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ANXIETY MANAGEMENT METHODS THROUGH PHYSICAL ACTIVITY IN PREGNANT WOMEN: A LITERATURE REVIEW

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Abstract

Background: Anxiety and depression are the most common mental disorders in the peripartum period. Therefore, this study will examine more deeply the treatment of anxiety through physical activity in pregnant women. In Indonesia, there are 373,000,000 cases of anxiety that occur in pregnant women. A total of 107,000,000 or around 28.7% of these cases occur in pregnant women before the delivery process (RI, 2018). Therefore, this study will examine more deeply the management of anxiety through physical activity in pregnant women. **Method:** This study uses the Narrative Literature Review method, which begins with reading various relevant articles carefully, then summarizing, drawing conclusions, and identifying gaps that are relevant to the topic or research question. The article search used the following keywords: method AND managing OR reducing AND anxiety AND physical activity OR exercise OR yoga OR aerobic AND pregnant women. The inclusion criteria used in this research article are articles that discuss methods of managing anxiety through physical activity (all types of physical activity) in pregnant women. The articles used must be published in the range of 2020 to 2024 and fully accessible, and in Indonesian or English. The synthesis results found a total of 10 articles that met the inclusion criteria. **Result:** The review found that physical activity has positive benefits in reducing anxiety levels in pregnant women. Physical activity can be an effective strategy in managing anxiety through the influence of hormones and various psychosocial mechanisms. Various types of physical activity, such as moderate exercise, strength training, and yoga, can improve mood and reduce symptoms of depression and anxiety through biochemical and physiological processes. Therefore, the recommendation given by practitioners to pregnant women is to engage in moderate-intensity aerobic physical activity for at least 150 minutes per week.

keyword : SDGs, Maternal Health, Mental Health, Pregnancy, Physical Acitivity

INTRODUCTION

Expectant mothers face a variety of new difficulties and challenges. Some can adapt smoothly while others may have difficulty adjusting. This can increase the risk of mental disorders developing or even relapsing. Anxiety and depression are the most common mental disorders during the peripartum period. (Cena et al., 2021). Pregnancy anxiety is an affective state experienced by pregnant women related to anxiety about the mother's health during pregnancy, the baby's health,

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smooth labour, and future parenting (Schetter et al., 2022). It is common for women to experience mood and anxiety disorders, especially during childbearing years, and these conditions can worsen during pregnancy, so mental health problems often occur during pregnancy (Araji et al., 2020). Anxiety disorders during pregnancy and postpartum may be more common than depression, and if anxiety disorders occur during pregnancy, they often lead to postpartum depression.

Anxiety during pregnancy is associated with a history of pre-pregnancy anxiety and depression, history of abortion, history of *still birth*, history of elective abortion, unplanned or unwanted pregnancy, concerns for maternal and infant health, fear of labour, stressful life events, and changes in social support(Atif et al., 2020). This anxiety appears from the first trimester until the time of delivery, but some studies mention that the level of depression or anxiety in early pregnancy is comparable to general anxiety. Meanwhile, the level of depression or anxiety during the second and third trimester is almost double that of the first trimester (Puspitasari and Wahyuntari, 2020). Mental health during pregnancy is a worldwide health problem with a prevalence of 20% until the postpartum period. (Luo et al., 2022). A recent systematic review estimated an overall prevalence of 22.9%, with an increasing trend in each trimester (18.2%, 19.1%, and 24.6% in the first, second, and third trimesters, respectively) (Atif et al., 2020). In Indonesia, there are 373,000,000 cases of anxiety that occur in pregnant women. A total of 107,000,000 or about 28.7% of these cases occur in pregnant women before the labour process (RI, 2018).

Untreated anxiety during pregnancy is a major risk factor for developing postnatal depression, which can triple the risk. It is also associated with poor birth outcomes such as spontaneous abortion, preeclampsia, preterm birth, low infant weight, and suboptimal infant body growth. Anxiety during pregnancy can interfere with bonding between mother and child in the early postpartum period, reduce the likelihood of exclusive breastfeeding, and potentially negatively affect child development (Atif et al., 2020). Anxiety in pregnant women can trigger an increased stimulation of uterine contractions that can potentially increase blood pressure, which in turn can lead to preeclampsia and the risk of miscarriage.

Discomfort during pregnancy and anxiety towards the labour process lead to disturbed sleep patterns in pregnant women. One of the factors that cause sleep disturbances in them is the physical and emotional changes that occur during pregnancy (Rahmiyanti, Firdha; Pratama, 2023). What's more, children born to mothers who experience psychological distress during pregnancy have a higher tendency to experience cognitive, behavioural, and impaired communication skills (Luo et al., 2022).

During pregnancy, a mother is advised to keep doing physical activities such as light exercise to maintain her body condition. Physical activity has positive benefits for pregnant women, especially in reducing anxiety levels. It can reduce anxiety levels in pregnant women through the influence of hormones produced by the body (Kowalska, 2023). Physical activity is body movement that is performed using skeletal muscles and results in energy expenditure. Based on the results of the meta-analysis, it was found that physical activity has a positive impact on pregnancy including a decrease in the likelihood of depression and depressive symptoms. Recommendations given by practitioners to pregnant women focus on doing moderate intensity aerobic physical activity for at least 150 minutes per week (Cilar Budler and Budler, 2022). The connection between the beneficial effects of exercise on mental health comes from biochemical and physiological processes. These include increases in brain chemicals such as neurotransmitters and beta-endorphins, which can improve mood and spirit, as well as psychosocial mechanisms such as changes in self-esteem and behavioural activation (Cai et al., 2022).

All types of physical activity and higher intensity exercise are known to help significantly reduce levels of depression and anxiety. Shorter or intermediate intervention programmes tend to provide greater effects compared to longer programmes, although longer programmes still provide significant positive benefits. Physical activity is effective in reducing depression and anxiety in all clinical conditions, although the magnitude of benefit varies between clinical groups. Different types of physical activity, such as aerobics, strength training, mixed exercise and yoga, all had positive effects. The positive effects of physical activity on depression and anxiety are likely due to a combination of diverse

psychological, neurophysiological and social mechanisms. Resistance training had the greatest impact on depression, while yoga and other mind-body exercises were more effective in reducing anxiety (Singh et al., 2023). This *literature review* examines in more depth the management of anxiety through physical activity in pregnant women.

METHOD

This study applies a *literature review* approach, which is a synthesis of several studies selected based on the theme of managing anxiety with physical activity methods in third trimester pregnant women. The search for research articles was conducted from July to August 2024. This study used the *Narrative Literature Review* method, which begins with reading relevant texts carefully, then summarising, drawing conclusions, and identifying gaps relevant to the topic or research question. The literature search used three databases, namely Google Scholar, Springer, and Sciencedirect. The article search used the following *keywords* : *method AND managing OR reducing AND anxiety AND physical activity OR exercise OR yoga OR aerobic AND pregnant women*. This literature review uses inclusion criteria, namely articles that discuss methods of managing anxiety through physical activity (all types of physical activity) in pregnant women, then articles published in the range of 2020 to 2024, fully accessible, and in Indonesian and English. Article searches conducted through related *databases* resulted in 17,900 articles from *Google Scholar,* 1000 articles from *Science Direct,* 2,500 articles from *Springer*. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The PRISMA guidelines is used as a literature search strategy up to the selection of relevant review articles. The article search was continued with a *critical appraisal journal* and obtained 10 articles that met the requirements.

RESULT AND DISCUSSION

Write the results of the study systematically, in general, the results begin with the number and characteristics of the research subjects, followed by the main

results of the study. Presentation of research results can be done in 3 forms, namely narratives, tables, or figures. The research results refer to the list of questions (problem formulation) and hypotheses (if any). Clearly write down the hypothesis results obtained from the research. The table must be explained in the text. Rules for using tables, figures and graphs.

No	Title of Research	Author	Research Methods	Result
1	*Long-term exercise from adolescence to adulthood reduces anxiety- and depression-like behaviors following maternal immune activation in offspring*	Rahimi, Samira, et al (2020)	*True Experimental*	Long-term exercise significantly reduced anxiety-like and depressive behaviours in pre-born children exposed to maternal immune activation. It also decreased serum corticosterone levels, and increased brain levels of oxytocin and IL-10; whereas no significant changes were found in TNF-α, IL-1β, IL-6, and TNF-α.
2	*Associations of physical activity, sedentary time, and physical fitness with mental health during pregnancy: The GESTAFIT project*	Rodriguez-Ayloon et al, (2021)	*Cross Sectional*	Moderate to vigorous physical activity was negatively associated with depression (b = 0.222, adjusted ratio = 0.050, p = 0.041). Higher levels of sitting time were negatively associated with positive affect (b = 0.260, adjusted ratio = 0.085, p = 0.017). Greater upper body flexibility was positively associated with better emotion regulation (b = 0.195, adjusted ratio = 0.030, p = 0.047). Other relationships were not significant (all p > 0.05).
3	*Reduction in physical activity signifcantly increases depression and anxiety in the perinatal period: a longitudinal study based on a self-report digital assessment tool*	Haßdenteufel, K et al, (2020)	*Mix Method (Qualitative and Quantitative)*	A significant decrease in physical activity in general in the period from week 20 to week 32 of pregnancy. Expectant mothers who reported a greater decline during pregnancy showed significantly higher depression and anxiety scores. In stratified analyses, only baseline mental health score was shown to be a variable with a stronger impact on postnatal depression and anxiety outcomes.
4	The effectiveness of gentle prenatal yoga on the recovery of anxiety	Sulastri, A., et al (2021)	*True Experimental*	HARS scores in the intervention group showed that the mean rank of the pre-test was 23.75, in the mid-test was 20.00, and in the post-test was 16.00. Meanwhile, in the

No	Title of Research	Author	Research Methods	Result
	level in primigravid and multigravid pregnant women			control group, the pre-test mean rank value of 23.50, mid-test of 21.58, and post-test of 20.41 showed that the intervention group experienced a significant decrease in anxiety levels. From the Mann Whitney test results, the intervention group p = 0.001 < (, 0.05) indicates that there is a significant change
5	*The effect of pregnancy yoga exercise on reducing anxiety of pregnant woman third trimester*	Rahayu, K,D., et al (2023)	Penelitian kualitatif	This study shows that yoga intervention during pregnancy has a significant effect in reducing anxiety in third trimester pregnant women with p < 0.001.
6	*Is Prenatal Exercise with Prayer Movement Affecting Anxiety Level and Blood Pressure in Third Trimester?*	Meiranny, A., et al (2022)	*Quasy Experimental*	The results showed that there was an effect of Muslim religious prayer movements on the level of anxiety and blood pressure of third trimester pregnant women with p<0.05.
7	*The Effect of Pre Natal Exercise on Pain and Anxiety Third Pregnancy Primigravida in Sukomoro Public Health Center Magetan*	Rahmawati, E., et al (2020)	*Quasy Experimental*	The results of this study indicate the effect of pregnancy exercises on reducing low back pain and anxiety in third trimester primigravida pregnant women.
8	*The Effect Of Pregnancy Exercise On Third Trimester Primigravida Anxiety In Dealing With Childbirth*	Astuti, P.A., et al (2020)	*Quasy Experimental*	The effect of pregnant gymnastics on third trimester primigravida anxiety in the treatment group with a p value (0.000) < (0.05). There is an effect of pregnant gymnastics on the anxiety of primigravida trimester III in the face of childbirth.
9	*The Role of Yoga Exercises on the Level of Anxiety in Pregnant Women at the Bondowoso Health Center*	Hasifah, H.,et al (2023)	Penelitian kuantitatif dengan pendekatan *pre experimental study*	The results showed that the highest level of anxiety of pregnant women before being given yoga exercises was at the level of severe anxiety (50%) and the anxiety level of pregnant women after being given yoga exercises was mostly at the level of moderate anxiety (63.3%). And the results of the analysis show a 2-tailed value of 0.000 which means there is an effect of yoga exercises on the anxiety level of pregnant women.
10	*The Role of Yoga Exercises on the Level of Anxiety in Pregnant Women*	Sriyoko, H, D., (2022)	*Quasy Experimental*	The effect of pregnant gymnastics on third trimester primigravida anxiety in the treatment group with a p

No	Title of Research	Author	Research Methods	Result
	at the Bondowoso Health Center			value (0.000) < (0.05). There is an effect of pregnant gymnastics on the anxiety of primigravida trimester III in the face of childbirth. The results showed a significant effect on the intervention group after gentle prenatal yoga. This study shows that there is an effect of gentle prenatal yoga on the anxiety level of third trimester pregnant women facing childbirth.

Women, especially those of childbearing age, often experience mood and anxiety disorders disproportionately, and mental health problems often worsen or emerge during pregnancy (Araji et al., 2020). Pregnancy triggers various physiological changes that impact the cardiovascular, hormonal and metabolic systems of the mother. Pregnancy is also commonly regarded as a period that increases the risk of mental disorders in women. Around 7% to 15% of women experience mental disorders during pregnancy (Rodriguez-Ayllon et al., 2021). Pregnant women need to be able to adapt to the pregnancy process. Anxiety is one of the factors that can hinder the achievement of optimal adaptation during pregnancy (Rahayu et al., 2023). Approximately 15-20% of pregnancies are considered high-risk, where the pregnancy faces one or more serious conditions that may affect the outcome of the pregnancy and/or the condition of the foetus. High-risk pregnancies can exacerbate the stress that normally occurs during pregnancy, increasing anxiety and risk in a worsening cycle. Concerns during pregnancy are usually also related to several things, such as the wellbeing of the foetus, the mother's health condition, social and financial support, and the possibility of death (Araji et al., 2020)

Pharmacotherapy is the most frequently used treatment method for depressed patients, although most antidepressants have shown negative effects on the foetus in animal studies. Previous meta-analyses revealed that the effectiveness of antidepressants in treating depression in pregnant women is unclear. Antidepressant substances may have adverse effects on the foetus, non-pharmacological treatments, such as psychotherapy, music therapy and exercise, appear to be safer options to treat depression during pregnancy (Lin et al., 2022).

Much evidence suggests that exercise can reduce symptoms of clinical depression, including anxiety, in the general population (non-pregnant mothers). According to research conducted by Belvederi Murri and colleagues (2019), exercise has an effective antidepressant effect, especially if done regularly (e.g., 3 sessions per week for 12-24 weeks) (Jarbou and Newell, 2022). In recent years, there have been suggestions that physical activity (i.e. any body movement that increases energy expenditure beyond basal metabolic rate) may be associated with better mental health during pregnancy (Rodriguez-Ayllon et al., 2021). Physical activity plays an important role in preventing adverse birth outcomes for the mother and foetus, including preeclampsia, gestational diabetes, unnatural weight gain during pregnancy, premature birth, and mental disorders (Haßdenteufel et al., 2020).

Recent guidelines from the *American College of Obstetricians and Gynaecologists* (ACOG) recommend a minimum of 30 minutes of exercise most days of the week for pregnant women, provided there are no medical or obstetric complications ('Committee Opinion No. 650: Physical Activity and Exercise During Pregnancy and the Postpartum Period', 2015). This advice is in line with the general recommendation for adults to do 150 minutes of moderate-intensity aerobic activity as per current US and WHO guidelines, given that physical inactivity is one of the major risk factors for premature death globally. However, pregnant women usually do not follow this recommendation and tend to have a less active lifestyle. In addition, physical activity levels in general often decrease significantly during pregnancy (Haßdenteufel et al., 2020).

Pregnancy is a good time to start exercising, as it is associated with increased motivation to maintain or start a healthy lifestyle, and increased frequency of visits to the doctor, which facilitates physical exercise monitoring. Engaging in regular physical exercise during pregnancy is associated with various benefits, such as reduced risk of gestational diabetes, hypertensive disorders, operative delivery, excessive weight gain and weight retention after delivery, as well as postpartum depression, etc (Ribeiro et al., 2022). Some common physical activities during pregnancy include walking, pregnancy exercises, and pregnancy yoga (Astuti et al., 2021).

Aerobic exercise, lumbar stabilisation and stretching, water exercise, nerve and tendon slippage exercises, resistance training, and strength training have been reported to benefit the health and well-being of pregnant women. For all of these types of exercise, it is recommended that activities are performed at a moderate intensity during pregnancy (Cilar Budler and Budler, 2022). Participation rates in physical activity among pregnant women vary depending on different studies and geographical locations. Most studies show that pregnant women generally engage in low-mobility activities (such as sitting or housework), as well as walking, jogging, aerobics and floor exercises (Okafor and Goon, 2020). One of the common physical activities done by pregnant women is yoga.

Physical activities that are widely practised by pregnant women are yoga and pregnancy exercises. Yoga has become a popular sport around the world. Combining postures, breathing, and meditation, yoga is associated with improved health and body awareness. Various scientific literatures have confirmed the benefits of yoga, such as improved health as well as therapeutic effects on illness, depression, stress, and anxiety. Yoga seems to be more suitable for pregnant women than other physical activities due to the low intensity of the exercise (Lin et al., 2022). Evidence suggests that yoga during pregnancy is safe, practical and well received by pregnant women, and may offer greater benefits than walking and standard prenatal exercises for physical and mental health. Yoga is also thought to provide an opportunity for pregnant women to improve their health and strengthen their relationship with their baby. Two randomised control trials (RCTs) on yoga during pregnancy reported that yoga can reduce levels of pain, stress, anxiety and depression. (Corrigan et al., 2022).

In an initial study conducted by Astuti (2021), it showed that five primigravida pregnant women in their third trimester felt more relaxed after participating in pregnancy exercises, while one pregnant woman who did not participate in pregnancy exercises experienced moderate anxiety due to anxiety and fear of facing childbirth (Astuti et al., 2021). It was found that there was a decrease in the number of pregnant women who experienced severe anxiety, which was due to the fact that pregnant women who participated in pregnancy exercises felt more prepared for childbirth. The benefits of pregnancy exercises include increased

oxygen flow to the baby, maintenance of elasticity of the abdominal wall muscles, reduction of tension or pain due to pregnancy, management of complaints related to body shape changes, improved blood circulation, and acceleration of the recovery process after childbirth (Rahmawati et al., 2020)

Research conducted by Meiranny et al (2022) raised the theme of the effect of physical activity in prayer on the anxiety level of pregnant women. Prayer is an obligation for every Muslim who is eligible to perform it. Every movement in prayer has many benefits in terms of health and can have a therapeutic effect on the body. Performing prayer movements perfectly and correctly, the organs of the body can become healthier because prayer has a calming effect and provides relaxation, which can improve blood circulation and make the muscles in the body more relaxed. The results showed that the movement of pregnant gymnastics had an impact on anxiety and blood pressure of pregnant women in the third trimester ($p<0.05$). This study concludes that pregnancy exercises, including prayer movements, are effective in reducing anxiety levels and lowering blood pressure in third trimester pregnant women (Meiranny et al., 2022).

