	Max	Means	SD
convenience Use	3.75	5.00	4.4 2	0.46
Benefit Application	3.67	5.00	4.4 7	0.52
Attitude	4.00	5.00	4.43	0.47
Desire	4.00	5.00	4.28	0.45
Awareness User	4.00	5.00	4.4 2	0.46

Table 2 shows ease of use, respondents gave an average of 4.42, that the web is easy to use. While the aspects of the benefits of the application get an average 4.47, that the web is useful. In the attitude aspect, the average respondent is 4.43, respondents agree with the existence of the web . In the aspect of desire, the average respondent's answer is 4.2 8 ,

respondents who want to agree to use the web . In the aspect of user awareness, the average respondent's answer is 4. 42, respondents consciously agree with the existence of the web .

Table 3. Distribution of Respondents by Age

Age	f	%
< 17 years	1	2%
17 - 25 Years	21	35%
26 - 35 Years	33	55%
36 - 45 Years	5	8%
46 - 55 Years	0	0%
> 55 Years	0	0%
Amount	60	100%

Table 3 shows that the majority of the 60 respondents are aged 26-35 years, namely 33 respondents (55%). Respondents 17-25 years, 21 respondents (35%). 5 respondents (8%) aged 36-45 years, and only 1 respondent (2%) aged <17 years. In this experiment, we didn't use the gestational age.

Table 4. Distribution of Respondents by Number Child.

Amount Child	f	%
Pregnancy first	19	32%
1 child	24	40%
2 children	15	25%
3 children	2	3%
Amount	60	100%

Table 4 shows that out of a total of 60 respondents, most of them had one child as many as 24 respondents (40%). 19 respondents (32%) were in their first pregnancy, 15 respondents (25%) had 2 children, and only 2 respondents (3%) had 3 children.

Table 5. Distribution of Respondents Based on Education Final

Education Final	f	%
No School	1	2%
SD	5	8%
Junior High School	9	15%
Senior High School	29	48%
Bachelor	16	27%
Amount	60	100%

Table 5 shows from 60 respondents, most of whom had a high school education background: 29 respondents (48%), followed by respondents with a bachelor's degree: 16 respondents (27%), respondents with a junior high school education background: 9 respondents (15%), respondents with an elementary education background: 5 respondents (8%) and one respondent had no educational background (2%).

Table 6. Distribution of Respondents by Occupation

Work	f	%
Mother House Ladder	53	88%
Farmers / Traders	0	0%
Employee Private	4	7%
civil servant	3	5%
Amount	60	100%

Table 6 shows that out of 60 respondents, most have the status of housewives, namely 53 respondents (88%). While the rest work as private employees: 4 respondents (7%) and civil servants: 3 respondents (5%).

Table 7. Effectiveness of web - based E-WoHealth on the skill level of pregnant women regarding breast care (n = 60).

	Mean ± SD	Difference Average Rating	p-value
Pre-Test	46.50 ± 6.36	37.06	0.000
Post-Test	83.56 ± 6.91		

Table 7 shows happen change level skills mother get pregnant seen from difference average pre-test 46.50 with standard deviation 6.36 & post-test 83.56 with standard deviation 6.91. Besides that is the p-value obtained from test statistic 0.000 (P <0.05), H0 is rejected . There are difference significant between skills mother pregnant before & after given E-WoHealth Education based web about maintenance breast at the Kabila Bone Bolango Health Center .

Skills are individual abilities that are influenced by education and training to apply the knowledge gained in the form of behavior (Fiantika & Sugesti, 2021). The amount of expertise that a person has achieved in various activities is considered a skill that describes his level of expertise (Jauhari & Hasibuan, 2022).

In this study, it was found that there was a difference in the skills of pregnant women before and after being given web-based breast care education media. There was an increase in the skill score of pregnant women before the intervention of 46.50 and after the intervention was 83.56, so the skills variable increased by 37.06. The results of the analysis obtained a p-value of 0.000 <0.05, it can be concluded that web-based breast care education media is significant in increasing the skills of pregnant women, which means that web-based E-WoHealth is effective in increasing the skills of pregnant women about breast care.

It has been proven to be able to increase the ability of pregnant women, meaning that this website is considered better, more appropriate, and more successful as an educational medium. The implication of this study is to help students understand breast care, and it has also been shown to be able to do so. Due to the existence of health education can play a role in changing the attitudes of people, groups, and society so that they are more in line with health ideals. The anticipated shift in mindset will enable maintenance or improvement of health, as well as prevention of the dangers of stunting in children through routine and adequate breast care.

Therefore, educational interventions in the form of E-WoHealth which are delivered via the internet also focus on education on breast care for pregnant women which has the potential to have a good impact and succeed in increasing knowledge and skills related to breast care for pregnant women. Professional health care should not only be oriented towards health problems among groups of pregnant women, but should also be supported to be implemented in all posyandu and puskesmas so that breast care is carried out properly and increases exclusive breastfeeding and prevents stunting in children.

Research conducted by (Lisa & Putri, 2019)showed a significant increase in breast care skills in third trimester pregnant women after being given a demonstration with p=0.000. Another study conducted by (Ningsih, Sri, 2021)also showed that counseling on breast care using communicative techniques was effective on knowledge and skills on related issues. These studies imply that health education via the web can help change attitudes of individuals and communities to maintain health and prevent the risk of stunting in children with good and routine breast care.

Web-based E-WoHealth educational interventions for breast care education for pregnant women can have a positive impact and effectively increase skills on related issues. Professional health care should not only be oriented towards health problems among groups of pregnant women, but should also be supported to be implemented in all posyandu and puskesmas so that breast care is carried out properly and increases exclusive breastfeeding and prevents stunting in children.

4. CONCLUSION

Based on the results of research and data analysis that has been done about Education Women Health (E-wohealth) is web-based, the conclusions that can be drawn are the Web-based E-wohealth educational model is appropriate and valid to educate pregnant women on breast care at the Kabila Bone Bolango Health Center. Then, Web-based E-WoHealth is effective in increasing the skills of pregnant women regarding breast care at the Kabila Bone Bolango Health Center. For the next experiment it may be needed to took the sample about gestational age to known relatedness one to another.

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R E S E A R C H   Open Access

The Effectiveness of Web-Based E-WoHealth on Compliance with Consumption of Iron Tablets in Young Women

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Abstract

Utilization of technological media in the field of education and health can increase public knowledge in efforts to prevent anemia, especially in young women. One of the efforts to prevent anemia and increase adherence to taking iron tablets is by using Web-based educational media (E-WoHealth) about iron tablets supplemented with a tablet supplement consumption control card. This research aims to develop Web-based E-WoHealth media and its effect on the level of adherence to the consumption of blood supplement tablets. This study used the Research and development (R&D) method with the Borg & Gall development model and the Pre-experimental Design quantitative method using the One Group Pretest-Postest approach. The sample in this study was 80 girls in grades VII and VIII of SMP Negeri 11 Gorontalo City, determined by purposive sampling technique. Statistical tests used the McNemar test and the Chi-Square test. The results of the McNemar test showed differences in the measurement results before and after being given the Web-based E-WoHealth media with a p-value of 0.000 <0.05 meaning that the Web-based E-WoHealth media was effective in increasing adherence to consumption of iron supplement tablets (TTD) in class VII and class VIII girls and the results of the Chi-Square P-Value test were 0.822 > 0.05 meaning that there was no difference in adherence between class VII and VII girls. This study recommends the application of WEB-based E-WoHealth media equipped with an iron supplement control card to increase adherence and monitor iron supplement consumption.

Keywords: Educational Media, Website, Blood Supplement Tablets, Young Women, Obedience.

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1. INTRODUCTION

Anemia is a serious health problem in the world, especially in children, pregnant women, and young women (Andriastuti et al., 2020). Globally, the prevalence of anemia according to *the World Health Organization* (WHO) in 2019, anemia in women of childbearing age is 29.9%, and as much as 36.5% in pregnant women (World Health Organization, 2021). In the African and Southeast Asian regions the prevalence of anemia in women of childbearing age is reported to be more than 35% (Dubik et al., 2019; WHO, 2018). The results of the 2018 RISKESDAS showed an increase in the number of cases of anemia in pregnant women by 48.9% compared to 2013, which was 37.1% of cases. This is due to the high incidence of anemia in young women, which is 25%, and in women of childbearing age, 17% (Amir & Djokosujono, 2019; Kementerian Kesehatan Republik Indonesia, 2018).

In young women, iron deficiency anemia can reduce endurance, concentration, enthusiasm for learning, and academic abilities which can hinder progress at school and can cause them to drop out of school (Dubik et al., 2019). In the future, it can increase pregnancy complications, such as impaired fetal growth, low birth weight, premature birth, and neonatal death as well as high morbidity and mortality rates (Gosdin, et al., 2022; World Health Organization, 2023). Adolescent girls are the next generation of the nation, so a fast and appropriate handling of the problem of anemia deficiency in adolescents is needed. WHO at the 65th *World Health Assembly* (WHA) agreed to reduce the anemia rate by 50% from the prevalence of anemia in women of childbearing age in 2025 (WHO, 2018). Based on this commitment, the Indonesian government provides a policy of administering 1 tablet of iron supplement per week throughout the year, for the prevention and treatment of iron deficiency anemia (Madestria et al., 2021).

Studies conducted in several regions in India revealed that weekly supplementation of iron and folic acid was effective in reducing anemia (Shah et al., 2016) (Abu-Ouf, 2015; Vir, et al., 2008). Providing iron and folic acid supplements during adolescence and continuing into adulthood improves iron status, and reduces the risk of iron deficiency anemia (Ghana Health Service, 2017; Sajna & Jacob, 2017; Dhikale, et al., 2015).