Physical activity has a significant effect in reducing anxiety in pregnant women. It can lower anxiety levels, especially during the pandemic, by reducing the stress and pressure that pregnant women face. Physical activity can improve sleep quality, which is often disrupted by anxiety and physical changes during pregnancy. Pregnant gymnastics and prenatal yoga, for example, can provide a steady relaxation effect, helping to reduce tension, anxiety, and depression during pregnancy, as well as increase calmness and focus. By engaging in regular and routine physical activity, pregnant women can minimise the effects of physical and emotional changes, such as cramps, oedema, and mood swings, which in turn helps to reduce pregnancy-related complaints and anxiety. Thus, physical activity plays an important role in reducing anxiety in pregnant women through various mechanisms, including stress reduction, improved sleep, relaxation, and readiness for labour. (Görücü et al., 2021).

CONCLUSION AND SUGGESTION

Physical activity plays a significant role in reducing the anxiety levels of pregnant women. A review revealed that exercise can improve hormonal balance, reduce stress, and improve sleep quality, all of which contribute to reduced anxiety. Physical activity can also improve skills and confidence, which are crucial for pregnant women in facing the challenges of pregnancy and labour. In an effort to improve the mental and physical health of pregnant women, regular and controlled physical activity is recommended. Pregnancy gymnastics and prenatal yoga can be an ideal choice as they can provide a stable relaxing effect on emotions, improve sleep quality, and minimise the effects of physical and psychological changes experienced during pregnancy. A doctor's consultation before starting a physical activity programme is essential to ensure its safety and effectiveness. A physical activity programme can help improve the mental and physical health of pregnant women, and prepare them to be healthy and happy parents.

DECLARATION

Conflict of Interest

The authors confirm that there are no conflicts of interest to disclose.

Authors' Contribution

NINP and RO collected the data and drafted the manuscript. RA critically reviewed and edited the original manuscript. All authors contributed significantly to the research, analysis, and writing of this article. Author designed the study and supervised data collection, performed statistical analysis, andcontributed to data interpretation and manuscript preparation. All authors revised the manuscript and approved the final version.

Ethical Approval

This study did not use Ethical Approval

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Data Availability

All data discussed in this study are included in the manuscript. The analyzed datasets can be obtained from the corresponding author upon reasonable request.

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SYSTEMATIC REVIEW: THE RELATIONSHIP BETWEEN MOTHER'S AGE AND HYPERTENSION IN PREGNANCY

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ABSTRACT

Background: The high maternal mortality rate is caused by a high risk of pregnancy. High risk is a condition that can endanger the mother and fetus and is associated with pregnancy, childbirth and the puerperium. 90% of maternal deaths are caused by obstetric risk complications and increasing 15% in mothers who have risk factors. Hypertension in pregnancy is a high risk for pregnant women and can be caused by several risk factors. Several risk factors of hypertension in pregnancy are age, history of hypertension, family support, and stress levels. The purpose of this study was to determine the relationship between maternal age and the incidence of hypertension in pregnancy. **Method:** This research is a systematic review with inclusion criteria are Indonesian journal from 2020 – 2022, full article, and open access. Researchers will exclude any other journal not in Indonesian or English, not an open acces article and not a research study of mother's age and hypertension in pregnancy. This research is a literature study using descriptive method and conducting journal searches on several scientific websites with keywords relationship, factors, age, and hypertension in pregnancy. **Results:** Based on a literature study of the 5 journals found, it was found most of the mothers are at risk of experiencing hypertension in pregnancy. Age at risk is more susceptible to experiencing hypertension in pregnancy, it is caused by the development of reproductive organs that are not optimal enough in mothers who are too young and degenerative processes in old mothers**.** **Conclusion**: Age at risk or < 20 years and > 35 years has a significant relationship with hypertension in pregnancy.

Keywords: relationship, age, hypertension in pregnancy

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INTRODUCTION

In Indonesia, maternal and child health problems are still one of the main problems in the health sector (Dyan et al., 2022). World Health Organization (2023), has stated the maternal mortality rate in the world has reached 303,000, while in ASEAN it is 235 per 100,000 live births. The maternal mortality rate in Indonesia significantly increasing, in 2019 it reached up to 4,221 cases of death, in 2020 it became 4,627 cases of death and increase in 2021 to 7,389 cases of death. In 2019 the maternal mortality rate reached 89.81 per 100,000 live births in East Java. In 2020 the maternal mortality rate has increased by 98.39 per 100,000 live births while in 2021 it is increasing to 234.7 per 100,000 live births (Dinas Kesehatan Provinsi Jawa Timur, 2021). The maternal mortality rate is one of the global Sustainable Development Goals (SDGs) targets in reducing the MMR to 70 per 100,000 live births by 2030 (Ministry of Health, 2019). 80% of deaths of pregnant women in the world are caused by bleeding (25%), hypertension in pregnant women (12%), obstructed labor (8%), abortion (13%), and other reasons (7%) Fajri & Sari (2019). Cases of maternal death caused by hypertension in pregnancy in 2019 amounted to 1,066 cases of death, then increased in 2020 to 1,110 and decreased in 2021 to 1,077 cases (Profil Kesehatan Indonesia, 2021).

One of the causes of maternal death is by high-risk pregnancies. High risk is a condition that can endanger the mother and fetus and is also associated with pregnancy, childbirth and the postpartum period (Brauthal & Andrei, 2019). 90% of maternal deaths are caused by obstetric complications and increasing 15% in mothers who have risk factors (Rangkuti & Harahap, 2020). Pregnancy hypertension is one of the high risks in pregnancy which is a cause of maternal and fetal death worldwide (Kemenkes RI, 2019). Hypertension in pregnancy is the second highest cause of maternal death in East Java. Hypertension is a condition of high blood pressure reaching ≥140/90 mmHg (Johnson et al., 2020). Hypertension in pregnancy can be classified into several based on the ISSHP, namely, chronic hypertension, gestational hypertension, white coat hypertension, masked hypertension, preeclampsia, and severe preeclampsia. Possible impacts on mothers with hypertension are kidney disease, HELLP syndrome, liver failure, cesarean section delivery, placental abruption, and death (Malha et al., 2018). The impact of hypertension not only attacks the mother but also the fetus. The impact that can be caused is 17% in the form of fetal death and 34% in low birth weight (LBW) (Hans & Ariwibowo, 2020).

Basri et al., (2018) and Fajri & Sari (2019) said that several risk factors for hypertension in pregnancy are age, history of hypertension, stress, and weight gain. Rahmawati et al., (2022) said that most mothers who experience hypertension in pregnancy are of a risky age. Mothers aged < 20 years and > 35 years are at risk of experiencing complications during their pregnancy. Age at risk has 4 times greater chance of experiencing hypertension in pregnancy compared to age not at risk. Efforts to reduce maternal mortality have been carried out for a long time, one of which is by providing quality health services such as health services for pregnant women and referrals for complications and high risks. Mothers with high risk are likely to experience emergency conditions during pregnancy and childbirth (Sudaryanti et al., 2023). This research aims to focuses on the relationship between maternal age and the incidence of hypertension in pregnancy.

METHOD

This research is a systematic review using Critical Appraisal Checklist from The Joanna Briggs Institute (JBI) to screened journals on Google Scholar, Science Direct, and several other scientific sites. The keywords used in the search were relationships, factors, age, and hypertension in pregnancy. Inclusion criteria are Indonesian and English journal from 2020 – 2022, full article, and open access. Researchers will exclude any other journal not in Indonesian or English, not an open access article and not a research study of mother's age and hypertension in pregnancy. In the initial stage of literature search, 15 journals were found which were then filtered based on inclusion and exclusion criteria. The filtered search results were selected using the CAC instrument and 5 journals were obtained and arranged based on journal title, author, year of publication, research instrument, and results.

RESULT AND DISCUSSION

Table 1. Relationship between Maternal Age and Hypertension in Pregnancy

No	Title	Authors	Year	Method	Result
1	Factors Associated with the Incidence of Hypertension in Pregnant Women in the Working Area of the Payung Sekaki Public Health Center, Pekanbaru City.	Muhammad Musthofa Hilmi, Riri Maharani, Yesica Devis	2021	This research is using observational analytic with cross sectional design with a sample of 74 people taken by consecutive sampling. Data analysis was performed univariately and bivariate with the chi-square statistical test.	The results of the study is the p value of 0.046 < α 0.05 which means that there is a relationship between age and the incidence of hypertension in pregnant women.
2	Relationship between Age and Parity with the Incidence of Hypertension in Pregnant Women at the Rajabasa Indah Health Center.	Rosy Yurianti, Mareza Yolanda Umar, Psiari Kusuma Wardhani, Feri Kameliawati	2020	In this study the method used was cross sectional with a total sample of 939 people taken by total sampling technique. The analysis used is the chi-square test.	Based on the results of statistical tests, it was obtained that the p value was 0.000 which has a value less than 0.05. It can be seen there is a relationship between maternal age and the incidence of hypertension in pregnant women.
3	Relationship between high risk of pregnant women's age and the incidence of hypertension in pregnancy at the Batu Aji Health Center.	Siti Husaidah, Nurbaiti	2020	This study uses an observational analytic design with cross sectional. The sampling technique was purposive sampling with a total sample of 59 people. Analysis in research using chi-square test.	The statistical test resulted in a p value of 0.03 <α 0.05 which means there is a relationship between age at risk and the incidence of hypertension in pregnancy.
4	The Relationship among Age and Parity with the Incidence of Hypertension in Pregnant Women in Grinting Village, Bulakamba Sub-*District, Brebes Regency*.	Susy Sriwahyuni, Darmawan, Lili Eky Nursia N, Arif Iskandar, Khairunnas	2020	The design used in this research is observational analytic with cross sectional approach. The sampling technique used purposive sampling and a total sample of 49 people. Research analysis using the chi-square test.	The results of the study showed that 29 mothers with gestational hypertension were at risk and 20 others were not at risk. The statistical test obtained a p-value of 0.002 <α 0.05, which means there is a relationship between maternal age and the incidence of pregnancy hypertension.
5	Analysis of Risk Factors for Hypertension in Pregnancy in Third Trimester Pregnant Women at the Cempaka Health Center, East Oku Regency.	Diana Rahmawati, Suprida, Turiyani	2022	This study used an analytic survey method with a cross sectional approach. The sample used in this study was 51 taken using systematic random sampling. Data analysis was tested using the chi-square test.	The results in the study found a p value of 0.044 <α 0.05. It was statistically proven that there was a relationship between age at risk and the incidence of hypertension in pregnancy.

Based on table 1, there are 5 literature studies with the results that maternal age has a significant relationship with the incidence of hypertension in pregnancy. Hypertension in pregnancy is included in the high risk category in pregnancy and is one of the causes of maternal death in the world, several other causes are bleeding, infection, and others. Hypertension in pregnancy contributes greatly to maternal and perinatal morbidity and mortality, causing 30,000 maternal deaths annually at the global level (Nath et al., 2021). According to the World Health Organization, the prevalence of hypertension is 22% of the world's population and Southeast Asia is in third position with a prevalence of 25% of the population. In Indonesia, cases of maternal death with hypertension in pregnancy are the second highest cause of maternal death after bleeding (Kemenkes RI, 2019).

In the first research journal conducted by Hilmi, Maharani & Devis, (2021) the results of bivariate analysis found a p value of 0.003 <α 0.05, which means there is a relationship between age and the incidence of gestational hypertension. Maternal mortality in mothers aged <20 years increased 2-5 times compared to mothers aged 20-30 years. Maternal mortality has again increased in women aged > 35 years. The International Society for the Study of Hypertension in Pregnancy explains that hypertension in pregnancy is an increase in blood pressure ≥140/90 mmHg and can be chronic and occurs before pregnancy or after 20 weeks of gestation. Hypertension in pregnancy can be classified into chronic hypertension, gestational hypertension, white coat hypertension, masked hypertension, preeclampsia, and severe preeclampsia. Severe preeclampsia is the highest cause of complications to death in the hypertension group in pregnancy (ISSHP, 2018). The cause of hypertension in pregnancy is currently not known with certainty, but there are several theories that explain the occurrence of hypertension in pregnancy (Prawirohardjo, 2016). Risk factors for hypertension in pregnancy include maternal age, gravida, parity, history of hypertension, and obesity. Basri et al, (2018) added that apart from age, risk factors for hypertension in pregnant women include family support, stress levels, and weight gain. Hypertension in pregnancy can have an impact on the mother and fetus. The possible impacts on pregnant women with hypertension are hemorrhage, liver damage, HELLP syndrome, cesarean section delivery, preterm birth, growth disorders, and fetal death (Malha et al., 2018).

The same results were found by Yurianti et al., (2020) in the second journal. Pregnant women with advanced maternal age are at greater risk of experiencing hypertension. The results of data analysis in this study obtained an OR value of 3.934 which means that mothers aged <20 years and > 35 years are 3.934 times more at risk of suffering from hypertension in their pregnancy. A person's age can anticipate health problems and actions to be taken. Ndiaye et al., (2020) said that teenage pregnancies and pregnancies of elderly mothers have a high risk of experiencing complications for the mother and her baby. Mothers who suffer from hypertension in pregnancy have the potential to experience hypertension in subsequent pregnancies. Mothers who are too young have a greater risk of experiencing hypertension in pregnancy. This is due to the age that is too young, the development of the reproductive organs is not optimal, while at an age that is too old it can cause complications (Yurianti et al., 2020). High blood pressure in mothers aged <20 years can be caused by contraction of the arteriole blood vessels which have decreased and headed for important organs in the body resulting in metabolic disorders and blood tissue disorders (Sulastri, 2021). In mothers aged > 35 years, hypertension in pregnancy can be caused by a degenerative process that causes structural and functional changes in the peripheral blood vessels which are responsible for regulating changes in blood pressure. Structural and functional changes cause the lumen to become narrow and the walls of blood vessels to become more rigid, therefore there is an increase in systolic blood pressure (Astuti, Husain and Sujawaty, 2022; Mutmainnah & Malka, 2021).

In the third journal, it was found that 29 pregnant women were at risk and 10 pregnant women were not at risk of suffering from hypertension in pregnancy. The P value in this study was 0.003 < α value of 0.05. The results of the bivariate analysis showed that there was a significant relationship between maternal age and the incidence of hypertension in pregnancy. Mothers aged < 20 years and > 35 years are 2 times more at risk of experiencing hypertension in pregnancy compared to those who are not at risk. Maternal age is an important part of reproductive status. Age is closely related to an increase or decrease in one's bodily functions. The best age for a mother in pregnancy or giving birth is at an age that is not at risk, namely 20-35 years. This is because at that age the uterus and other body parts are ready to

accept pregnancy so that when the mother is 20-35 years old, the mother has the least risk of complications (Astuti, Husain & Sujawaty, 2022). Complications in pregnancy that may be experienced by women of at-risk age are preeclampsia, gestational diabetes, low birth weight, premature birth, and miscarriage.

The fourth journal out of 49 pregnant women, 29 of them are at risk and 20 other mothers are not at risk. Most of the mothers who experienced hypertension in pregnancy were at risk age and the p-value was 0.002 <0.05 which indicated that there was a relationship between maternal age and the incidence of hypertension in pregnancy. According to Lopian, Kashani-ligumsky & Many (2023), there are still many elderly pregnant women affected by social and cultural advances in women's rights to delay pregnancy, as well as increased access to contraception and legal abortion. The term advanced maternal age is used for mothers who are > 35 years old at the time of delivery. When an elderly mother gives birth, this can increase the risk of chromosomal abnormalities and miscarriage. It also allows mothers to experience gestational diabetes, premature birth, stillbirth, preeclampsia, to morbidity and mortality in both mother and baby. The prevalence of hypertension in pregnancy is expected to increase based on the growing trend of delaying pregnancy in the world.

The fifth journal also found the relationship between age at risk and the incidence of hypertension in pregnancy which was statistically proven with a p value of 0.044 < α 0.05. The OR value in the statistical test was 4.722 which means that aged <20 years and > 35 years have a 4 times greater chance of experiencing hypertension in pregnancy. Mothers who experience hypertension in pregnancy have the potential to have offspring with cardiovascular health problems, neurodevelopment, mental health, metabolism, behavior, and the risk of death in the future. Offspring born to mothers who suffer from severe preeclampsia are at risk of dying more than 6 times compared to those who do not. Therefore, it is important for pregnant women with hypertension in pregnancy, especially severe preeclampsia, to get proper management during their pregnancy (Huang et al., 2022). Researchers believe that reproductive organs at risk ages that are not fully ready or have experienced decreased function are factors that cause hypertension in pregnancy.

The high maternal mortality rate caused by hypertension in pregnancy encourages the government to create various programs with the aim of reducing maternal mortality. Good management for pregnant women with hypertension in pregnancy is monitoring the mother's blood pressure during pregnancy and administering antihypertensive drugs (Huang et al., 2022). Handling of hypertension in pregnancy can be done by pharmacological and non-pharmacological methods. Pharmacological treatment can be carried out by giving antihypertensive drugs while non-pharmacological treatment can be carried out by means of Dietary Approaches to Stop Hypertension, namely reducing sodium consumption, avoiding smoking, alcohol consumption, and controlling stress levels (Sulastri, 2021). Healthy lifestyles such as exercising regularly and losing weight for obese mothers can help reduce the risk of hypertension in pregnancy (Ogunwole et al., 2021). Chronic hypertension is a risk factor that plays a role in the development of preeclampsia. Based on the results of the CHAP (Control of Hypertension in Pregnancy) trial, it was found that chronic hypertensive patients with blood pressure ≥140/90 mmHg who were given antihypertensive drugs had a 20% reduction in the risk of developing preeclampsia (Lopian, Kashani-ligumsky & Many 2023). Antenatal examinations during pregnancy are required at least 6 visits with distribution of 2 times in the first trimester, 1 time in the 2nd trimester, and 3 times in the third trimester. This needs to be done to detect risk factors, prevent and treat complications (Kementrian Kesehatan Republik Indonesia, 2021).

CONCLUSION AND SUGGESTION

Hypertension in pregnancy is one of the high risks during pregnancy and is a cause of maternal death. Age at risk or < 20 years and > 35 years has a significant relationship with hypertension in pregnancy. Routine antenatal checks, blood pressure monitoring, and appropriate treatment are needed to treat hypertension in pregnancy and prevent complications

DECLARATION

Conflict of Interest

This study has no conflicts of interest.

Authors' Contribution

All contributors were involved in every stage of the study, from the initial concept to the drafting of the article, so collaborative efforts were required in this study.

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Data Availability

In this part, data supporting the research findings are available upon request.

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PARENTING PREPARATION EDUCATION IMPROVES SELF EFFICACY IN PREGNANT WOMEN

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Abstract

Background: In Indonesia, 42.3% of pregnant women have low self-efficacy and 68.7% women are not physically and knowledge-wise ready to become mothers. Willingness to become parents is very important to create a better future generation. Education with audio-visual media is preferred and easy to understand. This study aims to determine the effect of education on preparation for becoming parents on the self-efficacy of pregnant women. **Method:** The design of this study was a quasi-experimental design with a pre-test post-test non-equivalent with control group design approach, which was conducted at the Songgon Health Center Banyuwangi, Indonesia in June 2024. The sample size consisted of 36 people selected through purposive sampling. The subjects of this study, pregnant women who met the inclusion and exclusion criteria, were divided into two groups: the intervention group (18 respondents), which received educational animated videos on parenthood preparation, and the control group (18 respondents), which received standard ANC interventions. Self-efficacy was measured using the Maternal Self-Efficacy in Parenting Preparation questionnaire. The statistical analysis was conducted using *the Mann-Whitney* and *Wilcoxon* tests. **Result:** The average increase in self-efficacy in the intervention group was greater than in the control group (10.72> 5.50). The results of the statistical test showed a p-value of 0.019 (p <0.05), namely there was an effect of education on preparation for becoming parents on the self-efficacy of pregnant women. **Conclusion:** Education about preparing to become parents using animated videos can be applied during pregnancy classes or during antenatal care.

keyword: education; parenting preparation; self-efficacy; pregnancy

INTRODUCTION

Parenthood is a journey that requires thorough psychological, emotional, and physical preparation.(Raphael-Leff, 2018; Sanders et al., 2022) This preparation is not only important for couples who will have children, but it is also very crucial for pregnant women who will experience significant changes in their lives.(Alizadeh-Dibazari et al., 2024; Bäckström et al., 2021) One of the important factors that affect the readiness of pregnant women is the level of self-efficacy, which is self-confidence in managing the role of a mother and overcoming challenges in caring for the baby.(Amaliya et al., 2023; Permatasari et al., 2021) High self-efficacy can make it easier for mothers to cope with stress, improve parenting skills, and support the welfare of mothers and babies during pregnancy

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and postpartum.(Tognasso et al., 2022) The study showed that as many as 42.3% and 63.7% of the 383 mothers were not physically and knowledgeably ready to be mothers-to-be. Meanwhile, as many as 68.7% of mothers are not physically and knowledgeable to become mothers-to-be.(Nedra et al., 2016) Another study conducted by Fitria et al. stated that 41.3 – 54% of mothers have low self-efficacy in parenthood.(Fitria et al., 2021)

Low self-efficacy in pregnant women shows that mothers are not ready to become parents, while from the beginning of pregnancy they need to prepare themselves to become parents. Many pregnant women tend to lack confidence in being able to take care of their babies and are not sure that they can be good mothers for their babies.(Oktaviani et al., 2022; Wardani et al., 2017) The low self-efficacy of pregnant women is one of the reasons for a lack of knowledge.(Shorey & Lopez, 2021) The lack of classroom intervention for pregnant women in health services in antenatal examinations is suspected to cause a lack of knowledge of pregnant women. Pregnant women with high knowledge allow them to have high self-efficacy so that later they will have better abilities in doing their duties as parents.(Márk-Ribiczey et al., 2016; Shorey and Lopez, 2021) Lack of awareness of motherhood and inadequate care for mothers and babies are two of the most important factors in maternal rejection.(Bojczyk et al., 2018)

In this era, technology offers many opportunities to expand knowledge and skills. Animated videos are one of the effective media to convey information and education. Animated videos have the advantage of conveying messages in an attractive, interactive, and easy-to-understand manner, especially for those who need a simple but meaningful presentation of information.(Aisah et al., 2021; Julita and Purnasari, 2022) The use of animated videos as an educational tool in preparation for parenthood is expected to increase pregnant women's understanding of various important aspects related to pregnancy, childbirth, baby care, and their role as parents.(Haryanti et al., 2023; Virani et al., 2021)

Various studies show that good education can strengthen the role of pregnant women in caring for themselves and their babies, as well as reduce anxiety and stress levels.(Çankaya and Şimşek, 2021; Downer et al., 2020) Animated videos, with their attractive and informative designs, have the potential to improve pregnant

women's self-efficacy by providing a clear and realistic understanding of what to expect during pregnancy and after childbirth.(Asih et al., 2023; Çankaya and Şimşek, 2021) This helps pregnant women be more confident in undergoing pregnancy and welcome the birth of their baby.(Wallace et al., 2023) However, although a lot of information about pregnancy is available in various media, in fact there are still limitations in how to communicate this information in order to effectively reach all levels of society, namely the lack of education about preparing to become parents in the form of animated videos. Therefore, it is important to further explore the effect of animated video-based education on increasing the self-efficacy of pregnant women. This study aims to determine the effect of parenthood preparation education with animated videos on the self-efficacy of pregnant women, which in turn can support their readiness to undergo the role of mother.

METHOD

This type of research was a quasi-experiment with a *pre-test and post-test approach non-equivalent with control group design,* which was conducted at the Songgon Health Center Banyuwangi, Indonesia in June 2024. The sample of this study consisted of primigravida pregnant women who met the inclusion and exclusion criteria through purposive sampling. The inclusion criteria included primigravida pregnant women who were willing to be respondents and follow the research process until completion by signing *informed consent,* owned a *smartphone*, had access to *WhatsApp* and *YouTube,* were pregnant from a legal marriage, and had a living husband. Meanwhile, the exclusion criteria included pregnant women with mental disorders, blindness/speech impairment, those who were multigravida. The sample size formula in this study used a power test of 90% ($Z\beta = 1.28$), a confidence level of 95% for the two-way hypothesis ($Z\alpha = 1.96$), a combined standard deviation of 0.7, and *an effect size* (X1-X2) of 0.8, and a 10% drop out anticipation for two groups of independent (numerical) data. As a result, 18 pregnant women were included in each group, making a total of 36 pregnant women.

Gambar jepretan layar video animasi parenting preparation. Durasi video 10 menit.

Figure 1. Animated Video "*Parenting Preparation*"

The subjects of this study were divided into two groups: the intervention group (18 respondents), which received an intervention in the form of educational animated videos on parenthood preparation, and the control group (18 respondents), which received standard ANC interventions. The educational animation video on parenthood preparation was developed by researchers in collaboration with experts and consisted of three themes: physical preparation for pregnancy, child care, and basic children's rights, with a duration of 10 minutes. In the intervention group, on the first day, participants took a pre-test. On the third day, they were given an educational video link via WhatsApp. On the fifth day, the researcher reminded the pregnant women to watch the educational video again. On the seventh day, the video was played offline, followed by a questions-and-answers (feedback) session, and finally, a post-test was conducted. Meanwhile, the control group received standard ANC interventions and also underwent both pre-tests and post-tests.

Self-efficacy measurements were conducted before the intervention (pre-test) and after the intervention (post-test) in both the intervention and control groups using *the Maternal Self Efficacy in Parenting Preparation* questionnaire. The questionnaire was developed by the researcher and consisted of 20 statement items. The questionnaire had three indicators: the degree of task difficulty (*magnitude*) in statement items 1-8, strength in statement items 9-14, and generality in statement items 15-20. Each statement item had four answer choices: strongly disagree (score 1), disagree (score 2), agree (score 3), and strongly agree (score 4). The total score from the 20 statement items represented the self-efficacy level of pregnant women, categorized as good (61-80), moderate (41-60), and poor (<40). The validity test

results showed that all 20 statement items were valid, as the calculated r-value was greater than the table r-value. Meanwhile, the reliability test revealed that Cronbach's alpha for this variable was higher than the baseline value (0.9 > 0.60), confirming that all 20 items were reliable. The data normality test results indicated that the data were not normally distributed; therefore, the statistical analysis was conducted using *the Mann-Whitney* and *Wilcoxon* tests. Statistical analysis was performed using SPSS version 25 software.

RESULT AND DISCUSSION

Based on table 1, the two research groups were mostly 20-35 years old, the youngest subject was 18 years old and the oldest was 35 years old. At that age, a person has begun to reach maturity in the thinking process so that it will increase his or her efficacy. Based on education level, both groups are mostly high school, while in terms of employment, most are not working and daily do work as housewives, teachers, and private employees.

Table 1. Characteristics of the Research Subject

Characteristic	Intervention n = 18 (%)	Control n = 18 (%)
Age (years)		
<20	1 (5,6)	0 (0)
20-35	17 (94,4)	18 (100)
>35	0 (0)	0 (0)
Education		
Elementary-Junior High School		
High school	0 (0)	4 (22,2)
College	17 (94,4)	14 (77,8)
	1 (5.6)	0 (0)
Work		
Work	1 (5,6)	1 (5,6)
Not working	17 (94,4)	17 (94,4)

Source: Primary Data May 2024

The results of data analysis (table 2) showed that between the intervention group and the control group before the intervention was given, comparable data was obtained, namely p-value 0.787 (p>0.05), based on a comparison of the average self-efficacy pre-test of the intervention group and the control group. The comparison of each group showed that there was a difference in the average self-

efficacy between before and after the provision of parenthood preparation education, which was *a p-value* of <.001. Meanwhile, in the control group, it was also found that there was a difference in the average self-efficacy between before and after the administration of the ANC standard, which was *a p-value* of <.001. However, the average increase in self-efficacy in the group that received the parenthood preparation education intervention with animated videos was higher than that of the group of mothers who did not receive education or only the ANC standard (10.72>5.50). The results of the statistical test comparing the average self-efficacy after providing education to the intervention and control groups were p=0.019 (p<0.05) showing that there was an effect of providing education to prepare for parenthood with animated videos on the self-efficacy of pregnant women.

Self-efficacy	Groups		*p-value**
	Intervention n=18	Control n=18	
Pre-Test			
Mean (SD)	45.28 (9.19)	44.67 (8.87)	
Median	48.50	46.00	0.787
Min-Max	34-62	34-62	
Post-Test			
Mean (SD)	56.00 (7.76)	50.17 (7.76)	
Median	55.00	51.50	0.019
Min-Max	39-65	36-64	
Increased self-efficacy	10.72	5.50	
p-value	<.001	<.001	

Table 2. Self-efficacy in both groups
Source: Primary data processed May 2024
*Mann Whitney, ***Wilcoxon*
Description: SD = Standard Deviation

During the 7 days of the intervention, both in the intervention group and the control group, there were no respondents who dropped out. In this study, the provision of parenthood preparation education to pregnant women in the third trimester 3 times for 7 days was proven to increase self-efficacy by 10.72. The increase in self-efficacy in this study is more than the research of Suratmi, et al. that self-efficacy in pregnant women after providing parenthood readiness education in primigravida increased by 7.47 from 34.29 to 41.76. This result can be caused by differences in the questionnaires used and the method of providing education. In

this study, the questionnaire used was *Maternal Self Efficacy in Parentig Preparation*, while in the Suratmi study, et al. used the *Maternal Self Efficacy* questionnaire. In addition, the method of providing education in this study uses animation and face-to-face video media, while in Suratmi's research, et al. use face-to-face and discussion methods.(Suratmi and Mariani, 2023)

The influence of providing education to prepare for parenthood with animated videos supports the statement that one of the strategies to change behavior (self-efficacy) is to provide information to increase knowledge so that awareness can arise and finally a person will behave according to his knowledge. Knowledge is gained by sensing something. Sensing occurs through the five senses, namely sight, hearing, smell, taste and touch.(Darsini et al., 2019; Farmer et al., 2022) In addition, audio-visual media received a very good category in providing health education.(Aisah et al., 2021) Exposure to parenthood preparation education using animated videos can affect the readiness of primigravida mothers in preparing to become parents from the time of pregnancy. This is because animated video media is more effective in providing a deeper understanding of what will happen during pregnancy, how to maintain health, and how to take care of the baby after birth as a parent.

This research has several advantages. As far as the researcher's knowledge, this is the first research that uses animated video media on the topic of preparing to become a parent and is in line with the current 4.0 and 5.0 era in the use of information technology. However, there are some limitations to this study. First, an educational video has been given to the respondents, but in the second iteration the researcher could not confirm that the respondents actually saw the video. Nevertheless, the researcher still reminded respondents to access the animated video. In addition, the sample size for this study was limited, and all participants were from one location, so it may not be accurate in reflecting its benefits in a wider population (in other areas).

CONCLUSION AND SUGGESTION

The provision of intervention in the form of education to prepare for parenthood with animated videos is one of the efforts to increase the self-efficacy of pregnant women. Providing educational classes to prepare for parenthood with animated

videos can increase the self-efficacy of pregnant women better than the provision of standard ANC. Health workers, especially midwives, can educate on preparation for parenthood with animated videos to be able to increase the self-efficacy of pregnant women. To get better validity of research results, it can provide education by extending the repetition of giving (videos are actually given together starting from the beginning, middle, to the end).

DECLARATION

Conflict of Interest

There is no conflict of interest in this research.

Authors' Contribution

All authors contributed to research and writing of the manuscript. The first author contributed more to the preparation of the manuscript and data collection. The second author contributed more to the preparation of the manuscript and review of the manuscript. The third author contributed more in reviewing the preparation of the manuscript, data analysis, and finalizing the manuscript.

Ethical Approval

Ethical approval of this research by ethics committee of STIKES Banyuwangi No. 167/01/KEPK-STIKESBWI/V/2024).

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Data Availability

If further study is conducted on this topic in the future, the researcher is open to being contacted, and we are prepared to assist with this.

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CORRELATION OF MACRONUTRIENT INTAKE, NUTRITIONAL STATUS AND AGE OF MENARCHE WITH PRIMARY DYSMENORHORE

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Abstract

Background: Pain during menstruation that does not cause any abnormalities is called primary dysmenorrhea, while menstrual pain that is related to abnormalities in the pelvis is called secondary dysmenorrhea. According to data from WHO, 90% of women experience severe dysmenorrhea. The aim of this study was to find out the correlation between macronutrient intake, nutritional status, and age of menarche with primary dysmenorrhea in medical students at the University of Jember, Indonesia. **Method:** This type of research was carried out with a cross-sectional study design. The research was conducted online and carried out in December 2023-February 2024. Samples were taken using the proportionate stratified random sampling technique. The number of samples in this study was 79 pre-clinical female students. Data was obtained by respondents filling out Google Form and interviews via zoom to fill out the SQ-FFQ questionnaire. The analytical test used in this research is the Spearman test. **Result:** Correlation analysis showed there was no relationship between carbohydrate (p=0.518), fat (p=0.124) and protein (p=0.260) intake and primary dysmenorrhea. The correlation test of nutritional status with primary dysmenorrhea also produced a significance of 0.703 (p>0.05), which means there is no correlation. Correlation analysis of age of menarche with primary dysmenorrhea produced a significance of 0.003 (p<0.05), which means a correlation was found. **Conclusion :** No correlation was found between macronutrient intake and nutritional status and primary dysmenorrhea, and a correlation was found between age at menarche and primary dysmenorrhea.

keyword : dysmenorrhea, macronutrient, nutritional status

INTRODUCTION

Dysmenorrhea is pain experienced during the menstrual period in the form of cramp-like pain in the lower abdomen that spreads to the legs or back. Dysmenorrhea is classified into two types, namely primary dysmenorrhea and secondary dysmenorrhea. Pain during menstruation that is not caused by an abnormality is referred to as primary dysmenorrhea, while menstrual pain

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associated with abnormalities in the pelvis is called secondary dysmenore (Martire et al., 2023).

According to data from the WHO, 90% of women experience severe dysmenorrhea (Qomarasari, 2021). The prevalence of dysmenorrhea in Indonesia amounted to 107,673 people (64.25%), consisting of 54.89% experiencing primary dysmenorrhea and 9.36% experiencing secondary dysmenorrhea (Rattu et al., 2019). According to the results of the study by Sima et al. (2022), the prevalence of dysmenorrhea among medical students is high at 78.4%.

Dysmenorrhea has a negative impact on the quality of life of female students because it affects relationships with family and friends as well as activities at university. According to research by Sima et al. (2022), female students cannot concentrate in class due to the duration of dysmenorrhea that persists for 2 days or more. Dysmenorrhea can also affect university performance in other aspects, as in a study by Sima et al. (2022), some female students were unable to take exams due to the presence of dysmenorrhea (4.2%) and thought dysmenorrhea affected exam grades (18.4%) (Sima et al., 2022).

Various risk factors have been shown to increase the occurrence of dysmenorrhea, such as menstrual duration, age of menarche, smoking, menstrual flow, nulliparity, menstrual cycle, family history, and a higher body mass index (BMI) (Karout et al., 2021). Early menarche age, namely < 12 years old, is one of the risk factors for primary dysmenorrhea. Increased hormone levels in adolescents can cause the age of menarche to be faster, so that the reproductive organs are not ready to experience changes, and the narrow size of the cervical canal will cause pain during menstruation. The risk of experiencing dysmenorrhea increases the younger the age of menarche (Mouliza, 2020; Qomarasari, 2021).

Nutritional status with anthropometric indicators, namely BMI, has an effect on primary dysmenorrhea in much literature. In Aktas' study (2023), it was found that the risk of primary dysmenorrhea was 1.06 times higher among obese young women than the thin/normal group (Aktaş, 2023). According to a meta-analysis study by Wu et al. (2022), undernutrition can also increase the risk of primary dysmenorrhea (Wu et al., 2022).

Macronutrients are compounds required in large amounts that play an important role in the provision of energy (Morris dan Mohiuddin, 2023). The three macronutrients are protein, carbohydrate, and fat. Based on research by Bajalan et al. (2019), there was an association between consumption of eggs, fish, and cheese with dysmenorrhea, which is an example of macronutrient intake (Bajalan et al., 2019). According to research by Monday et al. (2019), foods containing omega-6 fatty acids play a role in increasing the risk of dysmenorrhea (Monday et al., 2019). This is in line with the research of Damayanti et al. (2022), who found a correlation between fat intake and the severity of dysmenorrhea in female students of SMK Negeri 2 Lumajang (Damayanti et al., 2022).

Based on the explanation above, researchers are encouraged to conduct research on dysmenorrhea that focuses on medical students. Therefore, this study was shown to determine the correlation of macronutrient intake, nutritional status, and age of menarche with primary dysmenorrhea in medical students at the University of Jember.

METHOD

The study was conducted using observational analytic research and a cross-sectional study design. This research was conducted online and was carried out in December 2023–February 2024. The population in this study were all preclinical students of the Faculty of Medicine, University of Jember, Indonesia total 366 people. The sample consisted of medical students of each generation, calculated using the Slovin formula, which amounted to 79 people. Samples were taken using the proportionate stratified random sampling technique. Participants in this research who fulfill the following requirements: Preclinical female students at the University of Jember's Faculty of Medicine (Class of 2020–2023); Female students are willing to sign an informed consent form and take part in the study; Female students are at least eighteen years old. The following are the criteria for exclusion: Respondents with a history of gynecological problems; Respondents with a history of abdominal trauma; Respondents had experienced anemia in the past. Data were obtained by respondents filling out Google Form and interviews via Zoom to fill out the SQ-

FFQ (Semi-Quantitative Food Frequency Questionnaire). The analytical test used in this study was the Spearman correlation test.

RESULT AND DISCUSSION

Research Result

The results of the questionnaires in the Google Forms and SQ-FFQ that have been filled out by medical students are presented in several tables.

Table 1. Distribution of research subjects

Variables	Frequency	Percentage (%)
Age		
18 years	14	17,7
19 years	14	17,7
20 years	18	22,8
21 years	24	30,4
22 years	8	10,2
23 years	1	1,2
Age of Menarche		
SD Grade 4 (9-10 years)	4	5
SD Grade 5-6 (11-12 years)	42	53,2
SMP Grade 7-8 (13-14 years)	30	38
>14 years	3	3,8
Nutritional Status		
Underweight	16	20,3
Normal	49	62
Overweight	14	17,7

Table 1 shows that the majority of respondents were 21 years old and experienced their first menstruation during elementary school grades 5-6 (11-12 years). The majority of nutritional status in medical students is normal.