Data from the 2018 RISKESDAS, Gorontalo Province, young women aged 10-19 years who received iron supplement tablets were 78.4%, and at school 74.9% with the coverage obtained and drunk less than 52 tablets as much as 100% (Kementerian Kesehatan Republik Indonesia, 2018). This is caused for several reasons such as bad taste and smell, forgetting, feeling unnecessary, nausea, and vomiting (Harding et al., 2017). Indonesia's health profile, Gorontalo Province in the last 3 years has seen a decline in the coverage of giving iron tablets to young women, namely in 2019 as much as 58.3%, in 2020 16.4%, and in 2021 Gorontalo Province ranks 2nd lowest, namely 2.3 %. Likewise, in the city of Gorontalo, the coverage of iron tablets in young women in 2019 was 15.1% and decreased in 2021, namely 15.2%. (Kementerian Kesehatan Republik Indonesia, 2021; Kementerian Kesehatan Republik Indonesia, 2022).

The East City Health Center is one of the Health Centers with low achievement in administering blood-added tablets in Gorontalo City. One of the working areas of the Kota Timur Health Center is SMP Negeri 11 Kota Gorontalo. The initial survey was conducted randomly on 10 students in classes VII and VIII who were given questions regarding knowledge and adherence to taking iron supplement tablets. The average knowledge and adherence to consuming blood supplement tablets for female students were still low. The results of cross-sectoral joint FGDs (school heads, teachers, health center nutrition officers,

and health promotion officers) provided education to young women, namely by counseling using the lecture method and using flipchart media.

Many factors cause the low coverage of blood supplement tablet consumption, among them caused by a lack of knowledge about the benefits of blood supplement tablets (Sitohang et al., 2022). Knowledge is closely related to the behavior of young women to consume iron tablets (Dubik et al., 2019). Efforts to increase adherence to blood supplement consumption in young women are through health education using the media as an educational tool. The media plays an important role in determining the success of the message transmission process. The selection of the right media supports the success of the process of conveying messages to the public (Rumiyati et al., 2018). The implementation of health education is inseparable from the media because the health messages to be conveyed are more interesting, and easy to understand, making it easier for the target to receive the messages conveyed (Jatmika et al., 2019)

In the current era of globalization, technological developments are increasingly advanced and the use of *smartphones* is increasing. Smartphones as a medium of communication technology have a fairly important role in human life, one of which is teenagers who are currently having a hard time getting away from using gadgets (Sudiarto et al., 2019). The use of technological media in the fields of education and health can increase the knowledge of students and the community to be more actively involved with the content and media provided (Logan et al., 2021). Therefore we need an information system that can help adolescents to get access to information about blood supplement tablets which can be accessed via smartphones and desktops that do not require qualifications or certain types of smartphones and can be reached by everyone (Herliah et al., 2022)

This media is designed in the form of website-based educational media (E-WoHealth) regarding anemia tablets which are interactive, and equipped with animated video material, discussion forums, and control cards for monitoring anemia tablets. This is what distinguishes it from previous research. This research aims to develop Web-based E-WoHealth media and its effect on the level of adherence to the consumption of blood supplement tablets.

2.   RESEARCH METHOD

This study uses the Research and development (R&D) method with the Borg and Gall development model by designing E-WoHealth media according to needs, and expert validation tests are carried out, then user trials are carried out before the product is used to research respondents. And the Pre-experimental Design method is to find out the condition of the subject before and after being treated and then the results can be compared or seen the changes. Data analysis was performed using the McNemar and Chi-Square tests

samples were 2 material experts and 2 media experts, the *Technology Acceptance Model* (TAM) trial sample was in a small group of 10 young women and a large group of 30 young women at SMPN 12 Kota Gorontalo. This research was carried out at SMPN 11 Gorontalo City from December 2022 – February 2023. The sample in this study was girls in grades VII and VIII. With the inclusion criteria, willingness to be a respondent, and having a smartphone and laptop, the exclusion criteria were not present during the study, and had not menstruated. The sampling technique was *purposive sampling* with a total sample of 80 young women (36 Class VII and 44 Class VIII). Has received an ethical recommendation from the ethical committee of the Faculty of Public Health, the University of Hasanuddin Makassar with number 14731/UN4.14.1/TP.01.02/2022.

Before the researchers intervened, the researchers gave informed consent to the young women and provided socialization on how to use Web-based E-WoHealth media. The pre-test used a questionnaire contained in the WEB-based E-WoHealth media and was then given an intervention to watch animated videos on the Web 2 times a week for 4 weeks after that a post-test was carried out. And to see adherence to consumption of iron tablets for 4 weeks monitored

using a control card that is on the Web. With compliance criteria if consuming 4 tablets of anemia and disobedience if less than 4 tablets by checking the control card provided on the Web.

3.   RESULTS AND DISCUSSION

Figure 1. Display of Web-based E-WoHealth media content.

Appearance 1. Display of animated video material
1. After the respondent has filled out all *the pretests*, the educational video material icon will appear.
2. If the educational video material has been watched, the display of the educational video is checked.
3. If the animated video is not watched until it's finished, the animated video display will not be checked.

Figure 2. Display of Web-based blood supplement tablet control card
Appearance 2 is a display of the iron tablet control card on the Web which is used to monitor adherence to iron blood tablet consumption.

Graph 1. Material expert validation results in Web-based E-WoHealth media

Graph 1 shows the results of validation by 2 experts (A lecturer of nutrition at the Faculty of Public Health, University of Hasanuddin Makassar, and a Nutrition Lecturer at the Manado Ministry of Health Polytechnic) obtained an average value of 3.85, which means Web-based E-WoHealth is feasible to develop and use as an educational medium (Nurhayati, 2019).
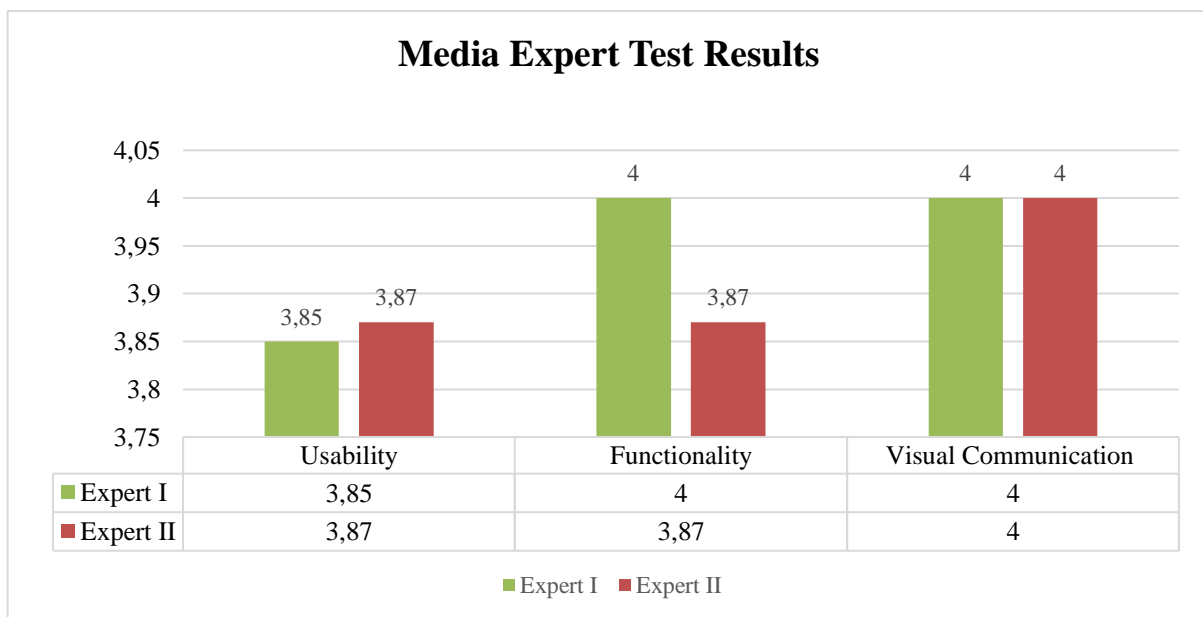
Graph 2. Results of expert validation of the Web-based E-WoHealth media model

Graph 2 shows the results of validation by 2 media experts (Head of a learning technology development laboratory at Hasanuddin University and Lecturer at the Faculty of Computer Science at the Indonesian Muslim University) with an average score of 3.91, which means that Web-based E-WoHealth media is feasible to develop and use as an educational medium (Nurhayati, 2019).

Table 1. Small group Web trial results (n=10).

Aspect	N	Min	Max	Means	SD
Web convenience	10	3.00	5.00	4.58	0.549
Web Benefits	10	4.00	5.00	4.67	0.479
We Trust	10	4.00	5.00	4.62	0.490
User Attitude	10	4.00	5.00	4.75	0.444
Valid N (listwise)	10				

Table 1 shows perceptions of convenience with an average respondent score of 4.58, an average benefit value of 4.67, an average trust value of 4.62, and an average user attitude value of 4.75. From the overall average results of small group trials, it can be concluded that Web-based E-WoHealth media about blood supplement tablets is feasible to be tested on respondents with a larger group (Arianggara et al., 2021; Divayana et al., 2016).

Table 2. Results of the large group Web trial (n=30).

Aspect	N	Min	Max	Means	SD
Web convenience	30	3.00	5.00	4.54	0.607
Web Benefits	30	3.00	5.00	4.53	0.545
Web Trust	30	3.00	5.00	4.38	0.564
User Attitude	30	3.00	5.00	4.57	0.533
Valid N (listwise)	30				

Table 2 shows the average value of respondents' answers about convenience is 4.54, the average value of benefits is 4.53, the average value of trust is 4.38 and the average value of attitudes is 4.57 which means that E-WoHealth media is based on The web is in a very good category and is suitable for use as an educational medium about iron tablets (Januarysman & Ghufron, 2016).

Table 3. Characteristics of Respondents (n=80).

	Class			
Characteristics	**VII**		**VIII**	
	n (36)	**Percentage (%)**	**n (44)**	**Percentage (%)**
Age				
12 years old	19	52,8	1	2,3
13 years old	17	47,2	18	40,9
14 years	-	-	25	56,8
Parent Education				
Father				
Low (SD)	9	25	20	45.5
Intermediate (junior high school)	25	69,4	24	54.5
High (College)	2	5,6	0	0
Mother				
Low (SD)	10	27,8	18	40,9
Intermediate (junior high school)	21	58,3	25	56,8

Table 3. Characteristics of respondents according to age in class VII, most of the respondents were 12 years old, 52.8%, and in class VIII, the majority of respondents were 14

years old, 56.8% of respondents. The last education of the respondent's fathers in class VII and class VIII was the majority with secondary education, 69.4%, and only 5.6% of the respondent's fathers in class VII had higher education. In class VII respondents, most of them had secondary education, 58.3%, while the respondents in class VIII, most of them had low education, 40.9%.

Table 4 . Frequency Distribution of Respondents Based on Compliance.

Class	Variable	Web-Based E-WoHealth Media			
		Pre Test		Posttest	
		n	%	n	%
	Obedience				
VII	Not obey	36	100	15	41.7
	obey	0	0	21	58,3
Total		36	100	36	100
VIII	Not obey	44	100	17	38,6
	obey	0	0	27	61,4
Total		44	100	44	100

Table 4 shows that there was a change in compliance in classes VII and VIII in the Pre-Test assessment, the results obtained were that all respondents were 100% disobedient in consuming iron supplement tablets and after being given Web-based E-WoHealth media intervention and monitored from the control card, there was a change in class VII category. obedient 58.3% (n=21) and class VIII obedient category 61.4% (n=27).

Table 5. Effect of Web-Based E-WoHealth Media Against Compliance with Consumption of iron supplement tablets for female adolescents.

Class		n	%	Negative Rank	Positive Rating	Ties	p-value
VII	Pretest Posttest	36	100	0	21	15	0.000
VIII	Pretest Posttest	44	100	0	27	17	0.000

McNemar

Table 5 shows the influence of Web-based E-WoHealth media on adherence to the consumption of iron supplement tablets in class VII young women with an increase in 21 obedient respondents and class VIII respondents with an increase in 27 obedient respondents with a p-value of 0.000 <0.05.

Table 6. Differences in adherence to taking blood supplement tablets for class VII and VIII girls after being given the Web-Based E-WoHealth intervention.

Class	Obedience				Total	p-value
	Obey		Not obey			
	n	%	n	%		
VII	21	58,3	15	41.7	36	0.822
VIII	27	61,4	17	38,6	44	

Table 6 shows that in class VII respondents who had adherence to taking iron tablets as much as 58.3% (n=21) while in class VIII respondents there were 61.4% (n=27) of respondents who were obedient in consuming iron tablets. The results of the comparative analysis between class VII and class VIII obtained a p-value of 0.822 > 0.05

The graphs and tables show that the results of the validation tests of the two material experts and media experts obtained an average value of 3.85 and 3.93. This means that the

material presented and the media used are included in the very good category so that the material and media can be used with or without revision. The overall results obtained are in line with research conducted by Nurhayati, (2019) which found that the development of print modules for the first 1000 days of life is very good/feasible and can be used without revision. The test results used the *Technology Acceptance Model* (TAM) questionnaire in Tables 1 and 2 which consisted of the components of ease of use, benefits, trust, and user attitudes in the very good/proper category (Rahayu, Budiyanto, & Palyama, 2017). Several studies state that the application of the TAM model aims to measure the level of user understanding and acceptance of information technology innovations and whether a system will be useful and easy to use (Arianggara et al., 2021; Divayana et al., 2016) the results of the feasibility test of small groups and large groups with a value of x > 4.21, it means that E-WoHealth media is suitable for use as an educational medium (Januarysman & Ghufron, 2016).

Women's health education media (E-WoHealth) about blood supplement tablets equipped with tablet supplement consumption control cards is an interactive multimedia technology-based educational media that can display material in the form of text, video, animation, and sound, equipped with discussion forums and control cards blood supplement tablets which are presented in digital form, can be accessed through a browser that can be used on various smartphone and desktop devices.

The number of respondents in this study was 80 young women consisting of 36 young women in class VII and 44 young women in class VIII. in class VII and class VIII, the average age range is 12-14 years. This age is the early and middle stages of adolescence which is a transitional period between childhood and adulthood that is characterized by rapid growth and development. During this period cognitive development occurs in adolescents, including changes in mental abilities such as learning, memory, reasoning, thinking, and language. Teenagers begin to have the capacity to acquire and use knowledge efficiently. They reach their peak because the growth of the brain reaches perfection. The nervous system that functions to process information develops rapidly. During this period, it is important to provide adequate information about reproductive health, one of which is to prevent anemia in adolescence by consuming iron tablets.

The highest education of parents of class VII and class VIII respondents is the majority of secondary education. only 5.6% of respondents' fathers in class VII have tertiary education. And of class VII respondents' mothers, most of them had secondary education, 58.3%, while the mothers of class VIII respondents had almost a low level of education, 40.9%. Parents' educational level is one of the factors that influence knowledge. A high level of education will make it easier for someone to gain knowledge and information, one of which is health information which can be used as a reference for providing information to their children (Perdana et al., 2017).

Compliance is a condition that arises and is formed through a process of behavior that shows the values of obedience, loyalty, and order. Attitudes or actions taken are no longer or are not felt as a burden at all, on the contrary, it will burden him if he cannot act as usual (Iqbal et al., 2016). Compliance in this study is defined as the obedient attitude of female adolescents in consuming blood-supplementing tablets regularly (1 tablet a week) by the 2018 circular of the Ministry of Health of the Republic of Indonesia concerning the administration of blood-supplementing tablets to female adolescents and women of childbearing age (Kementerian Kesehatan Republik Indonesia, 2018). Compliance assessment by looking at the control cards in the Web-Based E-WoHealth media is carried out for 1 month (4 weeks).

In this study, it was found that there were differences in the compliance results of female adolescents before and after being given Web-based E-WoHealth media. Those who were monitored for 1 month (4 weeks) by consuming 4 iron tablets were then monitored using a control card that had been provided on the Web media.

This finding is in line with the results of Perdana et al., (2017) which stated that Android-based nutritional education media and websites were effective in increasing knowledge, attitudes, and practices of balanced nutrition in elementary school students. The results of the study Kementerian Kesehatan Republik Indonesia, (2021) stated that there was an effect of using oral birth control medication applications with a p-value = 0.000. This application is an Android application that can always be carried out. However, previous respondents had to download and install it first on their respective *smartphones which needed storage space.* (Princess & Hasanah, 2021) . Meanwhile, E-WoHealth media can be accessed via a browser on various devices and does not require storage space, making it easier for young women to access the material.

Table 6 shows the differences in the obedience results of class VII and class VIII adolescent girls after being given the Web-Based E-WoHealth media intervention using the Chi-Square test showed a P-value of $0.822 > 0.05$ meaning that there was no significant difference between class VII and class VIII girls. Compliance with the consumption of blood-boosting tablets apart from being given interesting and interactive educational media, individual factors (intentions and behavior), and external factors such as the role of teachers, parents, peers, and the community is very influential (Shah et al., 2016). Adolescents are an age group that in their psychological development requires support from the surrounding environment to grow and achieve the best performance (Silitonga et al., 2023).

Based on the results of the analysis, the researchers concluded that the application of Web-based blood tablets (E-WoHealth) educational media that can be accessed via a browser on various devices makes it easier for young women to access material, study, and fill out control cards anywhere and anytime. And it is proven to be able to increase the adherence of young women in consuming blood-adding tablets as recommended even though there are still young women who are not obedient in consuming blood-adding tablets.

Compliance with the consumption of blood-boosting tablets apart from being provided with interesting and interactive educational media also requires cooperation from various parties (teachers, parents, peers, and health workers) as well as interpersonal trust between young women in the social environment so that the program can run optimally (Silitonga et al., 2023). The limitation of this study is that there is no control group as compared to the educational media that was developed and requires internet access.

4. CONCLUSION

Media-based E-WoHealth The web is suitable and valid for educating young women about iron tablets and is effective in increasing adherence to blood supplement consumption in young women at SMP Negeri 11 Kota Gorontalo. The results of this study can be used as material for consideration in implementing health education, especially the prevention of anemia by giving iron tablets to young women in a wider scope, namely the community and schools. This Web-based E-WoHealth media should be utilized as well as possible by related officers (teachers and health workers) as one of the educational media, especially about blood-boosting tablets, and can be used as an example for the development of educational media in other forms and different materials.

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Application of Self-Reflection Using Reflective Journal on Oxytocin Massage Skills in Diploma Three Midwifery Students

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Abstract

Midwifery is a profession based on women-centered and evidence-based care through the provision of mutually respectful professional relationships and partnerships. To train students' skills, repeated learning is needed, learning can be sourced from experiences such as doing self-reflection by keeping a reflective journal. This research aims to analyze the effect of applying self-reflection using a reflective journal on oxytocin massage skills. This research is an experimental research using a one-group pretest-posttest group design approach, taking samples using a simple random sampling technique. The research population was all level III students in a bivariate analysis using the Friedman ANOVA test. The results showed that the pretest mean value was 59.28 increasing to 79.50 in the first posttest and 83.38 in the second posttest with a p-value <0.05, which means that there is an effect of applying reflective journals using reflective journals on oxytocin massage skills. Having students write reflective journals is a great way for them to learn new concepts. This approach is also useful for lecturers to get feedback on the concepts being studied by students. The use of reflective journals will guide students to analyze what they have and do not know about the material being studied and how to overcome the obstacles encountered so that learning goals are achieved and foster independent learning in students.