Table 2. Distribution of macronutrient intake

Macronutrient	Frequency	Percentage (%)
Carbohydrate		
<80% RDA	75	94,9
80-110% RDA	4	5,1
>110% RDA	0	0
Fat		
<80% RDA	50	63,3
80-110% RDA	25	31,6
>110% RDA	4	5,1
Protein		
<80% RDA	54	68,4
80-110% RDA	22	27,8
>110% RDA	3	3,8

According to the National Widyakarya of Food and Nutrition (WNPG) (2004) macronutrient intake is categorized as normal if it is 80-110% of the RDA, while the category is less if it is less than 80% of the RDA and the category is more if it is more than 110% of the RDA (Widyakarya Nasional Pangan dan Gizi (WNPG), 2004). Table 2 shows that the intake of carbohydrates, fat and protein is in the deficient category.

Table 3. Correlation between macronutrient intake, nutritional status, and age of menarche with primary dysmenorrhea

No.	Variable	P Value	The Coefficient of Correlation
1.	Carbohydrate	0,518	0,074
2.	Fat	0,124	0,275
3.	Protein	0,260	0,128
4.	Nutritional Status	0,703	0,044
5.	Age of Menarche	0,003	0,326

Based on table 4 above, it showed that there is a weak correlation between menarche age and primary dysmenorrhea with a significance of 0.003 (<0.005). On the other hand, there was no correlation between nutritional status and macronutrient intake with primary dysmenorrhea.

Discussion

Correlation between macronutrient intake with primary dysmenorrhea

The correlation analysis of macronutrient intake with primary dysmenorrhea is divided into three intakes namely carbohydrate, fat, and protein. Carbohydrate intake and primary dysmenorrhea showed no correlation (p = 0.518). This is not in line with Adilah's research (2023), which found a relationship between the severity of dysmenorrhea and carbohydrate intake. Carbohydrate intake data in Adilah's study (2023) was grouped into rarely and often, which did not clearly state the method used for nutritional intake assessment. In this study, most of them consumed carbohydrates less than the RDA, namely 75 students (94.1%), so it

contradicts the results of Adilah's research (2023) that many students who consume excess carbohydrates experience severe dysmenorrhea (Adilah, 2023). The theory of carbohydrate intake associated with primary dysmenorrhea has not been well explained in several studies. Carbohydrate intake and primary dysmenorrhea are indirectly related. In the fat metabolism pathway, carbohydrates can be converted to acetyl-CoA and turned into fatty acids through the process of lipogenesis. Therefore, excessive carbohydrate consumption can increase fatty acids in the body so that prostaglandin hormones increase, which results in uterine contractions during menstruation and triggers menstrual pain and primary dysmenorrhea (Pratiwi dan Rodiani, 2015; Rodwell et al., 2015).

The correlation of fat intake with primary dysmenorrhea resulted in a significance of 0.124, indicating no correlation was found. This is also in line with Adilah's research (2023) that there is no relationship between fat intake and primary dysmenorrhea (Adilah, 2023). Most of the respondents in this study who experienced primary dysmenorrhea consumed less fat. Contrary to the research of Damayanti et al. (2022), subjects with excessive fat consumption tend to feel heavy menstrual pain (Damayanti et al., 2022). Pratiwi & Rodiani (2015) said that foods that contain more fat can increase prostaglandin levels, which play a role in uterine contractions during menstruation, triggering the occurrence of menstrual pain or primary dysmenorrhea (Pratiwi dan Rodiani, 2015).

Correlation analysis of protein intake with primary dysmenorrhea showed no correlation ($p = 0.260$), which is also in line with Adilah's research (2023). However, in this study, the majority of respondents with insufficient protein intake experienced primary dysmenorrhea, which is in line with the theory that low protein intake causes primary dysmenorrhea. Protein plays a role in iron transport for red blood cell synthesis, so low protein consumption can reduce Hb levels, which cause anemia (Erningtyas et al., 2023). This anemia causes a decrease in oxygen levels circulated throughout the body, including the uterus, so that ischemia occurs and dysmenorrhea or menstrual pain appears (Kusumawardani dan Cholifah, 2018).

Correlation between nutritional status with primary dysmenorrhea

Based on this study, in preclinical students of the Faculty of Medicine, University of Jember, there was no correlation between nutritional status (BMI) and primary dysmenorrhea (p = 0.703). This is not in accordance with the research of Nissa et al. (2016), which states that there is a relationship between BMI and primary dysmenorrhea in medical students. In the study of Nissa et al. (2016), the subject was a first-year medical student. This could be a factor that caused this study not to find a correlation because this study took 4 levels with an age range of 18–22 years (Nissa et al., 2016). The data also showed that the number of respondents who had abnormal BMI and experienced dysmenorrhea was very small compared to normal BMI respondents who experienced dysmenorrhea. Pre-college students of the Faculty of Medicine, University of Jember, also have an average normal nutritional status of 21.6 (63.3%).

Nutritional status with a BMI greater than normal or overweight has excess prostaglandin levels and causes ischemia in the uterus, causing menstrual pain (Rafique dan Al-Sheikh, 2018). Nutritional status with a BMI less than normal or underweight may have less fat, which can interfere with the ovulation cycle and excessive prostaglandin release, causing uterine contractions and menstrual pain or primary dysmenorrhea (Wu et al., 2022).

The results of the analysis showed no correlation between macronutrient intake and nutritional status in primary dysmenorrhea, possibly due to other factors. One of the factors is stress in female students who are not assessed, which can be one of the causes of primary dysmenorrhea. The onset of stress in college students is inevitable, even though this study was conducted during the vacation period. The cause of stress is not only academic life but can be caused by other factors. Some of the stressors for college students include changes in their living environment, difficulty managing themselves, and financial management issues. In addition, it is reported that stress is also caused by parental and university expectations that put pressure on failure, which impacts students' confidence and dignity (Suhandiah et al., 2021). One of the subjects in this study is a final-semester preclinical student who is also prone to stress when completing a final project or thesis. Stress can cause pressure on the hip and lower back muscles and reduce pain resistance.

Therefore, the severity of dysmenorrhea increases and is directly proportional to the high degree of stress (Sulistiani et al., 2023).

Correlation between age of menarche with primary dysmenorrhea

The age at first menstruation is called menarche age. In this study, the correlation analysis of menarche age with primary dysmenorrhea resulted in a significance of 0.003 ($p<0.05$) which means that a correlation was found which is in line with Qomarasari's research (2021). This is also indicated by data on the age of menarche in preclinical students, the majority of whom experienced menstruation at the age of ≤ 12 years, totaling 46 people (58.2%). According to Qomarasari's research (2021), the earlier the age of menarche will cause the reproductive organs to be unprepared and the narrow size of the cervical canal to cause dysmenorrhea (Qomarasari, 2021).

CONCLUSION AND SUGGESTION

There is a correlation between menarche age and primary dysmenorrhea in preclinical students of the Faculty of Medicine, University of Jember, Indonesia. Fat, protein, and carbohydrate intake were not found to be correlated with primary dysmenorrhea and there was no correlation between nutritional status and primary dysmenorrhea. Preclinical students of the Faculty of Medicine are advised to pay attention to the amount of carbohydrate, protein and fat intake consumed to match the nutritional needs. For future researchers, they can conduct research with other methods to assess nutritional intake and food recall when the respondent finishes menstruating.

DECLARATION

Conflict of Interest

Author declare there is no conflict of interest in this researchAuthors' ContributionAll author contribute from concept in writing draf article.

Ethical Approval

The research was declared by The Ethics Committee of The Faculty of Medicine, Jember University No. 5123-/UN25.1.10.2/KE/2023.

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Data Availability
The data supporting this research are available from the authors on reasonable

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EFFECTIVENESS OF ROLLING MASSAGE AND COMPRESS TECHNIQUES WARM TO BREAST MILK EXPENDITURE IN MOTHERS POST SECTION CAESARIA

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Abstract

Background. Inadequate breastfeeding is a problem often experienced by mothers who are breastfeeding. Breast milk release time in post sectio caesarean mothers is later than normal postpartum mothers. This study aims to determine the rolling massage technique and warm compresses on breast milk production in post-section caesaria mothers at hospital Denisa. **Method.** The research design of this study is Quasy Experimental with design (pre post test design). Purposive sampling method. The sample taken was 28 respondents. Divided into 2 groups, 14 respondents were intervened with rolling massage techniques and 14 respondents get warm compresses. Independent variables were rolling massage techniques and warm compresses. The dependent variable is breast milk production in post-section caesarea mothers. Data collection was using the SOP (Standard Operating Procedure) rolling massage technique, warm compress SOP and questionnaire sheet. **Result.** Wilcoxon test results p-value = 0.001 for breast milk production in the rolling massage technique. Rolling massage technique means there is an influence on breast milk production. The Wilcoxon test result p value = 0.001 for the result of Wilcoxon test showed that the p-value = 0.001 for breast milk production on warm compress means that there is an effect on breast milk production. The Mann Whitney U Test statistical test results obtained a significance value of p = 0.009 so that there is a difference between rolling massage and warm compress techniques on breast milk production. **Conclusion.** The rolling massage technique and warm compress can be used as a therapy for breast milk production.

keyword : Rolling massage technique, warm compresses, breast milk production

INTRODUCTION

Breast milk is the most beautiful gift from mother to baby that is secreted by two sides of the mother's breast glands, the best nutritious and high-energy milk that is easily digested and contains a balanced and perfect nutritional composition for baby's growth and development that is available at any time (Wiji, 2013). Infant growth is strongly influenced by breast milk production. Rapid growth can occur at the age of 2 weeks, 6 weeks and 3 months which at that time requires more breast milk (Meilirianta et al., 2014). Breast milk production is a very complex interaction

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between mechanical stimuli, nerves and various hormones (Mansyur & Dahlan, 2014). According to Suradi (2008), the criteria for breast milk production are: Breast milk seeps because the breast is full, breast milk comes out when pressed, breast milk drips when not breastfeeding or breast milk gushes out. In some cases, breast milk cannot be released smoothly so that the mother cannot breastfeed her baby. Breast milk release time in post sectio caesarea mothers is slower than normal post partum mothers (Desmawati, 2016). Based on the results of a survey at RSU Denisa in the obstetrics clinic of 10 post cesarean section mothers, there were 7 mothers whose smooth breast milk production required more than 1-2 days and 3 mothers whose smooth breast milk production after cesarean section surgery was completed. Interventions carried out to facilitate breast milk production only by providing information about breast care and expressing breast milk. However, the results were not optimal. Almost all of them chose to be given drugs / pills to increase breast milk. The intervention of rolling massage and warm compress techniques has never been done directly so that its effect on breast milk production cannot be explained.

According to WHO (World Health Organization, 2015), the incidence of sectio caesarea is increasing in developing countries. WHO sets an indicator sectio caesarean delivery rate of 5-15% for each country, if not indicated. sectio caesarea surgery can increase the risk of morbidity and mortality in the mother and baby. mother and baby. Data from the results of Riskedas (Basic Health Survey, 2017) shows that the incidence of delivery by cesarean section in Indonesia reached 9.8% of the total number of deliveries. In East Java in 2017 reached 20% of the total number of deliveries. Meanwhile, a preliminary study was conducted preliminary study of the last three months at Denisa General Hospital. In April - June 2021 the number of sectio caesarean deliveries was 235 patients out of 345 patients. Obtained from April 75 mothers post cesarean section (27 primiparas and 48 multiparas), decreased in May 72 mothers post cesarean section (27 primiparous and 45 multiparous), increased again in June 88 mothers post cesarean section (36 primiparous and 52 multiparous). primiparous and 52 multiparous), so on average per month there are 78 mothers post sectio caesarea (30 primiparous and 48 multiparous) at Denisa Hospital.

The inhibiting factor in breastfeeding is the milk supply itself. Insufficient breast milk production is influenced by many factors such as: Lack of breastfeeding frequency, low birth weight (LBW) infants have a lower ability to suck breast milk than normal birth weight (>2500) infants compared to normal birth weight babies (>2500), acute/chronic illnesses, and poor breast care (Juarni, 2014). acute/chronic illness, and poor breast care (Juarni, 2014). Reasons reasons for not providing breast milk other than non-breastfeeding are the mother's lack of (Turlina & Wijayanti, 2015). The impact that occurs when breast milk does not come out smoothly is: obstructed duct, swollen breasts, mastitis, and the baby does not like to suckle due to poor milk flow. The impact of young mothers who do not breastfeed their babies will cause the baby to be at risk of various infectious diseases such as infections respiratory tract infections, ear infections, low immunity, resulting in a less intelligent generation. generation, increased morbidity rates, increased child mortality, increased hospital subsidies and child mortality, increased hospital subsidies and more foreign exchange to buy formula milk (Nugroho, 2011).

Efforts that can be made for breast milk production are one of them with rolling back massage that can provide a relaxing sensation to the mother, the technique of giving rolling back massage can stimulate the parasympathetic nervous system. Technique of administering rolling back massage can stimulate the parasympathetic nervous system to convey commands to the back of the brain so that the process arises. Oxytocin action potential response is released into the systemic blood from the pituitary posterior. Oxytocin stimulates these cells so that the alveolus sac is depressed, the pressure increases and the ducts shorten. Increases and the ducts shorten and dilate. Milk is then ejaculated from the nipple. Rolling massage back will provide comfort and relax the mother because the massage can stimulate the release of breast milk and stimulate the uterus to contract (Ekawati, 2017). contract (Ekawati, 2017). Warm breast compresses during breastfeeding will can increase milk flow from the milk-producing glands. Other benefits of warm breast compresses include; stimulation of the let down reflex; preventing preventing breast engorgement which can cause breast swelling; improving blood circulation in the breast area (Saryono & Roischa, 2009).

METHOD

The research design used in this study was Quasy Experimental with design (pre post test design). Population in this research were all post sectio caesarea mothers at Denisa General Hospital as many as 78 respondents (30 primiparas and 48 multiparas) in monthly averages. The sample in this study was determined based on inclusion criteria and exclusion. The sample size was 14 people per group, so the number is large the overall sample is 28 people. Sampling in this study is using purposive sampling method. Inclusion Criteria: 1) Post sectio caesarea mothers who are willing to be respondents; 2) First day of post sectio caesarea; 3) Mothers post sectio caesarea primipara; 4) Mother post sectio caesarea with hospitalization for 3 days at Denisa General Hospital; 5) Post sectio caesarea mothers are cooperative. Meanwhile, the exclusion criteria were: 1) Post-sectio caesarea women with co-morbidities, such as: swollen breasts, mastitis and breast abscess; 2) Post sectio caesarea mothers who take drugs that can inhibit milk production, for example: bromocriptine, aspirin, reserpine; 3) Post sectio caesarea mothers whose babies have congenital abnormalities (congenital abnormalities) based on the doctor's diagnosis so that during the intervention they cannot breastfeed with their mothers, such as: premature, cleft lip, short tongue string, and hiccups); 4) Post-sectio caesarea mothers who consume breast-feeding pills, herbal milk-boosting herbs (a concoction of katuk leaves, turmeric, tamarind).

This research was conducted at Denisa Gresik General Hospital. In this study, the rolling technique became independent massage and warm compresses, the dependent variable is milk production in post sectio caesarea mothers. This research instrument used SOP (Standard Operating Procedure) for Giving Rolling Massage Techniques, RI Ministry of Health (2007) in Trijayati (2017), SOP (Standard Operating Procedure) for Giving Warm Compresses, Kristiana (2014), Runiari and Surinati (2013) in Hartanti (2017), and To assess the effect of giving rolling massage and compress techniques warm towards the expenditure of breast milk in mothers post sectio caesarea using a questionnaire sheet, in (Mashluchi, Y.A, 2019).

The research procedure includes: Respondents totaling 28 were divided into 2 groups, in group A 14 post sectio caesarea mother who was given rolling massage intervention, at group B 14 post sectio caesarea mothers who were given intervention warm compress. The researcher conducted a pre-test to groups A and B before it was carried out intervention accompanied by the researcher, then the researcher gave intervention to group A in the form of rolling massage for 3 days, 2x/day post SC with a duration of 10 minutes/intervention on days 1-3, and intervention in group B in the form of warm compresses for 3 days, 2x/day with a duration of 15 minutes/intervention on days 1-3. Both groups did a post-test after it was done last intervention. Assessment for output results ASI is categorized: 1) Current (76-100%) if the questionnaire getting a score of 8-9; 2) Enough (56-75%) if the questionnaire gets scores 6-7; 3) Not current (<56%) if the questionnaire get a score of 1-5. With ASI criteria: 1) ASI seeps because of full breasts; 2) ASI comes out on pressed time; 3) ASI drips when not breastfeeding or milk is gushing Go out; 4) Breast milk oozes out when the areola is squeezed; 5) ASI comes out gushing without squeeze breasts; 6) Breast milk is gushing out within 48 hours after delivery; 7) Breast milk comes as soon as the baby starts suckling; 8) 24 hours after delivery the milk has come out; 9) Breast milk is still dripping after feeding. Breast milk production was checked using a questionnaire sheet, adopted from Mashluchi, Y.A, 2019. Classification based on the score of the questionnaire as many as 10 criteria for breast milk production with the answer options Yes and No. After that, scoring of the percentage results was carried out.

Analysis was tested using the Wilcoxon test to determine differences in the dependent variable before and after treatment with a significance level of $p<0.05$. Furthermore compared the effectiveness of the rolling massage technique and warm compresses given intervention using the Mann Whitney U Test $p <0.05$ means for determine the significance of the effectiveness of rolling massage and compress techniques warm towards the expenditure of breast milk in mothers post sectio caesarea.

RESULT AND DISCUSSION

Table 1. Respondent Characteristics

No	Category	Intervention Group With The Rolling Massage Technique		Compress intervention group	
		n	%	n	%
1	Age				
	18-23 years old	5	36	4	29
	24-29 years old	7	50	7	50
	30-35 years old	2	14	3	21
	36-41 years old	0	0	0	0
2	Education				
	Elementary School	0	0	0	0
	Junior High School	2	14	2	14
	Senior High School	10	72	8	57
	College	2	14	4	29
3	Work				
	Housewife	9	64	6	43
	Working as Private Sector	5	36	8	57
4	Breastfeeding Schedule				
	Every 2 hours	14	100	12	86
	Every 3 hours	0	0	2	14
	Every 4 hours	0	0	0	0
5	Baby Weight				
	2-2,4 kg	0	0	0	0
	2.5-3 kg	5	36	6	43
	3,1-4 kg	9	64	8	57
6	Breastfeeding Position				
	Sit Down	14	100	14	100
	Lie Dow	0	0	0	0
7	Break Time				
	Yes	12	86	14	100
	No	2	14	0	0
8	Consuming Food Provided by the Hospital	14	100	13	93
	Yes	0	0	1	7
9	Finished the food provided by the hospital	14	100	8	57
	1 Portion	0	0	6	43
	Not Spent				
10	Mother's Nutritional Intake				
	Good	9	64	6	43
	Enough	5	36	8	57

Based on Table 1, in the intervention group with the rolling massage technique, the results obtained from 14 respondents aged 24-29 were 7 (50%), had senior high school education 10 (72%), worked as a housewife 9 (64%),

breastfeeding schedule every 2 hours once 14 (100%), 9 (64%) babies were born with a body weight of 3.1-4 kg, with a sitting breastfeeding position 14 (100%), resting while in hospital 12 (86%), consuming food provided by the hospital 14 (100%), spent 1 portion of food provided by the hospital 14 (100%), good maternal nutrition intake was 9 (64%). whereas in the warm compress intervention group the results were obtained from 14 respondents, namely aged 24-29 years as many as 7 (50%), senior high school education 8 (57%), working as a private sector 8 (57%), breastfeeding schedule every 2 hours as many as 12 (86%), 8 babies born weighing 3.1-4 kg (57%), breastfeeding position by sitting 14 (100%), resting according to hours 14 (100%), consuming food provided by Hospital 13 (93%), spending 1 portion of food 8 (57%), maternal nutritional intake in the adequate category 8 (57%).