Keywords: Self-Reflection, Reflective Journal, Skills.

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1. INTRODUCTION

Improving maternal and newborn health is key to meeting universal health coverage and Sustainable Development Goals (SDGs) (United Nations, 2015),(Bogren et al., 2022). The World Health Organization (WHO) interprets infant deaths as a result of acute pneumonia cases as much as 53% and 55% of infant deaths due to diarrhea related to nutrition (Erfiyani, 2020). Exclusive breastfeeding can save the lives of around 25,000 children in Indonesia and 1.3 million children worldwide every year, this is because breastfeeding supports the baby's immune system and can protect them from chronic conditions such as obesity and diabetes (Fan et al., 2022).

The coverage of exclusive breastfeeding globally only reaches 44%, which has not yet reached the targeted coverage of at least 50% in 2012-2025 (Unicef, 2021). Based on data for 2021 at the Central Statistics Agency, the percentage of infants aged <6 months who received exclusive breastfeeding was 71.58%. However, there are still provinces that are recorded as having presentations below the national average, one of which is the province of Gorontalo (Badan Pusat Statistik, 2022). The lowest coverage of exclusive breastfeeding was in Gorontalo City, which was 43.6%, and the lowest was in Bone Bolango Regency, which was 12.7%.

One of the obstacles to the failure of exclusive breastfeeding is due to suboptimal milk production or minimal milk production which causes breast milk to not come out (Rahmadhani, Lubis & Edison, 2013), (Darmasari, Putri & Rahmadaniah, 2019). Based on the 2018 RISKESDAS data, the causes of children aged 0-23 months never being breastfed are caused by breast milk not coming out (65%) (Kementerian Kesehatan Republik Indonesia, 2019). Breast milk production is influenced by the hormone prolactin which is responsible for producing breast milk and the hormone oxytocin to release breast milk. The hormone oxytocin is released through nipple stimulation. One effort to overcome the lack of breast milk can be done by oxytocin massage which is done through massage along the spine to the fifth-sixth costae which functions to increase the hormone oxytocin (Darmasari, Putri & Rahmadaniah, 2019).

Midwifery is a profession based on women-centered and evidence-based care through the provision of mutually respectful professional relationships and partnerships. Globally, educational institutions are required to provide a professional experience for midwifery students to prepare them to become skilled midwives (Hainsworth et al., 2022). One of the evaluations used to assess students' clinical competence is to use the OSCE (Objective Structured Clinical Examination) method. OSCE as a student competency evaluation strategy can develop clinical skills and experience skills that are more real (Nurdiyan et al., 2017). Based on the results of the OSCE exam for students in 2022, one of the skills assessed is oxytocin stimulation massage. From the results of the exam, there were 77 students (80.2%) were declared skilled, while 19 students (19.7%) were declared unskilled at the skill of oxytocin stimulation massage in one test. To train student skills, repeated learning is needed, learning can be sourced from experience. To be able to learn from experience requires the ability to do self-reflection. Many instructors suggest that educators must prepare students to be able to reflect (Alsalamah et al., 2022). Reflection is key to clinical learning and can bridge the gap between theory and practice (Graham & Johns, 2019), (Gjevjon et al., 2022). In line with research conducted in Taiwan, his research said that self-reflection and insight have a significant direct influence on coping behavior. Thus coping behavior can mediate the effect of self-reflection and insight into nursing competence (Eng & Pai, 2014).

Research on self-reflection was also researched by (Yusuff, 2015) with research results which said that the use of learner-centered teaching and assessment strategies such as student self-reflection and peer assessment of self-reflection sessions significantly increased academic

achievement. The exercise of carrying out the reflection process can be done in a written way such as making a reflective journal.

Based on the phenomenon above, the researcher is interested in researching the application of self-reflection using reflective journals on oxytocin massage skills in D3 midwifery students. So far there has been no research on the application of self-reflection by making reflective journals on skills in the laboratory. This study aims to determine whether there is an effect of applying self-reflection on improving the oxytocin massage skills of D3 Midwifery students.

2. RESEARCH METHOD

This study uses *experimental* research with a one-group *pretest-posttest group design approach*. The population involved in this study were level III students of the midwifery study program at the Gorontalo Ministry of Health Health Polytechnic for the 2022/2023 school year who are still active. Sampling in this study is *probability sampling* with *a simple random sampling technique*. Sampling used the *Slovin formula* so a sample of 32 respondents was used. The independent variable in this study is the application of self-reflection, namely making a reflective journal, while the dependent variable is oxytocin massage skills. In this study, an intervention was carried out 2 times for 120 minutes/meeting, namely the first intervention was carried out in the first week after the pretest, and the second intervention was carried out in the second week after the first posttest. providing interventions in the form of guidance on oxytocin stimulation massage skills using demonstration methods and applying self-reflection by keeping a reflective journal. Reflective journals contain descriptions, namely describing situations (implementation of oxytocin stimulation massage skill guidance) in detail and accurately, feelings, namely describing what is felt and thought when following guidance, evaluation, namely assessing the good things and bad things from following a series of guidance activities, conducting an analysis that is describing an opinion about the situation when following guidance, providing conclusions such as emphasizing things that should not be done and things that should be done and making an action plan that is making an affirmation if this happens again, what will be done do it.

Skills assessment using a checklist was carried out three times, namely once in the first week before the intervention (pretest), the second assessment was carried out in the second week after the intervention (first posttest), and the third assessment was carried out in the third week (second posttest). Data processing using IBM SPSS 25 software.

Data were analyzed through univariate analysis in the form of distribution and percentage of variables in the form of frequency tables. The univariate analysis consisted of the characteristics of the respondents, namely age and grade point average (GPA) as well as the frequency of the results of the skills of the respondents. Bivariate analysis to determine the effect between the independent variables and the dependent variable uses the Friedman ANOVA test. If the p-value < 0.05 then the null hypothesis (Ho) is rejected and vice versa if the p-value > 0.05 then Ho is accepted (Dahlan, 2014). Ho means there is no effect between the application of self-reflection and oxytocin massage skills. This research has been registered with the health research ethics committee of the Faculty of Public Health, the University of Hasanuddin Makassar with number 14734/UN.4.14.1/TP.01.02/2022.

3. RESULTS AND DISCUSSION

This study observed the effect of reflective journals on the oxytocin massage skills of D3 Midwifery students. This study involved 32 female students as respondents who participated in this activity three times which was carried out for three weeks. Table 1 shows the characteristics of respondents based on age and *grade point average* (GPA).

Table 1. Characteristics of Respondents based on Age and GPA.

Category	Frequency	Percentage (%)
19 years old	2	6.3
20 years	21	65.6
21 years	9	28.1
Good GPA (3.51-4.00)	27	84.4
Enough (2.76-3.50)	5	15.6

Table 1 shows the characteristics of the respondents including GPA and age. According to the characteristics of respondents according to age, the tendency is at the age of 20 years. The characteristics of respondents based on GPA tend to have GPA ≥ 3.51- 4.00

Table 2. Frequency Distribution of Respondents' Skill Levels.

Skill Implementation	Skills			
	Skilled		**Not Skilled**	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Pretest	0	0	32	100
First posttest	22	68.8	10	31.2
Second Posttest	32	100	0	0

Table 2 shows Frequency The results of the skills before the intervention were carried out and found that the respondents were not skilled (100%) in performing oxytocin stimulation massage skills. After giving the intervention once, it can be seen that there was an increase in skills in the first posttest, namely 22 respondents (68.8%) were already skilled, and after giving the second intervention, it could be seen in the second posttest that all respondents (100%) were skilled in doing oxytocin stimulation massage. Based on the table, it can be seen that there was an increase in skills from before giving the intervention to after giving the intervention, which means that one intervention can change the results of student skills, but with two interventions it can change the level of student skills of all respondents.

Table 3. The effect of applying self-reflection using reflective journals on oxytocin massage skills in Diploma Three Midwifery students.

Skill Results	Mean±SD	p-value
Pretest (first week)	59.28 ± 8.61	
First post-test (second week)	79.50 ± 4.67	0.000
Second post-test (third week)	83.38 ± 4.39	

Table 3 shows that there was an increase in the average value during the pretest, the average value of 59.28 increased to 79.50 in the first posttest and the second posttest increased again, namely 83.38 with a p-value <0.05. This shows that there is a significant difference in value before and after giving the intervention.

Table 4. Post-Hoc Analysis Results.

	Posttest with Pretest	Posttest with Pretest	Posttest with the first Posttest
p-value	0.000	0.000	0.000

Post hoc analysis using the *Wilcoxon test* obtained p = 0.000 <0.05 for comparison of all groups. It can be concluded that statistically the results of the skills scores after the intervention carried out in the first posttest were different from before the intervention, the results of the skills performed in the second posttest were different from before the intervention, and the results of the skills performed after the intervention, namely the second posttest, were significantly different from the assessments carried out in the first posttest.