Table 2. Expenditure of Breast Milk Pre Test and Post Test Rolling Technique Massage on Post Sectio Caesaria

No	Breast milk Withdrawal	Pre Test		Post Test	
		n	%	n	%
1	Fluent	0	0	9	64
2	Enough	3	21	4	29
3	Not Enough	11	79	1	7
Uji Wilcoxon Test p = 0,001					

Table 2 explains that the provision of rolling massage technique interventions changed from not fluent 11 (79%) to fluent 9 (64%) and quite fluent 4 (29%).

Table 3. Expenditure of Breast Milk Pre Test and Post Test Compression Warmly Post Sectio Caesaria

No	Breast milk Withdrawal	Pre Test		Post Test	
		n	%	n	%
1	Fluent	0	0	3	21
2	Enough	2	14	7	50
3	Not Enough	12	86	4	29
Uji Wilcoxon Test p = 0,001					

Table 3 shows that before and after giving the warm compress intervention there was a change from not fluent 12 (86%) to quite fluent 7 (50%).

Table 4. Differences in Expenditure of Breast Milk between the Rolling Massage Technique and Warm Compress on Post Sectio Caesaria

No	Milk Production	Rolling Technique Massage		Compression Warmly	
		Pre Test	Post Test	Pre Test	Post Test
		n	n	N	n
1	Fluent	0	9	0	3
2	Enough	3	4	2	7
3	Not Enough	11	1	12	4
Mean		18.39		10.61	
Median		257.5		148.5	
Uji Mann-Whitney Test		P = *0,009*			

Based on table 4 shows the mean data rank after the rolling massage technique was 18.39, while for warm compresses mean rank is 10.61 which means there is a difference milk production between the rolling massage technique group and the compress group warm. The results of the Mann-Whitney U Test statistical test obtained a sign value (2-tailed) p = 0.009 which is smaller than 0.05, which means there is a significant difference between the technique groups rolling massage and warm compress group on milk production.

Based on table 5.13 the results of statistical analysis using the test the Mann-Whitney U Test statistic obtained a significant value of p = 0.009 which is more smaller than 0.05 which means H1 is accepted, so there is a significant difference between the rolling massage technique and warm compresses on milk production.

The results of Rukayah's research (2020) show that breastfeeding is smooth as much as 54.5%. The results of this study are in accordance with research that has been conducted by Hanifah (2018), the results of the research hypothesis are p value 0.000 <0.002 which indicates that there is significant differences in smoothness of milk ejection between Massage interventions Back with Warm Breast Compresses, where in the intervention group. Back Massage obtained a p-value smaller than the p-value Warm Compress intervention which means giving Back Massage intervention more effective in expelling breast milk than warm compresses breast.

Breastfeeding can be provided with the intervention of rolling massage techniques and warm compresses. The mechanism of the rolling massage technique is neck massage with knuckles from the base of the mother's neck to the part under the shoulder blades on both sides of the spine (Nurhanifah, 2013:102). Back

massage can provide somatic sensory stimulation through the afferent pathway thereby stimulating the posterior pituitary to release the hormone oxytocin which is a hormone that plays a role in secretion ASI, oxytocin stimulates the let down reflex so that the process will occur milk ejection from the alveoli and lactiferous ducts which automatically becomes breast milk go out. In addition, rolling massage techniques can also increase relaxation thereby preventing the occurrence of stress and depression in post sectio caesaria mothers which lowers serum prolactin levels. (MOH RI, 2007; Groer 2005; Patel & Gadam, 2013) in (Dewi, 2017). Effect of rolling massage technique breastfeeding expenditure with an average (mean) of 18.39, where before given the rolling massage technique intervention 11 people did not expel breast milk smoothly and 3 people express enough milk, after being given technical intervention rolling massage 9 people express breast milk smoothly, 4 people express enough milk, and 1 person breastfeeding is not smooth. Rolling massage plays an effective role in increasing milk production through physiological and biomedical mechanisms. Physiologically, this massage technique helps stimulate the area around the breast and back, thereby increasing blood flow to the breast glands. This increased circulation facilitates the supply of oxygen and nutrients needed for milk production. In addition, massage stimulation can activate the release of the hormone oxytocin from the posterior pituitary gland, which plays an important role in the milk let-down reflex. From a biomedical aspect, massage provides a relaxing effect that can reduce levels of stress hormones such as cortisol, which if high can inhibit milk production. This combination of physical and hormonal effects of rolling massage makes it one of the safe and effective complementary methods to support smooth lactation in breastfeeding mothers.

Giving warm compresses to the breast can improve smoothness milk production. The mechanism of the warm compress is the skin of the body which getting a warm compress will experience the body's natural/physiological system, namely dilation of blood vessels, with the dilation of blood vessels in the skin. If the compressed area is compressed, the blood flow will increase in that part. Blood which has a liquid form is an intermediary medium (convection). Hot what happens to our body will also be delivered by blood and of course to a place where the blood vessels are wider (at the place of compression). Because the dilated blood vessels

are located in the skin close to outside air (lower temperature than body temperature). Then its hot flowed by blood will easily evaporate (evaporate) giving compresses. Warmth may also give a signal to the body's heat center there is a brain (thermostat) not to increase the temperature anymore (Yuwono S, 2011) in (Zulaikhah, 2017). The effect of warm compresses on milk production with an average (mean) of 10.61, which was before the intervention was given warm compresses 12 people milk production is not smooth and 2 people are spending Enough breast milk, after being given a warm compress intervention 7 people expended milk enough, 4 people breastfeeding is not smooth, and 3 people breastfeeding is smooth. Warm compresses have an important role in increasing breast milk production through biomedical and physiological mechanisms. Physiologically, warm temperatures applied to the breast area can facilitate vasodilation or dilation of blood vessels, resulting in increased blood flow to the breast tissue. This increased blood flow improves the supply of oxygen and nutrients needed for the milk production process. In addition, warm stimulation also stimulates the release of the hormone oxytocin from the posterior pituitary, which plays a role in the let-down reflex. From a biomedical aspect, the relaxation condition caused by warm compresses can reduce levels of stress hormones such as adrenaline, which is known to inhibit oxytocin production. Thus, giving warm compresses can create optimal physiological conditions to increase the production and smoothness of breast milk release.

The results of this study indicate that there is a significant difference between the rolling massage technique and warm compresses on milk production. During pregnancy, the hormone prolactin from the placenta increases but breast milk usually does has not come out because it is still inhibited by high levels of estrogen. On the day second or third postpartum, estrogen and progesterone levels fall dramatically, so that the influence of prolactin is more dominant and this is when it starts to happen milk secretion. With earlier breastfeeding there is stimulation of the nipples, prolactin is formed by the pituitary, so that milk secretion becomes smoother. Two reflex in the mother which is very important in the process of lactation, prolactin reflex and The flow reflex arises from stimulation of the nipple by the baby's sucking (Kristiyanasari, 2009). After delivery, oxytocin also

tones the muscles Smooth around the alveoli to squeeze the milk into the milk ducts. Milk production occurs because the smooth muscle cells around the mammary gland shrink so that squeezing milk to come out, milk can come out of the breast due to constricted muscles which can be stimulated by a hormone called oxytocin (Rahayuningsih et al, 2016).

CONCLUSION

The rolling massage technique is more effectively used for smoothness milk production compared to warm compresses. Rolling massage techniques and warm compresses can be one alternative to increase milk production.

DECLARATION

Conflict of Interest

the authors declare that there is no conflict of interest in this research

Authors' Contribution

This research was conducted by a team from the Faculty of Health Sciences, University of Gresik, so for the task all contributed in completing the research and completion of the article from beginning to end.

Ethical Approval

Ethical approval was obtained from the University of Gresik under number 065/PSIK.UG/EX/VIII/2021.

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Data Availability

The data supporting the findings of this study are available upon reasonable request from the corresponding author, with restrictions due to participant confidentiality.

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RISK FACTORS ASSOCIATED WITH SPONTANEOUS ABORTION AT DR. SOETOMO HOSPITAL IN 2019–2023

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Abstract

Background: Spontaneous abortion or miscarriage is one of the pregnancy complications which can cause vaginal bleeding, as well as a significant impact on women's psychology. The occurrence of spontaneous abortion is caused by several risk factors that need to be considered. This research is aimed to analyze risk factors related to spontaneous abortion in pregnant women at Dr. Soetomo Hospital. **Method:** The study used a cross-sectional approach. The population was women who checked their pregnancy at Dr. Soetomo Hospital who experienced spontaneous abortion and did not experience spontaneous abortion. The number of samples was 55 for the case group and 55 for the control group. Data were obtained from medical records at Dr. Soetomo Hospital Surabaya. Bivariate chi-square statistical analysis and multivariate logistic regression were performed using SPSS software. **Results:** The risk factors found to be significant for the occurrence of spontaneous abortion were maternal age (p = 0.003), pregnancy interval (p = 0.005), and hemoglobin levels (p = 0.005). Meanwhile, the insignificant risk factors for the occurrence of spontaneous abortion were parity (p = 0.070) and body mass index (p = 0.525). The most dominant risk factor associated with the occurrence of spontaneous abortion was maternal age <20 or >35 years (OR = 6,769). **Conclusion:** maternal age, pregnancy interval, and hemoglobin level have been shown to be the significant risk factors for spontaneous abortion in pregnant women.

Keywords: body mass index, hemoglobin level, maternal age, parity, pregnancy interval, spontaneous abortion.

INTRODUCTION

According to the WHO (2023), nearly 800 women worldwide died every day in 2020 due to pregnancy and childbirth-related causes that could have been prevented. Based on the Indonesian Health Profile, the number of maternal deaths due to hemorrhage in 2021 reached 1,320 from a total of 7,389 maternal deaths (Kemenkes, 2021). Hemorrhage in pregnancies under 20 weeks is generally caused by spontaneous abortion, and about 10-12% of pregnancies end in spontaneous abortion (Prawirohardjo, 2018). In Indonesia, the percentage of spontaneous abortions reaches 10-15% from 6 million pregnancies each year (Tuzzahro, *et al*. 2021). The

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number of maternal deaths in East Java in 2022 was the lowest in the last seven years. However, more motivation is still needed for preventative efforts because Indonesia's Maternal Mortality Ratio (MMR) is declining at a relatively slow rate (only 1.8% annually), making it almost impossible to meet the Sustainable Development Goals (SDGs) objective by 2030 (Dinas Kominfo Jatim, 2023).

Abortion or miscarriage is a termination of pregnancy when the fetus is less than 20 weeks old or weighs less than 500 grams making it incapable to live outside the womb. Spontaneous abortion is an abortion that is unintentional and occurs naturally, in contrast to an induced abortion which is intentional with a certain purpose (Purwaningrum and Fibriana, 2017). Theoretically, there are multiple potential causes that could lead to spontaneous abortion, such as chromosomal abnormalities, immunological factors, infectious diseases, and maternal risk factors (Jackson and Watkins, 2021). Despite causing physical complications such as vaginal bleeding and pain, spontaneous abortion has a significant impact on women's psychology such as depression and emotional disorders (Maulana, H., et al., 2023). It can also be an early sign of future health risks in women, including maternal death (Wang, et al., 2021).

To ensure a healthy and safe pregnancy among women, it is important to have early detection and control of risk factors for spontaneous abortion. There are many maternal risk factors that are proved could increase the occurrence of spontaneous abortion. Based on a meta-analysis from Akbar (2019), the main risk factors of spontaneous abortion in Indonesia in 2010-2019 were maternal age and parity. This statement is in line with research from Purwaningrum & Fibriana (2017) which found that mothers aged <20 or >35 years are at 3 times greater risk of experiencing spontaneous abortion than mothers aged 20-30 years. The research conducted by Kartina & Trisna (2014) discovered that primiparous parity has a 4.3 times higher chance of experiencing spontaneous abortion than multiparous parity.

There are a few more risk factors that play quite a significant role in spontaneous abortion, including pregnancy interval, nutritional status, and hemoglobin level. Supported by ACOG (2018), pregnancy interval of less than 18 months and greater than 5–10 years are associated with increased risk of adverse outcomes. According to Rahmah (2016), pregnant women with normal nutritional status must experience weight gain in order to meet the nutritional needs of the

mother and fetus, which can be measured from the mother's body mass index. Pregnant women who lack food for a long period will experience health problems (Madumurti, et al., 2020). Overweight women have reproductive weaknesses in achieving pregnancy, such as early miscarriage, recurrent miscarriage, and so on (Cunningham, 2022). Pregnant women with anemia (Hb <11g/dL) have an increased risk of maternal and infant morbidity and mortality. Maternal Hb levels of more than 13 g/L during the second and third trimester were associated with an increased risk of poor pregnancy outcomes (Wu L, et al. 2022).

As a referral hospital in the Eastern Indonesia Region, internationally accredited by the Joint Commission International (JCI), with a variety of health cases, and professional medical personnel in their fields, Dr. Soetomo Hospital is the right location to conduct this research. Above all, this study strives to educate pregnant women, women desire to become pregnant, and other related communities about the risk factors for spontaneous abortion so that they can always carry out early prevention and control the risk factors.

METHOD

This study was a descriptive analytical study using a retrospective method from secondary data, particularly medical records obtained from Dr. Soetomo Hospital, Surabaya. The population in this study were all pregnant women who checked their pregnancies at Dr. Soetomo Hospital, who had experienced spontaneous abortion and had not experienced spontaneous abortion in medical records from 2019 to 2023. The inclusion criteria were having complete medical records regarding patient diagnosis, gestational age, maternal age, parity history, pregnancy interval, body mass index, and Hb levels. Whereas exclusion criteria were having incomplete medical records at Dr. Soetomo Hospital from 2019 to 2023 according to the required data.

Lemeshow formula was used to calculate the sample size with 0.15 for value of case proportion (*p*) derived from the prevalence of spontaneous abortion in Indonesia (Tuzzahro, *et al*., 2021). The number of samples was 55 for the case group and 55 for the control group. A total sampling technique was used for case samples, which were all pregnant women experiencing spontaneous abortion. The control

samples used systematic random sampling to collect samples of pregnant women who had a complete assessment in the medical records and did not experience spontaneous abortion, each year randomly from 2019 to 2023 to represent the population of each year. Collected case samples had a gestational age of <20 weeks, while the gestational age of control samples was >20 weeks when the results of conception were removed from the mother's body in order to be excluded from the criteria for spontaneous abortion.

The data analysis used bivariate analysis with the Chi-square test and multivariate analysis with logistic regression. Confidence Interval (CI) was set at 95% and the degree of significance $\alpha = 0.05$. SPSS software version 25 was utilized to perform the statistical analysis. Independent variables consisted of maternal age, parity, pregnancy interval, body mass index (BMI), and hemoglobin (Hb) level. This study analyzed the significance of the association among these risk factors and the incidence of spontaneous abortion at Dr. Soetomo Hospital in 2019–2023 as the dependent variable. Ethical approval for this study was acquired from the Research Ethics Board of the Dr. Soetomo General Hospital Surabaya which ensured that all protocols adhered with the hospital's ethical guidelines.

RESULT AND DISCUSSION

Table 1 Distribution of subjects by demographic characteristics

Characteristics	Case	Control	Total	
	n	n	n	%
Year				
2019	4	4	8	7.3
2020	1	1	2	1.8
2021	2	2	4	3.6
2022	32	32	64	58.2
2023	16	16	32	29.1
City of origin				
Surabaya	39	19	58	52.7
Outside Surabaya	16	36	52	47.3
Maternal age (years)				
20–35 years	36	50	86	78.2
<20 or >35 years	19	5	24	21.8

Among the 110 pregnant women who were the subject of the study, the majority—64 individuals (58.2%)—were patients in 2022. Most participants, totaling 58 (52.7%), were from Surabaya. The average age of the participants was 28.7 years, with 86 women (78.2%) falling within the 20 to 35 age range, while those under 20 or over 35 accounted for 24 individuals (21.8%). Regarding parity, most patients (75 individuals, 68.2%) had a history of parity either below 2 or above 4, while 35 individuals (31.8%) had a parity of 2–4. For pregnancy intervals, 71 participants (64.5%) had intervals of less than 2 years or more than 5 years, while 39 participants (35.5%) had intervals of 2–5 years. In terms of body mass index (BMI), the largest group was classified as obese (≥25 g/dL), comprising 53 individuals (48.2%). This was followed by 28 participants (25.5%) with normal BMI (18.5–22.9 g/dL), 17 participants (15.5%) categorized as overweight (23.0–24.9 g/dL), and 12 participants (10.9%) who were underweight (<18.5 g/dL). For hemoglobin (Hb) levels, the highest percentage (65 individuals, 59.1%) had levels of 11–13 g/dL, while 45 individuals (40.9%) had Hb levels below 11 or above 13 g/dL.

Table 2 Bivariate analysis with chi-square statistical test

Variables	Case		Control		Total		*p*
	n	%	n	%	n	%	
Maternal age (years)							
20–35 years	36	41.9	50	58.1	86	100	0.003
<20 or >35 years	19	79.2	5	20.8	24	100	
Parity							
2–4	12	34.3	23	65.7	35	100	0.041
<2 or >4	43	57.3	32	42.7	75	100	
Pregnancy interval (years)							
2–5	10	25.6	29	74.4	39	100	<0.00
<2 or >5	45	63.4	26	36.6	71	100	1
Body Mass Index (BMI) (kg/m²)							
<18,5	8	66.7	4	33.3	12	100	
18,5–22.9	14	50	14	50	28	100	0.223
23.0–24.9	11	64.7	6	35.3	17	100	
≥25	22	41.5	31	58.5	53	100	
Hb level (g/dL)							
11–13	24	36.9	41	63.1	65	100	0.002

<11 or >13	31	68.9	14	31.1	45	100

Bivariate analysis was conducted to understand the relationship between independent and dependent variables and to determine which variables would be included in the multivariate analysis. The relationship between risk factors and spontaneous abortion incidence is indicated by a p value <0.05 at 95% Confidence Interval (CI). The bivariate analysis test revealed that the independent variables with p-value below 0.05 were maternal age (p = 0.003), parity (p = 0.041), pregnancy interval (p <0.001), and Hb level (p = 0.002), which can be interpreted that there was a significant relationship between maternal age, parity, pregnancy interval, and Hb level with spontaneous abortion.

The independent variable with a p-value above 0.05 was BMI (p = 0.223), which means there was no significant relationship between BMI and spontaneous abortion. The results of this study are in line with a case-control study conducted by Zakira and Hardianto (2021) on 120 samples, consisting of 40 people as cases and 80 people as controls. This might have occurred because the BMI used in the study by Zakira and Hardianto (2021) was only from BMI after pregnancy, while this study only used BMI during pregnancy, without considering weight before pregnancy. In addition, the different gestational ages of respondents can affect the results of weight measurements by health workers. The results of this study are contrary to the findings of a case-control study conducted by Hadi, R. *et al*. (2020) on 113 pregnant women who experienced abortion and 113 pregnant women who did not have spontaneous abortion as controls at Hasan Sadikin Hospital in the 2017-2018 period. According to Sitilonga, *et al*. (2017), increased BMI to obesity can cause leptin resistance; mothers with a history of recurrent abortions tend to have low serum leptin levels (Purwaningrum & Fibriana, 2017). Leptin plays a role in regulating the balance between food intake and energy expenditure in the body (Dornbush and Aeddula, 2023). Being overweight is also associated with various pregnancy complications such as hypertension, preeclampsia, gestational diabetes, and other complications. Conversely, severe malnutrition can increase the risk of abortion. Mothers with low BMI also have low leptin levels (Purwaningrum & Fibriana, 2017). Nutritional and health problems in pregnant women affect the quality of the baby

born. Pregnant women with chronic energy deficiency can cause chromosomal abnormalities (Madumurti, *et al*., 2020).

Table 3 Summary results of the multivariate model of risk factors associated with spontaneous abortion events at Dr. Soetomo General Hospital 2019–2023

Step	Variable enter	Nagelkerke R Square
1	Maternal age (years) Parity Pregnancy interval (years) Body Mass Index (BMI) (kg/m²) Hb level (g/dL)	0.402
2		0.382

Regression analysis showed that maternal age, parity, pregnancy interval, body mass index, and Hb levels simultaneously influenced the occurrence of spontaneous abortion in pregnant women. The Nagelkerke R Square value was 0.382, which means that those five risk factors altogether were risk factors for spontaneous abortion simultaneously and had a significance of 38.2% for spontaneous abortion. Meanwhile, the remaining percentage was explained by other factors not examined in this study. The next analysis removes variables with p values >0.05 from the model gradually starting from the variable with the largest p value. The removal starts from the BMI variable (p = 0.525) which is then processed again in the same way and if the result still has a p value of more than 0.05 then it is removed from the modeling and so on, until all of the remaining variables had a <0.05 p value on the last analysis test.

Table 4 Results of multivariate modeling of risk factors associated with spontaneous abortion events at Dr. Soetomo General Hospital 2019–2023

Variables	*p* Wald	OR	95% CI
Maternal age (years)	0.003	6.769	1.882 - 24.349
Parity	0.070	2.742	0.922 - 8.152
Pregnancy interval (years)	0.005	4.157	1.551 - 11.144
Hb level (g/dL)	0.005	3.796	1.508 - 9.555

The maternal age variable has a p value = 0.003 and OR = 6.769 with 95% CI 1.882 - 24.349, which means that maternal age is significantly related to the incidence of spontaneous abortion and mothers aged <20 or >35 years have a 6.769 times risk of experiencing spontaneous abortion. The results of this study are

supported by a case-control study conducted by Purwaningrum & Fibriana (2017), but contradict the findings of a case-control study conducted by Asniar, *et al*. (2022) which is thought to be due to the lack of samples studied. Pregnancy in adolescence causes various complex problems, including physical changes during pregnancy, psychological changes, anxiety about childbirth and the future, and economic factors such as family financial capacity which also increase the risk of pregnancy. At the age of under 20 years shows that the reproductive organs are not yet fully functioning properly and are not ready to accept conception. In addition, the perineum muscles and abdominal muscles are not yet working optimally (Purwaningrum & Fibriana, 2017).

Pregnancy at the age of ≥35 years causes a decrease in physiological body function. Changes during pregnancy present challenges to aging organ systems, which may be able to function well when not pregnant, but are compounded by the increased blood volume, cardiac output, and insulin resistance that occur during pregnancy (Sauer, *et al*., 2015). Older maternal age is also associated with inadequate progesterone production, so that the corpus luteum is unable to produce enough progesterone to maintain implantation (Purwaningrum & Fibriana, 2017). At age over 35 years, the risk of chromosomal abnormalities increases (Sitilonga, *et al*., 2017). Most miscarriages are caused by abnormalities in the meiotic spindle that occur in older oocytes, resulting in chromosome nondisjunction and abnormal embryos that fail to implant or experience spontaneous abortion (Sauer, *et al*., 2015).

Parity variable has a p value = 0.070 and OR 2.742, which explains that there is no significant relationship between the number of parities and the incidence of spontaneous abortion. The results of this study are in line with the case-control study conducted by Yanti (2018), but not in line with the findings from the research by Asniar, *et al*. (2022). Difference in results may occur because the study by Asniar, *et al.* (2022) calculated both babies born alive and dead, while this study did not count stillbirths, but only the number of viable babies born who could live in the outside world according to the definition of parity from BKKBN (2021). Pregnant women with safe parity still have a risk of abortion which is caused by other factors that have not been studied, such as abnormalities in fetal growth, infection, hypertension, abnormalities in the reproductive tract, problems with the placenta,

diseases experienced by the mother, endocrine disorders, malnutrition, use of drugs, and environmental factors such as alcohol consumption, caffeine, tobacco, and radiation exposure (Asniar, *et al*., 2022). According to Purwaningrum & Fibriana (2017) Pregnancy history is associated with subsequent pregnancies, where the endometrium in the uterine corpus experiences decreased function and reduced blood supply. This makes the area less fertile and not ready to receive the results of conception leading to nonoptimal implantation, which can cause death or some or all of the results of conception are released. Mothers with parity of more than four children are at risk of fetal growth disorders and bleeding during pregnancy due to the increasingly weak condition of the uterus. Parity 2-3 is considered the safest from the risk of maternal death. Meanwhile, the first parity and high parity (more than three) have higher maternal mortality rates.

The pregnancy interval variable has a p value = 0.005 and OR = 4.157 with 95% CI 1.551 - 11.144, which means that the pregnancy interval is significantly related to the incidence of spontaneous abortion and mothers with a pregnancy interval of <2 or >5 years have a 4.157 times risk of experiencing spontaneous abortion. The results of this study are supported by a case-control study conducted by Sitilonga, *et al.* (2017), but are not in line with the results of a meta-analysis study by Akbar (2019) which found that pregnancy interval was not the most significant risk factor for spontaneous abortion, but was one of the factors associated with spontaneous abortion from 43 articles published throughout 2010 to 2019 in Indonesia.

The WHO recommendation for a 24-month interval is based on the higher risks to maternal, infant, and perinatal health associated with birth intervals shorter than 24 months. The selection of a 24-month interval also takes into account other factors, such as its compliance with WHO and UNICEF recommendations on a minimum breastfeeding duration of two years, as well as its ease of program implementation, compared to a gap of 18 or 27 months (Hassen, *et al*. 2024). Pregnancies that are too close to a previous pregnancy can have a negative impact because the reproductive organs have not fully recovered in terms of form and function (Purwaningrum & Fibriana, 2017). The uterus is not ready for implantation and fetal growth, increasing the risk of abortion (Sitilonga, *et al*., 2017). Pregnancy that is

too far apart can cause a decline in reproductive organ function due to the mother's increasing age (Purwaningrum & Fibriana, 2017). Degenerative processes occur, which affect pregnancy and childbirth due to weakening of the uterine and pelvic muscles (Sitilonga, *et al*., 2017). Public health and clinical recommendations suggest a minimum interpregnancy interval of 18 months, with some suggesting a range of 18 to 60 months (Schummers, *et al*., 2018). These intervals are based on recommendations from the WHO Technical Consultation Report on Pregnancy Spacing which stated that the lowest risk for miscarriage, induced abortion, and stillbirth was in the birth-to-pregnancy (BTP) interval group of 18–36 months, and the highest risk was in the very short (<6 months) and very long (>71 months) interval groups. Although this study did not examine how many women from the 2-5 years pregnancy interval group who actually knew about the pregnancy interval recommended by WHO or other studies to implement, it is clearly important for every woman to know the ideal pregnancy interval to avoid the risk of spontaneous abortion and other adverse outcomes of pregnancy.

The Hb level variable has a p value = 0.005 and OR = 3.796 with 95% CI 1.646 - 13,681.508 - 9.555, which means that Hb levels are significantly related to the incidence of spontaneous abortion and mothers with Hb levels <11 or > 13 g/dL have a 3.796 times risk of experiencing spontaneous abortion. The results of this study are supported by research conducted by Kartina & Trisna (2014), especially in patients with Hb levels <11gr% (anemia) who are at higher risk of spontaneous abortion than patients with Hb ≥11gr%. In contrast to the case control conducted by Asniar, *et al*. (2022) which found no significant relationship between Hb levels and the incidence of spontaneous abortion.

Iron deficiency during pregnancy can inhibit fetal growth, including the development of body and brain cells, which can potentially cause miscarriage. Iron deficiency occurs gradually, starting with a decrease in iron stores. Serum ferritin levels drop to less than 30 mg/l, while Total Iron Binding Capacity (TIBC) increases. When iron stores are depleted, red blood cell production continues, but serum iron levels drop to below 30 mg/dl, and transferrin saturation drops below 15%. In the later stages MCV will decrease, accompanied by microcytic hypochromic cells, anisocytosis, and poikilocytosis. Therefore, meeting iron needs

is very important for pregnant women to prevent unwanted complications (Kartina & Trisna, 2014). During pregnancy, the total number of erythrocytes and plasma volume increase, but hemoglobin (Hb) levels decrease due to a greater increase in plasma volume. This condition reduces blood viscosity and increases blood flow to the placenta. On the other hand, excessively high Hb levels during pregnancy can cause placental infarction due to increased blood viscosity. This can lead to complications such as gestational hypertension, fetal growth retardation, and perinatal death (Çakmak, *et al*. 2018).

Table 6 Results of logistic regression analysis of risk factors associated with spontaneous abortion at Dr. Soetomo General Hospital 2019–2023

Variables	Coefficient Value	*p* Value
MA	1.912	0.003
PI	1.425	0.005
HL	1.334	0.005
Constant	-2.579	<0.001

MA: maternal age; PI: pregnancy interval; HL: Hb level

The independent variables that have a significant relationship reanalyzed in this model are maternal age (MA), pregnancy interval (PI), and Hb levels (HL) on the dependent variable of spontaneous abortion (SA) at Dr. Soetomo Hospital. The results of the logistic regression analysis can be formulated into the following logistic regression equation: SA= -2.579 + 1.912MA + 1.425PI + 1.334HL + e. Based on the logistic regression equation above, the relationship between the independent variables and the dependent variable can be analyzed. The constant value (α) is -2.579, meaning that if the independent variable is constant, then the spontaneous abortion value (SA) is -2.579. Coefficient values for each of the significant independent variables are 1.912 for maternal age (MA), 1.425 for pregnancy interval (PI), and 1.334 for Hb levels (HL). Each one-unit increase in MA, PI, or HL assuming the value of other variables remains constant will increase the spontaneous abortion (SA) value according to the size of their respective coefficient values.

CONCLUSION AND SUGGESTION

Based on the results, it can be concluded that the risk factors that have a significant relationship with the occurrence of spontaneous abortion consist of maternal age, pregnancy interval, and Hb levels, while those that do not have a significant relationship include parity and body mass index (BMI). However, the risk factors of maternal age, number of parities, pregnancy spacing, body mass index, and Hb levels altogether are associated with the occurrence of spontaneous abortion with a significance of 38.2%. Mothers, expected parents, families, and the general public are expected to always avoid things that are risk factors for spontaneous abortion by planning a healthy pregnancy. Pregnant women who have risk factors are advised to routinely check their pregnancy such as in Antenatal Care (ANC) and more intensive supervision by medical personnel. Further researchers are expected to examine other variables that are suspected to be risk factors for spontaneous abortion and use a larger number of samples.

DECLARATION

Conflict of Interest

Regarding the publishing of this study, the authors declare there is no conflict of interest.

Authors' Contribution

Each author made a substantial contribution to the article's writing, analysis, and research. The study's design, data collection supervision, statistical analysis, data interpretation, and paper preparation were all done by the authors. The final version was examined and approved by all authors.

Ethical Approval

This research has been approved by the Research Ethics Board of the Dr. Soetomo General Hospital Surabaya with the Letter of Exemption referral number 1617/LOE/301.4.2/III/2024.

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Data Availability

Subject to participant confidentiality limitations, the corresponding authors can provide the data supporting the study's conclusions upon reasonable request.

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THE EFFECT OF NON-PHARMACOLOGICAL INTERVENTION ON VITAL SIGNS IN PREGNANT WOMEN WITH HYPERTENSION

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Abstract

Background: Pregnancy induced Hypertension (PIH) is a significant cause of maternal and fetal death. Although, the intervention approach that takes into account physical and psychological conditions is not yet optimal. This study aims to determine the efforts of relaxation technique therapy on the difference in heart rate dan oxygen saturation level (SpO_2) in pregnant women with hypertension. **Method**: This study used a cross-over design. A total of 36 pregnant women with third trimester hypertension obtained by random sampling technique were given bed rest therapy for 5 days 1 x 20 minutes and given relaxation therapy for 5 days 1 x 20 minutes. Bedrest is a health treatment where the client lies in bed certain period of time and relaxation therapy is techniques involve tensing and relaxing muscles in sequence which is a psychological mechanism that connects the mind and body. Measurements using a pulse oximeter. Data were analyzed using the Friedman and Wilcoxon tests. **Results**: The results of the study showed a significant difference in relaxation technique therapy and bed rest therapy on reducing in normal heart rate ($P < 0.001$) and oxygen saturation levels (SpO_2) with $P < 0,05$. The average decrease in heart rate and increased oxygen saturation levels (SpO_2) was greater in the relaxation technique therapy group and the confounding variables have no effect on either. **Conclusion**: Relaxation techniques can reduce heart rate and increased SpO_2 to optimal in pregnant women with hypertension. Relaxation techniques can be a complementary therapy in midwifery care for pregnant women with hypertension.

Keyword : Relaxation, heart rate, increased oxygen saturation levels (SpO_2), pregnancy induced hypertension.

INTRODUCTION

Pregnancy induced hypertension (PIH) is a condition where systolic blood pressure is ≥ 140 mmHg and diastolic ≥ 90 mmHg with measurements at least twice with a difference of 4 hours in pregnant women. Pregnancy complications due to hypertension account for 5-10%, which is the main cause of maternal and infant morbidity and mortality, such as premature birth, Intrauterine Growth Restriction (IUGR), Intrauterine Fetal Death (IUFD), placental abruption, increasing the incidence of Sectio Cesarea (SC), kidney failure, heart failure and maternal death (Kementerian Kesehatan RI, 2014; Dimitrova N, Zamudio JR and Jong RM, 2017).

Pregnant women will often experience ambivalent feelings, namely feelings of sadness and happiness that occur alternately even at the same time. Anxiety is

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believed to be an uncomfortable feeling experienced by someone, especially pregnant women (Kneisl, WIlson and Trigoboff, 2012; Sujianti and Dhamayanti, 2012). Pregnancy in mothers with complications such as hypertension in pregnancy has a higher risk of experiencing stress such as depression and anxiety (Bastard J and Tiran D, 2009). During stress exposure, the entire stress regulation system, namely the hypothalamic-pituitary-adrenal cortex system and the sympathetic nervous system-adrenal medulla system, are activated. Anxiety will result in changes in vital signs, such as increased blood pressure, heart rate, and respiratory rate. With increased sympathetic activity, it can cause at least a 15-20% increase in heart rate (Calimag-Loyola APP and Lerma E V, 2019).

Management of anxiety related to optimizing vital signs is limited to pharmacological therapy such as administration of blood pressure lowering drugs. However, this therapy has side effects such as dizziness, flushing, headache, nausea, peripheral edema, and transient hypotension. Non-pharmacological management such as relaxation techniques can be an alternative complementary therapy to optimalisasi heart rate dan kadar saturasi oksigen (SpO_2) in pregnant women with hypertension (Ward PJ, Clarke WR and Linden RW, 2009).

Efforts to overcome anxiety in pregnant women with hypertension have been carried out, such as providing dhikr therapy, murottal therapy, green color therapy, five-finger hypnosis, Cognitive Behavioral Therapy (CBT), psychological education, classical Turkish music therapy (Asghari, Faramarzi and Mohammmadi, 2016; Toker and Kömürcü, 2017; Widiastuti *et al.*, 2018; Abazarnejad *et al.*, 2019; Mamlukah *et al.*, 2019). However, these efforts are less able to be done independently by the client and have not considered the physical and psychological aspects as a whole.

Progressive Muscle Relaxation (PMR) is a technique of tensing and relaxing muscles sequentially which is a psychological mechanism that connects the mind and body. PMR is done by tensing the muscles for 5 seconds and relaxing for 5-10 seconds on the forehead, eyes, mouth, jaw, neck, chest, shoulders, back, biceps, hands, thighs, calves and toes which is done for 20-30 minutes (Jose R and D'Almeida V, 2013). In a relaxed state, the body will rest and activate the parasympathetic nervous system. The parasympathetic nervous system also

produces Ach as a neurotransmitter which is then inactivated by acetylcholine which inhibits or reduces the rate of chemical reactions. So that there is a decrease in heart rate and SpO_2 will increase (Chu *et al.*, 2024). PMR is very important to do because this relaxation technique is quite easy, does not require imagination, involves mind-body therapy and is an alternative to overcome anxiety in pregnant women with hypertension, but until now it has not been proven. This study aims to determine the difference in heart rate and oxygen saturation levels (SpO_2) in pregnant women with hypertension after being given relaxation techniques.

METHOD

The research location was at the Magelang Regency Health Center, Cetral Java Indonesia. The design of this study was a quasi-experimental study with a cross-over study design. The subjects were pregnant women third trimester with hypertension.. The sampling technique was simple random sampling, 36 respondents were obtained. The sample inclusion criteria included: blood pressure ≥ 140/90 mmHg, maternal age 20-35 years, gestational age 28-36 weeks, have no other health complications (musculoskeletal disorders, bleeding, seizures, respiratory diseases), having anxiety problems and living in the research area, confounding variables (age, gestational age, and physical activity) have been controlled. Respondents were given 20 minutes of bed rest therapy every day on the first day to the 5th day, on the 6th day a washout or rest was carried out, then on the 7th to 11th day relaxation therapy was given, namely Progressive Muscle Relaxation (PMR) therapy for 20 minutes. The heart rate and oxygen saturation levels (SpO_2) measurement instrument used pulse oximetry. The heart rate and SpO_2 was measured every day, the first to the 5th day and the 7th to the 11th day. Data analysis used the parametric paired t-test Friedman + post hoc Wilcoxon test.

RESULT AND DISCUSSION

The characteristics of respondents in this study consist of education, income, occupation, parity can be seen in Table 1.

Table 1 Frequency Distribution of Respondent Characteristics based on Education, Parity, Income, and Occupation.