Reflection has been defined by Moon as a set of abilities and skills, to demonstrate taking a critical attitude, and problem-solving orientation. Reflection, too, is that adult learning depends on understanding and evaluating our experiences for better achievement. Reflective writing has been shown to improve problem-solving attitudes by providing a better understanding of oneself, especially what is already known (individuals), and identifying what needs to be known for a more advanced understanding of the subject (Hargreaves, 2016), (Kadam et al., 2022). Research on the application of self-reflection has also been researched at the University of Florida School of Nursing which shows that student self-reflection provides valuable insights into the challenges and successes of telehealth practice. Through reflection, students can identify their strengths and weaknesses, improve remote communication skills, and understand the role of technology in health care. Engaging students in the reflection process and using their insights in curriculum development can improve the quality of telehealth education and prepare students for the practical challenges they face (LaManna, Eckhoff & Duncan, 2023).

Based on Table 3, there was an increase in the results of oxytocin stimulation massage skills before and after the intervention. This is because at the time after the pretest was given an intervention in the form of practical guidance on oxytocin stimulation massage skills and the application of self-reflection by making a reflective journal which was proven to improve skills results during the first posttest. After the first posttest, the same intervention was given again, and it was proven that there was an increase in the mean value during the second posttest. So it can be concluded that giving one intervention can increase the value of student skills, and giving intervention twice can improve the massage skills of oxytocin stimulation of all respondents.

The more often we repeat and hone our skills, the more often we save files in the subconscious mind. So that without realizing it or not, a person will easily repeat the skills he has acquired to produce skilled and competent respondents (Kurniawati et al., 2014), (Nurlaily et al., 2021). This is in line with research which states that every learning activity that is carried out repeatedly and continuously will become a permanent and automatic learning habit so that the result of the learning process objectives can be achieved optimally (Andrie et al., 2019).

Self-reflection is very important for student health workers who work daily to apply theory and practice to clients, so students must learn to be aware of their professional performance (Oktaria, 2015). Self-reflection involves self-awareness, self-evaluation, and critical thinking. Self-reflection is part of achieving self-awareness competencies, and the application of lifelong learning *and* self *-regulation* which are important aspects of professional development (Meidianawaty, 2019). In recent years, reflection has been used in education and is now recognized as a component of competency acquisition. The Nursing and Midwifery professions in Ireland and the UK have promoted reflection in educational programs (Graham & Johns, 2019). It is proven that the positive contribution of reflective practice is to student development. This is evidenced by the publication of reflective practice as a strategy in the learning process (McCarthy et al., 2013), (Gallagher et al., 2017).

Reflective journals are considered a means of reflection by educators. By doing reflection, students gain new knowledge. Reflection is an intellectual and emotional activity that a student thinks about when receiving new knowledge (Jarvis, 2001; Park et al., 2019). Reflection has the potential to help students improve their understanding, enrich lifelong learning, and reduce clinical errors (Jarvis & Baloyi, 2020). Writing a reflective journal is a logical approach that helps someone express a view or situation by thinking, remembering, or explaining it in their way (Lin et al., 2022). The use of reflective journals will guide students to analyze what they have and do not know about the material being studied and how to overcome the obstacles encountered so that learning goals are achieved and foster independent

learning in students. When students can consciously design, monitor, and reflect on their learning process, they will become more self-confident and independent in learning.

Writing a reflective journal regularly is beneficial for medical or professional graduates (Kadam et al., 2022). Having students write reflective journals is a great way for them to learn new concepts. This approach is also useful for lecturers to get feedback on the concepts being studied by students (Mansor, 2011). The use of reflective journals will guide students to analyze what they have and do not know about the material being studied and how to overcome the obstacles encountered so that learning goals are achieved and foster independent learning in students. When students can consciously design, monitor, and reflect on their learning process, they will become more self-confident and independent in learning.

The results of this study are in line with previous research conducted at private Catholic universities on third-year nursing students using qualitative research methods The research results show that keeping a reflective journal can lead not only to an increase in skill competence in patient care but can also reduce severe bias in clinical practice (Oliver et al., 2021). Another study also conducted at the Kwazulu Natal University in Africa stated that reflection by keeping a reflective journal has a significant role significant in the development of clinical reasoning skills in midwifery students (Baloyi & Mtshali, 2018).

4.   CONCLUSION

The application of self-reflection using reflective journals which is carried out twice can have a significant effect on oxytocin massage skills in D3 midwifery students. The findings in this study revealed that there was a significant increase in skills from before the application of self-reflection to after the application of self-reflection. Writing a reflective journal helps increase self-awareness. Through written reflection, students can observe, analyze, and interpret their experiences more deeply. This allows the development of a better understanding of thoughts, feelings, values, and motivations for performing skills.

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R E S E A R C H   Open Access

The Effectiveness of Na'o Beps Animation Video on Young Women's Knowledge and Skills in Early Detection of Breast Cancer by Breast Self-Examination (BSE)

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Abstract

Breast cancer ranks first in cancer-related deaths in women in the world, which are generally found at an advanced stage. Breast self-examination (BSE) that has been used since puberty can detect breast cancer symptoms earlier so that treatment can achieve a survival probability of 90% or more. Animated video is one of the developments in health education media that is in line with advances in digital technology. This study aims to determine the effectiveness of the Na'o Beps animated video on improving the skills of young women in performing breast self-examination (BSE). This research is a research & development model of 4D development (define, design, develop, disseminate) and the research design used a pre-experimental design with a one-group pretest-posttest design. The sample in this study was all grade VIII students at SMP Negeri 14 Gorontalo City, Gorontalo Province in 2022, a total of 36 students. The sampling technique used purposive sampling. Data analysis in this study was carried out by the Wilcoxon test. The results showed that there were significant differences in the knowledge (p=0.00) and skills (p=0.000) of female adolescents regarding breast self-examination (BSE) after the intervention with the Na'o Beps animation video. Conclusion Health education using animated video media is effective in increasing the knowledge and skills of young women about breast self-examination (BSE) so that it can be used as an alternative medium in providing health education.

Keywords: Video Animation, Breast Self-Examination, Knowledge, Skills, Health Education.

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1. INTRODUCTION

Breast cancer is a disorder of the breast in the form of a malignant tumor that is formed from breast cells that grow and develop uncontrollably so that it spreads between tissues or organs around the breast or other parts of the body (Tanjung & Hadi, 2018). Breast cancer ranks first in cancer-related deaths in women in the world (Omar et al., 2020), according to data from the World Health Organization (WHO) in 2020 there were 685.000 deaths and 2,26 million new cases of breast cancer worldwide (World Health Organization, 2021). This number is estimated to continue to grow if it is not addressed immediately, around 26 million people will likely become breast cancer sufferers and 17 million of them will die by 2030 (Tanjung & Hadi, 2018).

Breast cancer is designated as the most common cancer in Indonesia in Permenkes No. 34 of 2015 (Marfianti, 2021). The number of new cases of breast cancer in Indonesia in 2020 reached 68,858 cases (16,6%) of a total of 396,914 cases (Kementerian Kesehatan Republik Indonesia, 2022), previously only 58,251 cases in 2018 (World Health Organization, 2020). Data from Globocan in 2020, the number of breast cancer deaths in Indonesia has reached more than 22.000 people, of which 70% are detected at an advanced stage (Kementerian Kesehatan Republik Indonesia, 2022). Even if it can be detected early, the treatment will achieve a survival probability of 90% or higher (World Health Organization, 2021). One way for early detection of breast cancer can be done easily is through breast self-examination (BSE) (Pradnyandari et al., 2022) which is quite effective for finding breast cancer at an early stage in Indonesia (Sari et al., 2020), where the use of mammography as a screening tool is still limited due to cost factors and tool distribution (Ardiansyah, 2022).

Gorontalo Province based on Indonesia's profile data in the last three years has experienced a decrease in the percentage of early detection of breast cancer in a row. In 2021 the province of Gorontalo ranks sixth out of 34 provinces in Indonesia with a percentage of 1,33% so it is feared that it will experience an increase in the number of cases and deaths from breast cancer so efforts are needed to increase public awareness about early detection of breast cancer (Kementerian Kesehatan Republik Indonesia, 2021).

Adolescents are a contributor to the number of breast cases, which, although the number is small, are more aggressive, usually diagnosed at a higher stage than adult breast cancer patients, so they require higher treatment and costs (Murphy et al., 2019). Therefore it is necessary to screen for breast cancer by accustoming adolescents to BSE (Dwitania, Azizah & Rosyidah, 2021). Preliminary studies by the Nottingham Center in England and the Canadian National Breast Screening Study (CNBSS) show that practicing BSE can help to reduce deaths from breast cancer that can be carried out since puberty (Albeshan et al., 2020).

BSE is still considered very effective because the diagnosis rate is relatively high, around 65%, so developing countries should use it specifically because of its affordability, flexibility, and ease of use, however, in these developing countries, the presentation of early detection is low due to lack of knowledge, lack of awareness or training and do not know how to practice BSE (Karimian et al., 2022). Increased knowledge and skills can be done through health education using educational media (Widyawati, 2020). One of the media providing education more interestingly is using animated videos (Marfianti, 2021). Animated video has two elements that synergize to provide a stimulus to hearing and sight which provides a more realistic picture thereby increasing memory retention because it is more interesting and easier to remember (Sandika, 2021). This is in line with research conducted by Nabilatul Fanny, et al which states that animated videos are more interesting, grab attention, and can be easily

remembered by teenagers so that their application is done more quickly (Fanny, Arif & Azizah, 2022).

Many researchers have carried out research related to BSE (Handayani, & Sudarmiati, 2012);(Pippin & Boyd, 2023);(Husna et al., 2019), but a combination of multimedia-based education is considered very important to increase knowledge and train young women's skills about BSE so that it can contribute to reducing mortality from breast cancer by detecting it earlier (Luo & Colditz, 2022). This study aims to determine the effectiveness of the Na'o Beps animated video on improving the skills of young women in performing breast self-examination (BSE).

2. RESEARCH METHOD

This research included research & development model 4D development (define, design, develop, disseminate) and research design using pre-experiment with one-group pretest-posttest design to determine changes in knowledge and skills about BSE before and after intervention with the research subjects. limited to 36 grade VIII students of SMP Negeri 14 Gorontalo City, Gorontalo Province, because BSE needs to be done from the start of puberty. This research was conducted in January 2023. The sampling technique used total sampling. The independent variable in this study was the educational media of the Na'o Beps animation video, while the dependent variable was BSE knowledge and skills. The research instrument used was the Na'o Beps animation video, which means an invitation to do BSE, and a questionnaire and BSE checklist which contains 6 steps on how to do BSE according to the Ministry of Health.

The first phase of this research involved developing educational media in the form of animated videos which included activities such as making animated videos, validation tests conducted by 2 media experts and 2 material experts, and field trials conducted on 30 young girls. The second stage consists of administering pre-tests to respondents, providing interventions using media that has been developed, and conducting an evaluation or post-test to all respondents in the 3rd week.

The research data was first tested for normality using the Kolmogorov-Smirnov test with the results of the data not being normally distributed and the homogeneity test using the Levene test with non-homogeneous results. Data were analyzed using the Wilcoxon Signed Rank Test to determine differences in BSE knowledge and skills before and after the intervention

This research has received research ethics from the ethics committee of the Faculty of Public Health, University Hasanuddin with number 15026/UN4.14.1/TP.01.02/2022.

3. RESULTS AND DISCUSSION

Table 1. Distribution of Respondents' Characteristics by Age and Age Menstruation First Time.

Category	Frequency	Percentage (%)
Age		
12 Years	2	5.6
13 Years	11	30.6
14 Years	19	52.8
15 Years	4	11.1
Menstruation first time		
9 Years	1	2.8
10 Years	7	19.4
11 Years	10	27.8
12 Years	14	38.9
13 Years	4	11.1

Table 1 shows the demographic characteristics of respondents at SMP Negeri 14 Gorontalo City, Gorontalo Province based on age with 19 female students (52.8%) being 14 years old and the age of menstruation at the time of the first menstruation, mostly at the age of 12, totaling 14 female students (38.9%).

Table 2. Distribution of Levels of Knowledge and Skills of Young Women about BSE.

Category	Na'o Beps Animation Video							
	BSE knowledge				BSE skills			
	Pretest		Posttest		Pretest		Posttest	
	n	%	n	%	n	%	n	%
Good	0	0	36	100	0	0	30	83.3
Enough	2	5.6	0	0	0	0	6	16.7
Not enough	34	94.4	0	0	36	100	0	0
Total	36	100	36	100	36	100	36	100

Table 2 shows that in this study most respondents had a lack of knowledge about BSE before giving treatment with animated video media of 34 respondents (94.4%), in this study it was found that the reason was that respondents very rarely received education about breast self-examination, while the counseling given by health workers did not use the media so that it was boring, especially breast self-examination was considered taboo among respondents. In addition, according to the researcher's assumption, the lack of knowledge is also caused by the age factor where the respondents are still young, between 12-15 years old, so they do not have a sense of concern for maintaining health, given their relatively healthy and productive physical condition (Zhang et al., 2018).

After being given treatment with animated video media there was a very good increase in knowledge because all respondents had a good level of knowledge of 36 respondents (100%) this indicated that respondents had understood the meaning, purpose, benefits, time, and method of performing BSE techniques with evidence from the respondent's ability to answer the questions given in the form of a questionnaire (Ahmad et al., 2022)

For the skill variable, it can be seen that all respondents before providing health education with animated video media had less skills regarding BSE, namely as many as 36 respondents (100%), this was due to the lack of knowledge possessed by the respondents. This is in line with previous research which stated that there was a significant relationship between knowledge and BSE skills (Abo Al-Shiekh et al., 2021). Knowledge has been highlighted as an important indicator of women's behavior and actions around BSE (Karimian et al., 2022). After being given an intervention using animated video media, it can be seen that most of the respondents' skills improved as many as 30 respondents (83.3%), with increased knowledge to increase the awareness of the respondents to motivate themselves to practice the BSE technique directly. Knowledge is a very important domain for the formation of one's actions (Indryani, 2021).

Table 3. Characteristics of Respondents' Knowledge and Skills on Breast Self-Examination (BSE).

Distribution Frequency	n	Minimum	Maximum	Means
Before intervention				
Knowledge	36	4	10	7.22
Skills	36	0	4	0.92
After intervention				

| Knowledge | 36 | 11 | 14 | 12.86 |
| Skills | 36 | 11 | 18 | 15 |

Table 3 shows that the level of knowledge and skills of the respondents before being given education with animated video media the average score of knowledge is 7.22 while for skills the average score is 0.92 and there is an increase in the knowledge and skills of respondents after being given education with animated video media the average score - average knowledge 12.86 and skills 15. Educational media such as animated videos have certain advantages because study time is free and can be done anywhere, and learning media that has animations or videos will increase students' knowledge and skills. This is in line with other research which states that the learning process using animation or video tutorials is better than non-technological learning media (Krey et al., 2022). The results of research conducted by Ulfa Farrah Lisa, et al in 2016 concluded that students' knowledge and skills about shoulder dystocia were higher in the group that used video media compared to the group without video media (Lisa et al., 2016)

Table 4. Results of Analysis of the Effectiveness of Video Animation on the Knowledge and Skills of Young Women on Breast Self-Examination (BSE)

Category	n	Knowledge	Skill	p-value
		Mean Rank		
Before	36	0.00	0.00	0.00
After	36	18.50	18.50	

Table 4 shows that the mean rank of knowledge of young women before being given education using the video animation Na'o Beps was 0.00, while after being given the mean rank was 18.50. Based on statistical tests, it was obtained that the value of p = 0.000, so it can be concluded that there is a significant influence between the provision of the Na'o Beps animation video and the level of knowledge of young women about breast self-examination (BSE). This is in line with previous research which shows that it is more effective to provide health education using animated video media than just discussions with significant significance values (Ruslinawati & Wulandatika, 2020).

The animated video media used makes it easy for respondents to understand the message to be conveyed because, in the animated video, the message is conveyed with moving images so that the delivery is clearer. Animated video has the main attraction not only being able to explain a material that is difficult to explain with other media but also having an aesthetic appeal so that the appearance is attractive and motivates users to be involved in the learning process (Ahmad et al., 2022).

For the variable skills of young women before being given education using the Na'o Beps animation video media was 0.00, while after being given the mean rank was 18.50. Based on statistical tests, it was obtained that the value of p = 0.000, so it can be concluded that there is a significant influence between the provision of education using the Na'o Beps animated video media and the skills of young women about BSE. This is in line with previous research which showed that the use of video amination media obtained better results compared to conventional methods for young girls, this is because, in animated video media, the images have a coherent flow to increase students' understanding, interest and skills in the material taught. delivered (Saputra & Shofa, 2015).

Technology has the potential to improve many good aspects of daily life including learning because it has been proven to increase student involvement in learning which includes more effective learning concepts, encourages more participation, increases learning satisfaction, and develops student skills (Mustafa et al., 2020). Health education using video for young women can clarify the pictures and steps in carrying out BSE because in the process of giving it the respondent does not only hear voices but the respondent will see directly and

clearly the steps for self-breast examination (Mardianti, Fahdi & Mita, 2021). This is in line with previous research which stated that the use of animated video media is better than using leaflet media because leaflet media only uses the sense of reading, so it is more difficult to explain the sequence of skills compared to animated videos (Iriyani, 2020)

4. CONCLUSION

The use of video media has a better impact because health education relies on hearing and sight from the target, is interesting, the message conveyed is fast and easy to remember, and can develop thoughts and develop the imagination of young women. The findings in this study reveal that animated video media can significantly increase the knowledge and skills of young women. It is recommended that the Na'o Beps animated video be used as an educational medium by health services or junior high schools to be able to increase the knowledge and skills of young women about BSE. Suggestions for further research can be to carry out an assessment or posttest for each educational provision using media so that you can find out differences or developments in knowledge and skills each time education is given.

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R E S E A R C H   **Open Access**

Apgar Score and the Amount of Blood of Mother in Labour in Delayed Cord Clamping Period

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Abstract

A delay in cutting the umbilical cord in infants can increase the Apgar score in infants who experience asphyxia. Besides that, it can prevent postpartum hemorrhage from occurring. Most deaths from postpartum hemorrhage occur during the first 24 hours after delivery. This increase in the Apgar value proves that the longer the delay in the umbilical cord is carried out, even until it doesn't pulsate, the better the baby's body will be, which results in an increase in hemoglobin in the baby's body. The population in this study were all mothers in the 3-4 stage of labor in the city area. Bandar Lampung. The sample is part of the number and characteristics possessed by the population with 120 maternal. It is known the length of time delayed cord Clamping is performed on babies born (<30 seconds) as many as 3 (2.5%) respondents, while umbilical cord clamping is delayed for 30-180 seconds as many as 117 (97.5%) respondents, the Apgar score in newborns in the category of mild asphyxia - not asphyxia as much as 100%, the amount of blood that came out <250 grams was 93 (77.5%) respondents and the amount of blood that came out 250 grams were 27 (22.5%) respondents. Delayed cord clamping does not increase the incidence of asphyxia and bleeding in laboring mothers, so immediate umbilical cord clamping can be performed by observing the baby's birth condition.

Keywords: Apgar Score, Delayed Cord Clamping, Maternal.