Characteristics		Frequency (n)	Presentation (%)
Education			
	Elementary School	16	44,5
	Junior High School	17	47,2
	Senior High School	3	8,3
Parity			
	Primigravida	10	27,8
	Multigravida	26	72,2
Income			
	< UMR	21	58,3
	≥ UMR	15	41,7
Occupation			
	Working mom	10	27,8
	Housewife	26	72,2

The results of the analysis of the distribution of respondent characteristics in the table show that most respondents have junior high school education as many as 17 people (47.2%), then based on parity it can be seen that some respondents are multigravida as many as 26 people (72.2%), the majority of respondents have family incomes less than the minimum wage as many as 21 people (58.3%) and according to occupation, most respondents are unemployed as many as 26 people (72.2%).

The characteristics of respondents based on age, gestational age, physical activity and BMI of respondents are shown in Table 2.

Table 2 Distribution of Respondents Based on Age, Gestational Age, Physical Activity, and BMI.

Variabel	n	Mean	SD	Min	Max	95%CI
Age	36	28,06	4,57	20	35	26,51-29,60
Gestational age	36	31,45	2,42	28	36	30,63-32,27
Physic Activity	36	184,9	62,8	96,82	362,5	163,6-206,1
BMI	36	26,36	3,17	21,5	34	25,28-27,43

Table 2 shows that the mean age is 28.06 with a standard deviation of 4.57. The average estimated results at a 95% confidence level are around 26.51 years to 29.6 years. The lowest age is 20 years and the highest age is 35 years. The

gestational age of the respondents shows a mean of 31.45 with the lowest gestational age of 28 weeks and the highest gestational age of 36 weeks. The average physical activity of the respondents is 184.9 MET/week with a standard deviation of 62.8. The lowest BMI of the respondents is 21.5 kg/m2 and the highest BMI is 25 kg/m2.

The results of the comparative analysis of heart rate frequency in hypertensive pregnant women before and after treatment can be seen in Table 3.

Table 3 Results of Comparative Analysis of Heart Rate Frequency Before and After Treatment.

Heart Rate Frequency	Group			
	Intervention		Control	
	Median(min-max)	P-value	Median(min-max)	P-value
Pre-Test (n=36),bpm	101 (90-120)	0,000	101 (90-120)	0,010
Post-Test day-1	99,5 (85-117)		100 (85-120)	
Post-Test day-2	99,5 (85-115)		101 (90-117)	
Post-Test day-3	98 (85-110)		100 (87-120)	
Post-Test day-4	93 (81-106)		100 (89-118)	
Post-Test day-5	90 (80-101)		100 (85-118)	

*Friedman

Table 3 shows that the results of the Friedman test obtained a p-value <0.05 in the intervention group and the control group, which means that there were at least two different heart rate measurements before and after relaxation technique therapy and bed rest therapy.

The results of the comparative analysis of pulse rate frequency in the control group and intervention group according to time can be seen in table 4.

Table 4 Results of Comparative Analysis of Pulse Rate Frequency by Time.

Heart Rate Frequency	Group	
	Intervention	Control
	P-value	P-value
Pre-Test vs *Post-Test* day-1	0,000	0,070
Pre-Test vs *Post-Test* day-2	0,000	0,099
Pre-Test vs *Post-Test* day -3	0,000	0,084
Pre-Test vs *Post-Test* day -4	0,000	0,001
Pre-Test vs *Post-Test* day -5	0,000	0,000

*Post Hoc Wilcoxon

Table 4 shows that the results of the Wilcoxon Post Hoc Test in the group obtained pulse frequency before therapy vs day 1 to day 5 has a p-value of 0.000 so it can be concluded that the difference in pulse frequency starts on the first day, while in the control group it shows that the difference in pulse frequency occurs on days 4 and 5.

The results of the study on the heart rate of pregnant women given to the relaxation group and the bed rest group are shown in Table .

Table 5 Differences in Mean Heart Rate in the Intervention and Control Groups.

Variable and Group (n=36)	Intervention	Control	p value
	Mean±SD	Mean±SD	
Pre-Test	102,2±7,69	102,47±8,12	0,000
Post-Test 1	100,11±8,5	101,81±8,09	
Post-Test 2	98,25 ± 7,2	101,69 ± 7,87	
Post-Test 3	95,89 ± 6,9	101,61±8,06	
Post-Test 4	92,47±5,9	101,17±7,6	
Post-Test 5	89,42±6,0	100,7±8,0	
Difference	12,81±5,84	1,72±2,386	
p value	0,000	0,010	

*wilcoxon

Based on table 5, it can be seen in the intervention group, changes in heart rate from day to day in each observation tended to decrease. The mean difference was 12.81 with a standard deviation of 5.84. While in the control group, the mean difference was 1.72 with a standard deviation of 2.386. The p-value obtained was 0.000 <0.05, which means there was a significant difference in heart rate in the intervention group given relaxation technique therapy and the control group given bed rest therapy.

Oxygen Saturation Level (SpO_2) measurements were carried out every day for five days, so that there were five measurements in each group which aimed to determine the effect of PMR and bed rest on changes in Oxygen Saturation Level (SPO_2). The results of the comparative analysis of Oxygen Saturation Level (SpO_2) in hypertensive pregnant women before and after treatment can be seen in Table 6.

Table 6 Results of Comparative Analysis of Level (SpO_2) Before and After Treatment.

SpO2	Group			
	Intervention		Control	
	Median(min-max)	*P-value*	Median(min-max)	*P-value*
Pre-Test (n=36), %	98 (97-99)	0,000	98 (97-99)	0,561
Post-Test day-1	98 (98-99)		98 (97-99)	
Post-Test day-2	98,5 (98-99)		98 (97-99)	
Post-Test day-3	99 (98-99)		98 (97-99)	
Post-Test day-4	99 (98-99)		98 (97-99)	
Post-Test day-5	99 (98-99)		98 (97-99)	

*Friedman

Table 6 shows that the results of the Friedman test obtained a p-value < 0.05 in the intervention group, which means that there were at least two different measurements of oxygen saturation levels (SpO_2), while in the control group a p-value > 0.05 was obtained, which means there was no difference in oxygen saturation levels (SpO_2) before and after the intervention.

Tabel 7 Results of Comparative Analysis of Oxygen Saturation Levels (SPO_2) by Time.

SpO2 (%)	Group	
	Intervention	Control
	P-value*	P-value*
Pre-Test vs Post-Test day-1	0,480	0,564
Pre-Test vs Post-Test day-2	0,109	0,655
Pre-Test vs Post-Test day -3	0,021	0,655
Pre-Test vs Post-Test day-4	0,005	0,414
Pre-Test vs Post-Test day -5	0,005	0,739

*Post Hoc Wilcoxon

Based on table 7, it shows that statistically and clinically, the oxygen saturation level (SpO_2) before PMR therapy is different from the oxygen saturation level (SpO_2) after three days, four days, and five days of therapy with a p-value < 005.

The results of the study on the oxygen saturation levels (SpO_2) of pregnant women given to the relaxation group and the bed rest group are shown in Tabel 8.

Table 8 Results of Comparative Analysis of Oxygen Saturation Levels (SpO2) in the Intervention Group and Control Group.

*Wilcoxon

Table 8 shows that the intervention group has a median oxygen saturation level (SpO_2) that tends to increase in observations from the first to the fifth day of post-test. While in the control group, the median remains at 98 from the first to the fifth day of post-test. The p-value shows that the amount is 0.008 <0.05, so it can be concluded that there is a difference in oxygen saturation levels (SpO_2) in the intervention group and the control group.

Results of the analysis of the relationship between confounding variables with pulse rate and oxygen saturation levels are shown in Table 9.

Table 9 Relationship between Confounding Variables with Pulse Rate, and Oxygen Saturation Levels (SpO_2).

	Variabel	Heart Rate	SpO2
P-value	**Age**	0,163	0,168
	Pregnancy Age	0,746	0,399
	Physical Activity	0,725	0,355

**Spearman Test*

The results of statistical tests showed in table 9 is no significant relationship between confounding variables (age, gestational age, and physical activity) with pulse rate, or oxygen saturation levels with P > 0.05.

The results of the statistical test showed that there was a significant difference in heart rate in the group given PMR therapy and the bed rest group with a P value of 0.000 <0.05. After conducting the Post Hoc Wilcoxon test, it was found that the difference in heart rate in the intervention group, namely the one given relaxation therapy, occurred starting on the first day after the intervention with a p-value of 0.000 <0.05.

SpO2	Group		P-value
	Intervention	Control	
	Mean±SD	Mean±SD	
Pre-test	98,33 ± 0,63	98,33 ± 0,63	0,008
Post-test 1	98,39 ± 0,49	98,31 ± 0,64	
Post-test 2	98,50 ± 0,50	98,31 ± 0,62	
Post-test 3	98,58 ± 0,50	98,36 ± 0,59	
Post-test 4	98,64 ± 0,48	98,39 ± 0,59	
Post-test 5	98,64 ± 0,48	98,36 ± 0,63	

After being given PMR therapy, the results based on the Friedman Test showed a change in oxygen saturation levels (SpO_2) with a P value of 0.000. The Wilcoxon Post Hoc test showed that changes in oxygen saturation levels (SPO2) occurred starting from the third day statistically with a P value of 0.021 (<0.05).

Based on the results of statistical tests, it was shown that there was a difference in oxygen saturation levels between the intervention group, namely those given PMR therapy and the control group given bed rest therapy with a P value of 0.008 <0.05.

Heart rate is influenced by the sympathetic nerves that stimulate the adrenal medulla to release the hormones adrenaline (epinephrine) and noradrenaline (norepinephrine). Epinephrine and norepinephrine will increase the rate of decrease in the pacemaker potential so that the time required to reach the threshold is faster, thus the rate of decrease in the SA node resting potential is also fast which will cause the heart rate to increase. Meanwhile, pregnant women with hypertension have a higher risk of anxiety, so the effect of sympathetic nerve exposure is higher (Ward PJ, Clarke WR and Linden RW, 2009).

In a state of anxiety, the hypothalamus stimulates the cortex and amygdala to influence the pneumotaxis center in the pons, chemoreceptors and lung receptors in the medulla which can cause changes in the respiratory pattern, namely increased respiratory rate. When the respiratory rate increases, hyperventilation will occur, hyperventilation normally cannot increase O2 content. While oxygen transport throughout the body requires inadequate respiratory system function from the exchange of O2 and CO2 will affect the oxygen saturation level to decrease (Ward, Clarke and Linden, 2009).

This study revealed that pregnant women with hypertension in the Magelang Regency Health Center area before being given therapy had a heart rate faster than normal (tachycardia) and there is an increase in oxygen saturation levels (SpO_2) to optimal levels. Namely, in the intervention group the average heart rate was 102.2 and in the control group 102.47. Before being given relaxation therapy, the heart rate of pregnant women with hypertension was tachycardia. After being given relaxation therapy, the heart rate decreased to a normal heart rate. Likewise, SpO2 showed an increase of 1% after PMR therapy. This study involved 36 pregnant women with hypertension. Control of confounding variables such as maternal age, gestational age, and physical activity has been carried out. The limited number of respondents in the study can make the results of the study to be generalized to a wider population also limited.

This study is in line with research conducted by Urech on pregnant women in the third trimester who underwent PMR therapy once for 30 minutes which

showed a decrease in heart rate of P < .001 compared to the control group (Pan L, Zhang J and Li L, 2012).

Nickel in his research conducted on pregnant women with asthma after being given PMR therapy for 10 minutes was able to significantly reduce the heart rate (P < 0.001) compared to the control group (Nickel C, Lahmann C and Muehlbacher M, 2016).

Other studies revealed that there was a statistically significant difference in PMR therapy on reducing the heart rate with P < 0.05 (Trisnowiyanto, Kesehatan and Surakarta, 2015; Sahin and Basak, 2020). So it can be concluded that PMR is effective in reducing the heart rate in pregnant women with hypertension.

With relaxation therapy, the body will experience relaxation or experience a resting phase. At that time the body will activate the parasympathetic system. The parasympathetic nerves produce Ach as a neurotransmitter which is then inactivated by acetylcholine. This acetylcholine works on muscarinic cholinergic whose response is excitation or inhibitor which is a substance that inhibits or reduces the rate of chemical reactions. As a result, the rate of decrease in the pacemaker potential decreases which results in a longer time required to reach the threshold and a longer rate of decrease in the SA node resting potential so that there is a decrease in heart rate and heart rate will decrease (Ward PJ, Clarke WR and Linden RW, 2009).

Exercise can produce molecular, microscopic, and macroscopic changes that improve each of these variables and increase oxygen delivery to the trained muscles (Jonathan, Mark E and Opotowsky, 2019). The parasympathetic system can decrease the respiratory rate which causes more adequate oxygen transport so that the level of oxygen bound to hemoglobin (oxygen saturation) distributed throughout the body is more optimal (Calimag-Loyola APP and Lerma E V, 2019).

The results of the research that has been conducted are in line with the research conducted by Cahyati et al on 30 patients with chronic heart disease which proved that PMR therapy can increase oxygen saturation levels statistically significantly (P = 0.000 < 0.05) (Cahyati, Herliana and Februanti, 2020).

The results of other studies on PMR therapy can significantly increase oxygen saturation levels (P < 0.05), namely in research conducted by Dinaryanti et al on 19 lung cancer patients who were given PMR therapy for 5 days (Dinaryanti, 2019).

Based on the research results, it is known that the covariate variables contained in this study, namely age, gestational age, and physical activity, showed that there was no relationship with heart rate and oxygen saturation levels (SpO_2) with a P value > 0.05.

The results of the study are in line with Fadlilah's research which stated that there was no significant relationship between age and oxygen saturation levels (SpO_2) with P>0.05 (Fadlilah, Rahil and Lanni, 2020).

This is different from the theory that age can affect the pulse rate. The pulse rate will gradually settle to meet the oxygen needs as age goes by. In old age the pulse rate will decrease by 50% from the age of adolescence (Sandi, 2013). Because in this study the respondents' age was 20-35 years which does not include teenagers or the elderly.

The research results are not in line with the theory that states that physical activity is an indirect factor that affects oxygen saturation levels and heart rate in pregnant women because physical activity affects erythrocyte and hemoglobin levels (Ward, Clarke and Linden, 2009).

However, the results of this study are in line with the results of research conducted by Alza which showed that physical activity had no effect on anxiety in pregnant women in the third trimester (Alza, 2017). In addition, research conducted by Widhisusanti revealed that there was no relationship between physical activity and oxygen saturation levels (SpO2) with P>0.05 (Widhisusanti, 2016).

CONCLUSION AND SUGGESTION

The results showed a significant difference in heart rate and oxygen saturation levels (SpO_2) between those given relaxation therapy and bed rest therapy, and the decrease in heart rate in the relaxation therapy group was greater than in the bed rest group (P <0.05). Variable confounding such as age, gestational age, and physical activity have not been shown to affect changes in heart rate and oxygen saturation levels (P > 0.05). So it can be concluded that relaxation techniques can make the heart rate and oxygen saturation levels (SpO2) in pregnant women with hypertension optimal.

For health workers, PMR can be an alternative complementary therapy in caring for pregnant women with hypertension. Further research is needed with the addition of variables and a longer research duration in order to obtain long-term effects of PMR therapy.

DECLARATION

Conflict of Interest

In this sub-section, the authors declare that there is no conflict of interest in this research. This ensures transparency and integrity in the research process.

Authors' Contribution

I declare that all authors have approved the authorship sequence, the content of the paper, and the release of the paper for publication.

Ethical Approval

Ethical clearance was obtained from the Health Research Ethics Commission of Dr. Moewardi Hospital number 050/I/HREC/2020.

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Data Availability

The author encourages transparency and invites other researchers to verify and develop this research.

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ANALYSIS FACTORS AFFECTING OPPORTUNISTIC INFECTIONS IN WOMEN HIV IN DR SOETOMO HOSPITAL

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Abstract

Background: Human Immunodeficiency Virus (HIV) remains a major global health concern. In Indonesia, women account for 35.1% of HIV cases. In East Java alone, 1,062 new cases were reported between January and March 2023, with Surabaya recording the highest number at 663 cases. Opportunistic infections frequently affect HIV patients due to weakened immune systems. Tuberculosis is the most prevalent OI among HIV patients in Indonesia, accounting for 62.1% of cases, and is commonly found in women, posing a risk of vertical transmission. This study aims to analyze the factors influencing of opportunistic infections in women living with HIV. **Methods:** A quantitative approach with an observational analytic design and retrospective method. Used a total sampling technique involving all female HIV patients diagnosed with opportunistic infections at HIV clinic of Dr. Soetomo Hospital from January-December 2023, meet the inclusion criteria. The research was conducted from December 2023-October 2024. The dependent variable is opportunistic infections, while the independent variables are duration of HIV infection, adherence to antiretroviral therapy, CD4 cell count, and viral load. Data were analyzed using univariate and bivariate methods, with the Chi-Square test. **Results:** The results, duration of HIV infection was not significantly associated with opportunistic infections ($p = 0.402$). However, ARV adherence ($p = 0.003$), CD4 count ($p < 0.001$), and viral load ($p = 0.001$) were significantly associated with increased risk of opportunistic infections. **Conclusion:** In conclusion, ARV adherence, CD4 count, and viral load significantly influence the occurrence of opportunistic infections among HIV-positive women at Dr. Soetomo Hospital.

Keyword : Opportunistic Infections, HIV/AIDS, Women, ARVs, CD4 levels, Viral Load Levels

INTRODUCTION

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) are serious global health problems, especially in efforts to control the spread of the virus and provide support for People with HIV/AIDS (PLWHA). HIV is a virus that attacks the immune system and can cause AIDS.

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Transmission occurs through direct contact with bodily fluids such as blood, semen, vaginal fluids, and breast milk (Indonesian Ministry of Health, 2023).

According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), the estimated number of PLWHA in Indonesia in 2022 is around 540,000 (range: 490,000–590,000), with women contributing 35.1% of cases, or around 190,000 (range: 170,000–210,000). The Indonesian Ministry of Health reported that HIV cases in Indonesia increased throughout 2023, with the majority of new cases being women. A total of 429,215 confirmed HIV cases have been recorded. Data from the Executive Report on the Development of HIV/AIDS and Sexually Transmitted Infections (STIs) shows that from January to March 2023, 4,188 cases of HIV/AIDS have been reported, with the highest number of cases (1,062) in East Java.

People with HIV who progress to stage 3 experience severe damage to their immune systems, making them increasingly susceptible to serious diseases known as opportunistic infections. Opportunistic infections (OIs) are conditions that generally affect people with compromised immune systems. These infections often occur in patients with low CD4+ cell counts and can be caused by external pathogens or microorganisms that are usually controlled by the immune system.

The Indonesian Ministry of Health reported that by 2014, the cumulative number of AIDS cases (HIV infection with opportunistic infections) in Indonesia had reached 55,799 cases, or 36.7% of all HIV cases in the country (Framasari and Flora, 2020). Opportunistic infections are caused by fungal, parasitic, bacterial, or viral pathogens, which take advantage of weakened immune systems in individuals such as PLWHA.