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1. INTRODUCTION

Maternal Mortality Rate (MMR) is one of the indicators to measure maternal health. MMR is the ratio of maternal deaths during pregnancy, childbirth, and lochia caused by pregnancy, childbirth, and lochia or other procedures, but it is not due to other causes such as accidents or falls in every 100,000 live births. According to the World Health Organization (WHO, 2019) report, the World Maternal Mortality Rate (MMR) in 2019 in underdeveloped countries of the world is high, with an estimated 415 maternal deaths per 100,000 live births with a lifetime risk as high as 1 in 37 for 15-year-old girls in sub-Saharan Africa. In comparison, the same girl living in Australia or New Zealand would have a risk of only 1 in 7,800. Sub-Saharan Africa and South Asia accounted for about 86% (254,000) of estimated global maternal deaths in 2017 whereas sub-Saharan Africa alone accounted for about 66% (196,000). South Asia accounts for nearly 20% (58,000) and Southeast Asia accounts for more than 5% of global maternal deaths (16,000) (Podungge, 2019).

The Intercensal Population Surveys in 2015 show that maternal mortality rate tripled compared to the MDGs target (Kementerian Kesehatan Republik Indonesia, 2022). Based on the graphic chart of maternal death cases in 2019 below, it can be seen that the number of maternal death cases is increased compared to 2018, from 102 cases to 110 cases. It can be seen that the causes of maternal death cases in lampung Province in 2019 which caused by bleeding are 29 cases, hypertension are 31 cases, infection are 3 cases, circulatory system disorders are 4 cases, metabolic disorders are 1 case and others are 42 cases. The highest number can be found in Central Lampung and East Lampung districts where 16 cases each are recorded and the lowest number can be found in West Tulang Bawang District where there are 2 cases are recorded while in Bandar Lampung city there are found 14 people (Dinas Kesehatan Provinsi Lampung, 2022). When a mother is delivering a baby, the baby is still connected to the mother through the umbilical cord which is part of the placenta (McDonald et al., 2014). The baby will separate from the placenta through the clamping and cutting of the umbilical cord, and these activities are included in the active management of the stage III of Labor (Purisch et al., 2019). The clamping and cutting of the baby's umbilical cord at birth is one of the steps of Normal Delivery Care (APN) and it is an intervention that must be undertaken (Kementerian Kesehatan Republik Indonesia, 2013), but the optimal time to do the clamping and cutting of the umbilical cord is still a controversy and it is still being discussed today (Winkler et al., 2022).

The active treatment involves clinicians to more actively intervene in Stage III, which includes uterotonic injection, umbilical cord clamping, controlled umbilical cord stretching and uterine massage after the baby is born. Active management of stage III here means cord clamping is undertaken immediately after the baby is born (Mercer, 2001). It means that after the baby is born, they will immediately clamp and cut the umbilical cord in the first one minute of the baby's birth (Rashwan et al., 2022).

WHO since 2012 recommends to undertake delayed cord clamping as part of the active management of stage III of labor at least 1-3 minutes after birth for all infants regardless of gestational age or fetal weight and it is not recommended to undertake immediate cord clamping (<1 minute) unless asphyxia occurs in the infant and requires immediate resuscitation (WHO, 2012).

Infants who have an apgar score with severe asphyxia category (0-3), who postponed the procedure for the umbilical cord until it does not pulsate, are able to drastically increase their apgar score to the category of mild asphyxia or fit infants (7-10) (Rendra et al., 2013). This increase of apgar score proves that the longer the delay of the procedure of the umbilical cord is undertaken, even until it does not pulsate, the better it will be, which results in the increase in hemoglobin in the baby's body (Hutchon, 2012). When the hemoglobin level in the baby's

body is quite plenty, then this hemoglobin will bind more oxygen so that it can help infants with asphyxia in their breathing adaptation (Rendra et al., 2013).

Post-partum bleeding is the main cause of maternal death in low-income countries and accounts for nearly a quarter of all maternal deaths globally. Post-partum bleeding which occurs during the first 24 hours after the delivery leads to the deaths (WHO, 2012).

According to Andersson et al., (2013), by waiting until the umbilical cord stops pulsating naturally can reduce the risk of bleeding. Riksani, (2012), stated that delayed cord clamping can reduce the risk of bleeding after giving birth although there are still few evidences to suggest that delayed cord clamping can reduce the risk of having heavy bleeding after giving birth.

Riksani, (2012), recommended to undertake clamping and cutting the umbilical cord that after the umbilical cord stops pulsating where the range of time is about 3-5 minutes after the baby is born, and early umbilical cord clamping is not recommended. According to the Indonesian Ministry of Health, (2013) cord clamping is undertaken 2 minutes after the baby is born (Kementerian Kesehatan Republik Indonesia, 2013). The delay in cutting the umbilical cord immediately after the baby is born is still a polemic in conducting midwifery care because standard delivery care requires immediate action to cut the umbilical cord when the baby has no complications besides that there is still little evidence base related to research on this procedure. There is no research directly related to the relationship between cutting the umbilical cord immediately with the APGAR score in newborns, and the relationship between cutting the umbilical cord and bleeding in postpartum mothers made researchers interested in doing this research. This study aimed to determine the relationship between delayed cord clamping and the apgar score in newborn infants in Bandar Lampung City in 2021.

2.   RESEARCH METHOD

The type of research used in this study is quantitative research with a descriptive survey approach. The research was conducted in September - December 2021 at Praktik Mandiri Bidan (Independent Midwifery Practice) in Bandar Lampung.

The population in this study was all mothers in labor period stage II and IV in Bandar Lampung City, where a total of the average mother which will be giving birth in a month was 120 maternity mothers. *Purposive Sampling* was conducted. Measuring instruments used in the form of test instruments (closed-ended question) using digital scales and observation sheets to measure the weight *underpad* which the mother has used during the fourth stage of Labor, the apgar score and the length of the cutting umbilical cord duration. The stage of data collection including Observing the duration of *Delayed Cord Clamping*: As soon as the infants are delivered, it is placed on the mother's stomach or on the bed and covered with a dry and warm cloth. Injecting oxytocin to the mother Monitoring the release of the placenta from the uterine wall and allowing the placenta comes out without clamping intervention umbilical cord. Putting the placenta on the basket or placental container Replacing the mother's underpad with a new one, observing the stage IV (2 hours postpartum). Observing the umbilical cord cutting time, immediately after birth or <15 seconds and between 30-180 seconds Delayed Cord Clamping process, then write on the observation sheet. Conducting a post-test on the mother of stage IV by measuring the weight of the underpad used, measuring with the underpad on a digital scale after two hours postpartum, if underpad weight <250gram: no bleeding underpad weight ≥ 250gram: bleeding. The process of calculating the amount of bleeding in the underpad in the normal state of the mother who does not experienced such pathological postpartum as postpartum seizures according to the inclusion criteria. Measuring the apgar score in newborns

This study has received ethical approval from the Health Research Ethics Committee of Tanjung Karang Health Polytechnic with Number No. 249 / KEPK-TJK/X / 2021. Data analysis was performed using univariate and bivariate (chi-square).

3.   RESULTS AND DISCUSSION

Table 1. Frequency distribution of *Delayed Cord Clamping* duration in newborns.

Variable	Categories	f	%
Delayed Cord Clamping	DCC (duration ≥120 seconds)	47	39.2
	No DCC (duration <120 seconds	73	60.8

Table 1, it is known that 73 (60.8%) out of 120 respondents are in No DCC category (duration <120 seconds) and 47 (39.2%) out of 120 respondents are in DCC category (duration ≥ 120 seconds).

Based on the result of the research, it is found 73 respondents (60.8%) out of 120 respondents did not go through the DCC process (duration<120 seconds). Immediate umbilical cord cutting is defined as cutting the umbilical right after birth or before one minute for a full-term baby and immediately cutting the umbilical cord for a premature baby (Wickham, 2006). Umbilical cord cutting that less than 15 seconds is categorized as immediate umbilical cord cutting (Setiawan, 2009).

Delayed clamping (or not clamping at all) is a physiological way of caring for the cord, and early clamping of the cord is an intervention that still requires further evidence (Utami et al., 2021). Based on the result of the research, it was found that 47 respondents (39.2%) went to the DCC process category (duration >120 seconds), it is because in Indonesia, the period to undertake umbilical cord cutting changes to 2 minutes after birth and after oxytocin is being given (Departemen Kesehatan Republik Indonesia, 2008). Currently, WHO or The World Health Organization stated "The optimal time to clamp the umbilical cord for all infants regardless of gestational age or fetal weight is when the circulation or pulsation in the umbilical cord has stopped, and the umbilical cord is flat and pulseless (30-60 minutes after delivery) and at the same time early initiation of breastfeeding in newborns is undertaken. Thus, based on this, it is seen that in normal births, the delay in umbilical cord clamping is done within > 30 seconds, and there is a delay in umbilical cord clamping is because there are some opinions states that the umbilical cord clamping immediately after the baby is born can cause complications for the mother as well (Rahmawati, 2017). Some evidences prove that clamping the umbilical cord immediately after the baby is born increases the risk of postpartum hemorrhage and retention of the placenta by *engorging the placenta* with the baby's blood (Riksani, 2012). This makes it harder for the uterus to contract and release the placenta. For some women, feto-maternal bleeding may increase the probability of serious blood incompatibility problems (rhesus) in subsequent pregnancies (Mercer, 2001).

Table 2. Frequency distribution of Apgar score in newborns in *Delayed Cord Clamping* period

Variable	Categories	f	%
Apgar Score	Severe Asphyxia (0-3)	0	0
	Moderate Asphyxia (4-6)	4	3.3
	Mild Asphyxia / No Asphyxia (7-10)	116	96.7

Table 1 shows that 116 (6.7%) respondents are in mild asphyxia - no asphyxia category where the Apgar score is 7-10, and 4 respondents (3.3%) are in moderate asphyxia categories where the *Apgar score* is 4-6, and there is no baby in severe asphyxia category where the Apgar score is 0-3.

Based on the results, it was found that 116 (6.7%) out of 120 respondents are in the mild asphyxia - no asphyxia category where the Apgar score 7-10, and 4 respondents are in moderate

asphyxia category where the Apgar score 4-6, and there is no baby in severe asphyxia category where the Apgar Score 0-3.

Infants who have an apgar score with severe asphyxia category (0-3) who postponed the procedure for the umbilical cord until it does not pulsate, are able to drastically increase their apgar score to the category of mild asphyxia or fit infants (7-10). The increase of the apgar score proved that the longer the delay of doing the procedure of the umbilical cord is undertaken, even until it does not pulsate, the better it will be, which results in the increase in hemoglobin in the baby's body. When the hemoglobin level in the baby's body is quite plenty, then this hemoglobin will bind more oxygen so that it can help the infants with asphyxia in their breathing adaptation (Asisdiq et al., 2017).

According to researchers, 116 out of 120 infants which is in mild asphyxia category – no asphyxia with Apgar Score 7-10 and 4 (3.3%) respondents which is in moderate asphyxia category with Apgar Score 4-6, and no infants in severe asphyxia category with Apgar Score values 0-3 is in line with the theory that reveals that the delay of doing umbilical cord cutting could elevate the erythrocyte which was being transfered to the infants and it also led to the increase of hematocrit of newborn infants (Sundari, 2016). The method of cutting directly after the baby is born can remove the blood needed by the baby and cause the baby to lack blood which eventually causes anemia in the baby. Not caring for it properly can cause an extended discharge (Buwana et al., 2015). Hb and Ht levels had an important function in delivering oxygen during the transition from fetus to baby, and adequate levels of HB concentration in newborns would determine the level of oxygenation in the brain, so that early umbilical cord binding was considered not physiological and can harm the baby (McDonald et al., 2014). The delay in clamping and cutting the umbilical cord took more time in transferring blood from the placenta to the baby; in this case, this placental transfusion process will increase the baby's blood volume up to 30% (Purisch et al., 2019).

Table 3. Frequency distribution of the amount of blood from bleeding in Delayed Cord Clamping period

Variable	Categories	f	%
The amount of blood from bleeding	Bleeding ≥ 250 grams	27	22.5
	No bleeding <250 grams	93	77.5

Based on the table 3, it is observed that 93 (77,5%) out of 120 respondents are in the category of <250 gram and 27 (22.5%) respondents are in the category of ≥250gram.

According to Andersson, et al., (2013), by waiting until the umbilical cord stops pulsating naturally can reduce the risk of bleeding. Stated that delayed cord clamping can reduce the risk of bleeding after giving birth (Sundari, 2016). Even though there is still little evidence to suggest that delayed cord clamping can reduce the risk of heavy bleeding after giving birth.

According to the researchers, in this study, it was seen that mothers who applied delayed clamping of the umbilical cord did not experience postpartum bleeding. This can be seen in the mothers who did not bleed more when compared to those who experienced bleeding. The results of this study also found that mothers who experienced bleeding were mothers with parity who were at risk. This can be seen based on the known effects of 27 respondents who experienced bleeding ≥250 grams, with parity at risk (1 and > 3) as many as 15 people. This follows the theory which reveals that parity at risk is one of the factors that can influence the occurrence of bleeding in the mother during the delivery process. Postpartum hemorrhage compared to mothers who have parity ≤3 times (Satriyandari, 2017).

High parity will have an impact on the health problems for both mothers and the newborn infants (Pradana, 2021). Repeated pregnancy and childbirth caused damage to blood vessels in the uterine wall and decreased flexibility (elasticity) of tissues that are repeatedly affected during pregnancy, thus they tend to cause abnormal placement or abnormal placental growth

and fetal growth which leads to giving birth to a baby with low birth weight (Pinontoan, & Tombokan, 2015)

According to researchers, the occurrence of bleeding with >250grams can also be caused by various factors such as, in this study, is a mother with a risk age (<20 years and >35 years) where there were 5 people found with this condition (Podungge, 2019). The ideal reproductive age is 20-35 years because at the age of 35 years of concomitant diseases such as hypertension and diabetes mellitus can affect fetal growth and development due to lack of food supply to the placenta. The age of 35 years is a risk factor that can cause complications during pregnancy and childbirth that can threaten the mother's life. The age of 35 years is associated with progressive damage to the endometrium that hinders the supply of nutrients to the placenta for fetal growth and development (Harry, 2010).

Table 4. The relation between *Delayed Cord Clamping* and Apgar Score in newborn infants.

Delayed Cord Clamping	**Apgar Score**				**Total**		**p-value**
	Moderate Asphyxia (4-6)		**Mild Asphyxia / No Asphyxia (7-10)**				
	n	**%**	**n**	**%**	**n**	**%**	
DCC (duration ≥ 120 seconds)	4	8.5	43	91.5	47	100	0.011
No DCC (duration <120 seconds)	0	0	73	100	73	100	

Based on table 4, it is seen that 47 respondents go through the DCC process (duration ≥120 seconds) where 4 respondents (8.5%) are in the moderate asphyxia (4-6) category and 43 (91.5%) are in mild asphyxia/ no asphyxia category. 73 respondents do not go through the DCC process (duration 120 seconds) where 0 respondent is in moderate asphyxia and 73 (100%) respondents are in mild asphyxia / no asphyxia category. Based on the result of statistical test, in which p-value <0.05, it is 0.011, thus it can be concluded that there is a relation between *Delayed Cord Clamping* with Apgar Score in newborn infants in Bandar Lampung City in 2021.

There is a relation between *Delayed Cord Clamping* and Apgar Score in newborn infants in Bandar Lampung City in 2021. Apgar scores on the first and fifth minute of birth. The first-minute apgar score indicated the baby's tolerance to the birth process, and the next fifth-minute indicated the baby's adaptation to his new environment (Kementerian Kesehatan Republik Indonesia, 2022). If the apgar score was still below 7 then the baby needs resuscitation, then the assessment was conducted every five minutes until normal or age 20 minutes while normal infants have apgar values more than 7 (Winkler et al., 2022). The best time to perform umbilical cord cutting is still being discussed up until now by the experts. WHO recommends a clamping delay of between 60-120 seconds (Purisch et al., 2019). The debate about delaying umbilical cord cutting has been going on for a long time, the answer to the question of the best time to do clamping or delayed clamping is still uncertain since the experts are still discussing it (Panburana et al., 2020)

The delay in umbilical cord binding can increase the number of erythrocytes transfused into the baby's body and this is seen with an increase in hemoglobin and hematocrit levels in newborn infants (Cernadas, 2006). Hb and Ht levels have an important function in delivering oxygen during the transition from fetus to baby, and adequate levels of HB concentration in newborns will determine the level of oxygenation in the brain, so that early umbilical cord binding is considered not physiological and can harm the baby (Hutchon, 2012).

Another study stated that there was an effect of delaying cord clamping on Hb levels in BBL in the working area of Sipatana Health Center Gorontalo City. It can be seen from the levels of Hb in the delayed clamping category which was higher than those who got immediate clamping. This showed that the longer it takes the better it is in which it increases the amount of Hemoglobin and hematocrit in infants (Podungge, 2019). Delayed umbilical cord clamping and cutting gave more time in the process of transferring blood from the placenta to the baby and in this case the process of placental transfusion will increase the baby's blood volume up to 30%

Umbilical cord clamping undertaken 3 minutes after birth can increase HB and Ht levels that benefit the baby. The midwifery services in Indonesia refers to the policies on labour care guide that recommends to clamp and cut the umbilical cord after 2 minutes after labour. However, many midwifery and hospital still do the immediate umbilical cord clamping and cutting (less than 2 minutes) (Kohn, 2013), although delaying cord clamping has been shown to be beneficial for newborns. This shows the gap between the facts and the existing literature. This is due to not being socialized yet, and few scientific studies examine the positive and negative effects of delaying the umbilical cord cutting in newborns.

Various assumptions suggest that delayed cord clamping can increase polycythemia (Chaparro, 2011). Polycythemia is defined as an Ht level greater than 65% and occurs in about 2% -5% of full-term infants. Delayed clamping can increase the baby's hematocrit value because there is additional blood volume (Pong et al., 2022). The main concern with Polycythemia is related to blood hyperviscosity, which can increase bilirubin levels, but good blood flow allows the liver to process bilirubin more efficiently (Purisch et al., 2019).

For decades, various studies have shown that clamping the umbilical cord immediately after the baby is born will interfere with the normal physiology, anatomy and birth process. Dr. Mercer insisted the practice of immediate umbilical cord clamping is developed without considering the baby's needs and can cause the baby's blood volume to vary by 25% to 40% (Mercer, 2001). Whereas the immediate umbilical cord clamping can reduce the process of transition and contribute to hypovolemic damage, low blood volume, lack of oxygen and hypoxia in newborns, especially vulnerable infants (premature, asphyxia, LBW). This study is inseparable from limitations, where the sample taken is not homogeneous besides the small sample, so it does not represent the actual condition of postpartum mothers and newborns.

4. CONCLUSION

There is a relation between Delayed Cord Clamping and Apgar Score in newborn infants in Bandar Lampung City in 2021. In the process of childbirth, DCC action can be implemented but it is expected that the umbilical cord clamping can be undertaken immediately by looking at the condition of the infants. Further research is needed to see the influence of DCC with apgar score and bleeding incidence by considering confounding variables such as: maternal haemoglobin levels, parity, age, spasing, and time.

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