Some common types of opportunistic infections include candidiasis, invasive cervical cancer, coccidioidomycosis, cryptococcosis, encephalopathy, herpes simplex virus, lymphoma, tuberculosis, pneumocystis pneumonia, and toxoplasmosis. In Indonesia, the most common opportunistic infections found in HIV patients are pulmonary tuberculosis, cryptosporidiosis, and candidiasis/syphilis (Ministry of Health of the Republic of Indonesia, 2022). A study conducted in East Jakarta found that tuberculosis (TB) is the most common

infection in HIV patients in Indonesia. Almost half of all tuberculosis cases occur in women, because women with advanced HIV are at higher risk of developing opportunistic infections, which can cause severe illness and death. In addition, pregnant women with HIV and opportunistic infections are at risk of transmitting the virus to their unborn children (Rostina et al., 2019). This study aims to analyze the factors contributing to opportunistic infections in women with HIV at the HIV Clinic of Dr. Soetomo Hospital.

METHOD

The study utilized a quantitative approach with an observational design and a retrospective method. This involved reviewing the medical records of female HIV patients at Dr. Soetomo Hospital who experienced opportunistic infections. The population included all female HIV patients treated at the hospital's HIV clinic from January to December 2023. A total sampling method was applied, meaning all patients who met the inclusion criteria, such as those with late-stage HIV and complete medical records were included, while those with incomplete records or early-stage HIV were excluded.

Data collection relied on secondary data from medical records, which were processed through steps such as editing, coding, data entry, and tabulation. Univariate analysis was used to describe the characteristics of each variable, while bivariate analysis, using chi-square tests, explored the relationships between variables like ARV adherence, CD4 levels, viral load, and the occurrence of opportunistic infections. The research followed ethical guidelines, including obtaining informed consent (where required), ensuring patient anonymity, and maintaining the confidentiality of all collected data.

RESULT AND DISCUSSION

Table 1 Frequency distribution of opportunistic infections

Characteristics	Frequency (f) N = 94	Percentage(%)
Infection		
Infected	48	51,1
Not Infected	46	48,9

Types of Infection		
Candidiasis	3	3,2
Hepatitis	2	2,1
Tuberculosis	16	17,0
Toxoplasmosis	5	5,3
Pneumonia	4	4,2
Herpes	1	1,1
Condyloma Acuminata	4	4,2
Cytomegaloviral	2	2,1
Septicaemia	2	2,1
Respiratory Infection	2	2,1
Acute Pharyngitis	1	1,1
Chronic Pansinusitis	1	1,1
Cyst of Bartholin's Gland	1	1,1
Chronic Tubotympanic	1	1,1
Conjuctivitis	1	1,1
Bisitopenia	1	1,1
Gastroenteritis	1	1,1
Without Infection	46	48,9

Table 2 Frequency distribution of predominant factors

Respondent Characteristics	**Frequency of Infection N = 94**		**Percentage(%)**
	Infected	not infected	
Age			
<20	3	0	3,2
20-35	24	23	50,0
>35	21	23	46,8
Work			
Employees	12	15	28,7
Housewife	28	23	54,3
Student	4	1	5,3
Other	4	7	11,7
Duration of Infection			
≥ 5 year	10	13	24,5
< 5 year	38	33	75,5
Compliance ARV consumption			
Low	24	9	35,0
Medium	12	12	25,6
High	12	25	39,4
CD4 cell Level			
≤ 350 cell (at Risk)	34	15	52,1
>350 cell (no Risk)	14	31	47,9
Viral Load Level			
>100.000 (High)	13	0	13,9
10.000-100.000 (Medium)	4	3	7,4
50-10.000 (Low)	6	5	11,7
<50 (not detected)	25	38	67,0

Table 1 provides an overview of the distribution of opportunistic infections among female HIV patients. A total of 48 patients (51.1%) had opportunistic

infections, compared to 46 patients (48.9%) without such infections. Tuberculosis was the most common opportunistic infection, affecting 16 patients (17.0%).These findings indicate that opportunistic infections affect more than half of female HIV patients, with tuberculosis being the most prevalent. According to the World Health Organization (WHO, 2024), individuals with HIV have a 14-fold higher risk of developing tuberculosis due to the decline in CD4 cell count, which compromises the immune system's ability to suppress *Mycobacterium tuberculosis*. As a result, latent tuberculosis infections are more likely to progress to active disease in HIV-infected individuals.

Table 2 presents the frequency distribution of factors influencing opportunistic infections by age. Patients aged 20–35 years constitute the majority, with 47 individuals (50.0%), followed by those over 35 years (44 individuals, 46.8%), and those under 20 years (3 individuals, 3.2%). Previous studies suggest no significant relationship between age and HIV incidence, as all age groups are at risk. However, Rahmawati et al. (2023) report that individuals under 40 years are 7.3 times more likely to contract HIV. The highest prevalence of HIV infection occurs in the productive age group (20–24 years), largely due to risky behaviors, including unprotected sexual activity (Oktaseli et al., 2019).

When examining the occupational background of respondents, housewives comprise the largest group, with 51 individuals (54.3%), followed by private-sector employees (27 individuals, 28.7%), students (5 individuals, 5.3%), and those with unknown occupations (11 individuals, 11.7%). Of the 48 respondents with opportunistic infections, 28 were housewives, a finding consistent with previous studies indicating that housewives constitute a significant portion of HIV patients (Sianturi & Aprianingsih, 2021). The lack of access to information on HIV/AIDS due to household responsibilities may contribute to their vulnerability. Furthermore, 85% of HIV transmission among housewives is linked to sexual contact with infected partners.

Regarding the duration of HIV infection, most patients (71 individuals, 75.5%) had been diagnosed for less than five years, while 23 individuals (24.5%) had been infected for more than five years. In terms of antiretroviral (ARV) therapy

adherence, 37 patients (39.4%) demonstrated high adherence, 33 patients (35.0%) had low adherence, and 24 patients (25.6%) exhibited moderate adherence. CD4 cell count distribution indicates that 49 individuals (52.1%) had CD4 levels ≤ 350 cells/mm³, placing them at higher risk, while 45 individuals (47.9%) had CD4 levels > 350 cells/mm³.Lastly, viral load analysis reveals that 63 patients (67.0%) had undetectable viral loads (<50 copies). In contrast, 13 patients (13.9%) had high viral loads (>100,000 copies), 11 patients (11.7%) had low viral loads (50–10,000 copies), and 7 patients (7.4%) had moderate viral loads (10,000–100,000 copies).

Table 3 Bivariate analysis with chi square statistical test

Variables	Opportunistic Infection Occurrence			*P Value*
	Infected	Not Infected	Total	
	f (%)	f (%)	f (%)	
Duration of Infection				
≥ 5 year	10(10,6)	13(13,9)	23(24,5)	0,402
< 5 year	38(40,5)	33(35,0)	71(75,5)	
Compliance ARV consumption				
Low	24(25,5)	9(9,5)	33(35,0)	**0,003**
Medium	12(12,8)	12(12,8)	24(25,6)	
High	12(12,8)	25(26,6)	37(39,4)	
CD4 cell Level				
≤ 350 cell (at Risk)	34(36,2)	15(15,9)	49(52,1)	**<0,001**
>350 cell (no Risk)	14(14,9)	31(33,0)	45(47,9)	
Viral Load Level				
>100.000 (High)	13(13,9)	0(0)	13(13,9)	
10.000-100.000 (Medium)	4(4,2)	3(3,2)	7(7,4)	**0,001**
50-10.000 (Low)	6(6,2)	5(5,3)	11(11,7)	
<50 (not detected)	25(26,6)	38(40,4)	63(67,0)	

Based on the results of statistical tests, the p-value for the variable *duration of HIV infection* was 0.402, exceeding the significance level (α = 0.05). Therefore, it can be concluded that the hypothesis (H1) is not supported, indicating that there is no significant effect of the duration of HIV infection on the occurrence of opportunistic infections in women living with HIV. This finding is consistent with a cross-sectional study conducted by Teeka, Mutai, and Kangogo (2019) in Kenya involving 196 HIV patients aged 18 and above, which also reported no significant effect of the duration of HIV infection on the occurrence of opportunistic infections (Teeka et al., 2024). However, this result contrasts with a retrospective cohort study by Melkamu et al. (2020) involving 408 HIV-infected patients, which demonstrated a higher risk of opportunistic infections among patients with longer infection duration.

Regarding the variable *adherence to antiretroviral (ARV) therapy*, the statistical test yielded a p-value of 0.003, which is below the significance threshold ($\alpha = 0.05$). Consequently, the hypothesis (H1) is accepted, affirming that ARV adherence significantly affects the occurrence of opportunistic infections in women living with HIV. This result aligns with findings from a systematic review and meta-analysis by Low et al. (2016), which demonstrated a reduction in opportunistic infection risk among HIV patients with good ARV adherence. Similarly, a study by Woldegeorgis et al. (2022) identified poor ARV adherence as a critical factor contributing to the development of opportunistic infections. Low adherence levels are influenced by factors such as limited knowledge, challenges in maintaining routine medication schedules, and insufficient social support. Muchtar et al. (2023) highlighted the impact of patient knowledge and social motivation on adherence, emphasizing the importance of family involvement in medication supervision to enhance ARV compliance (Suryanto & Nurjanah, 2021).

Statistical tests for the variable *CD4 cell count* produced a p-value of <0.001, which is significantly lower than the α level of 0.05. Therefore, the hypothesis (H1) is accepted, indicating that CD4 levels significantly influence the occurrence of opportunistic infections in female HIV patients. This finding is corroborated by a study conducted by Kurniawati et al. (2022) involving HIV/AIDS patients at Dr. Moewardi Hospital, where CD4 levels were found to significantly affect the incidence of opportunistic infections, with a p-value of 0.002. Similarly, research by Letissia et al. (2019) at Dr. Mohammad Hoesin Hospital in Palembang concluded that declining CD4 levels are associated with an increased risk of opportunistic infections in HIV patients.

The statistical analysis of *viral load levels* revealed a p-value of 0.001, lower than the significance level of $\alpha = 0.05$. This supports the acceptance of the hypothesis (H1), indicating that viral load levels significantly affect the incidence of opportunistic infections in female HIV patients. This conclusion is consistent with research by Paramadika et al. (2023) at Sanglah Hospital, Denpasar, which demonstrated that lower viral loads correspond to a reduced risk of opportunistic infections. However, conflicting findings were reported by Siagian (2023) in a study conducted at Dr. H. Abdoel Moeloek Hospital, where no significant

relationship between viral load levels and opportunistic infections was observed, as evidenced by a p-value of 0.539, exceeding the significance threshold.

CONCLUSION

Based on the findings of this study, it can be concluded that among the 94 female patients living with HIV, the majority were between the ages of 20 and 35 years and primarily engaged in domestic work as housewives. Most patients experienced opportunistic infections, with tuberculosis being the most prevalent. The duration of HIV infection did not have a statistically significant effect on the occurrence of opportunistic infections. Conversely, adherence to antiretroviral (ARV) therapy, CD4 cell count, and viral load levels were found to have a significant impact on the development of opportunistic infections.

DECLARATION

Conflict of Interest

Authors declare no conflict of interest regarding the publication of this research.

Authors' Contribution

All authors contributed significantly to the research, analysis, and writing of this article. Author designed the study and supervised data collection, performed statistical analysis, and contributed to data interpretation and manuscript preparation. All authors reviewed and approved the final version.

Ethical Approval

Ethical approval for this study was obtained from the Institutional Review Board of Universitas Airlangga Hospital, ensuring that all protocols complied with the hospital's ethical guidelines (177/KEP/2023). Informed consent was acquired from all participants prior to inclusion in the study.

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Data Availability

The data supporting the findings of this study are available upon reasonable request from the corresponding author, with restrictions due to participant confidentiality.

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REVIEW FOOD ENGINEERING HEALTHY FOOD *Centella asiatica* TO PREVENT STUNTING IN TODDLERS

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Abstract

Background: WHO ranked Indonesia as the third country with the highest prevalence of stunting in Asia. In Indonesia, 1 in 3 children under five is potentially stunted (26.6%). Stunting is a chronic nutritional problem caused by a long lack of nutritional intake. In Indonesia, Centella asiatica is easy to find because it grows well in tropical climates. Besides being a source of plant-based protein, it also acts as an antioxidant, anti-inflammatory, neuroprotective agent, and supports brain function. It helps improve concentration and memory, and may help prevent stunting. Preliminary studies show that 8 out of 10 children enjoy healthy processed foods such as brownies, nuggets, crackers, and seaweed candies enriched with Centella asiatica. Accounting nutritional facts from the healthy food Centella is the purpose study. **Method:** This exploratory study analyzed the nutritional content of Centella asiatica-based brownies with five toppings: almond slices, mixed nuts, white chocolate chips, choco chips, and shredded cheese. Tests were conducted at Pasundan University's Food Engineering Laboratory, measuring moisture, fat, protein, carbohydrates, and calories using standard methods. The study aimed to evaluate the potential of these brownies to prevent stunting in children. This research is an advanced study of exploratory study with a pre-experimental approach model one shoot case study. At this stage, this study used a laboratory test in the form of nutritional facts tests. Some of these tests will be conducted at the food engineering laboratory of Pasundan University Bandung. All of kind of brownies have been measured in nutritional facts. **Result:** The results show that the nutritional content in 1 cupcake brownie with 5 variants of toppings (choco chips, almonds, cheese, nuts, white chips) shows the content of Kkal/ 100 grams range from 319.97-322.44 Kcal, and the percentage of Calories Nutritional Rate Adequacy is 100 grams range from 16.00 - 16.19%. **Conclusion :** Therefore, Centella's innovation as a healthy snack to overcome stunting growth in toddlers can be developed as a healthy natural product as one of the characteristics of Indonesian food.

keyword : Centella asiatica, stunting, toddlers

INTRODUCTION

WHO ranked Indonesia as the third country with the highest prevalence of stunting in Asia. In 2017, more than half of the world's stunted toddlers were from

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Asia (55%). In Indonesia, 1 in 3 children under five has the potential to be stunted (26.6%)(Prendergast & Humphrey, 2014).

Stunting is a chronic nutritional problem caused by a long lack of nutritional intake. The cause of stunting growth is generally caused by food intake that is not by following per under nutritional needs (First 1000 Days of Birth), low access to nutritious foods, low intake of vitamins and minerals, and exposure to free radicals consumed in food. For example, vegetables that contain pesticides and chemicals. Stunting can be prevented from the womb until the age of 2 years (Hanifah et al., 2019). The impact of stunting on children if not treated immediately can interfere with the child's growth and development later in life. Some studies have shown that Centella may increase zebrafish larvae by expressing BDNF growth factors (Ridlayanti et al., 2021). Administration of Centella before and after hatching can improve the development of brain neurons, and improve the hardening of the bones, thereby preventing stunting (Calapai, 2010). Previous research has shown that the empowerment of parents in processing the daily diet affects the increase in the height of children with stunting. Researchers added to another study that toddlers favor modifications of Centella in their daily snacks (Fatmawati, 2021).

In Indonesia, Centella is easy to get because this plant grows in the tropics. People in West Java usually consume it as a lalapan (Saputri & Evy Damayanthi, 2015). Benefits of Centella in addition to being a source of vegetable protein as well as antioxidants, anti-inflammatory, nerve protectors, strengthening the brain nerves, making concentration and memory higher, and can prevent stunting (Pittella et al., 2009). In addition, Centella also contains calcium, magnesium, phosphorus, zinc, copper, and beta-carotene. Centella is especially appropriate if children under five during the golden age are given the intake of Centella as one of their daily food ingredients(James & Dubery, 2009).

Preliminary studies that the authors have done show that 8 out of 10 children like processed healthy foods in the form of brownies, nuggets, crackers, and seaweed candies that Centella has added. Therefore, researchers are trying to explore more deeply the potential of processed healthy foods Centella healthy foods as an innovation in preventing stunting growth in children under five. This study aims to

find out the nutritional fact content contained in 1 pcs processed healthy Centella as an innovation in preventing the stunting growth of children under five.

METHOD

This research is an advanced study of exploratory study with a pre-experimental approach model one shoot case study. At this stage, this research design used a laboratory test in the form of nutritional facts tests. Some of these tests will be conducted at the food engineering laboratory of Pasundan University Bandung.

The sample in this study is a healthy food processed product made from Gotu kola (Centella) in the form of cupcake-shaped brownies consisting of 5 variants. This study was conducted within 6 months (May-October 2021). The nature of the problem that arises in this study is how the results of nutritional facts test analysis of the potential of processed Centella to prevent stunting growth in children.

The scope of testing of this study is the creative results of processed healthy foods based on Centella given in the study sample. There are 5 variants of processed centella food made by researchers consisting of brownies topping almond slices, brownies topping nuts, brownies topping white choco, brownies topping choco chips, and brownies topping cheese. These five food variants will be given to the laboratory for analysis of nutritional facts tests. The data obtained are the results of laboratory tests in the form of nutritional facts test results. This Research have etical approval from Health Polytechnique Ministry Of Health with No.04/KEPK/EC/X/2023.

RESULT AND DISCUSSION

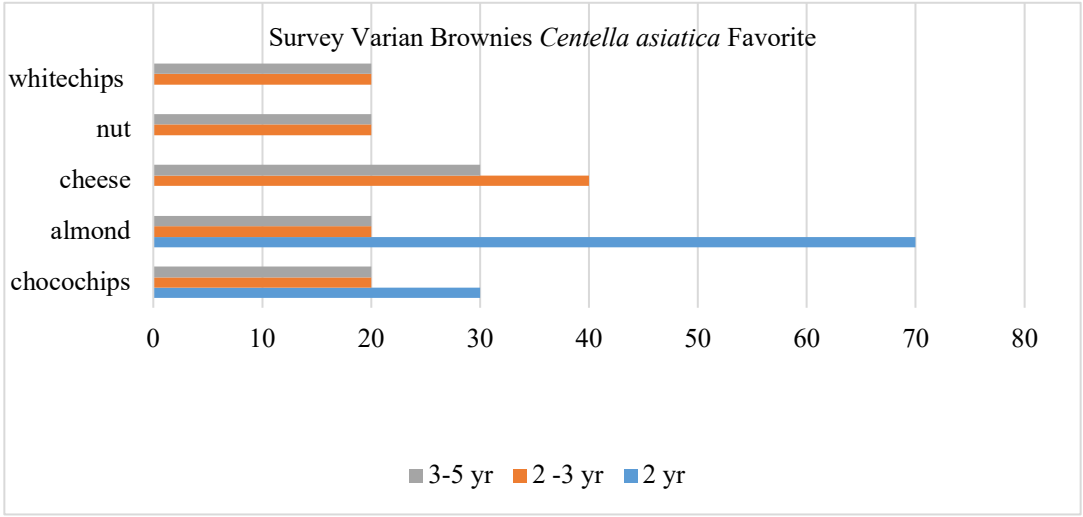
The manufacture of samples of healthy brownies processed Centella was done in the nutrition laboratory of the University of 'Aisyiyah Bandung. Once all the materials are prepared, the equipment is prepared in a clean state.

The results of the nutritional facts analysis test come out on August 27, 2023. With the following results:

No	Toping	Test Parameters	Unit	Test results	% NRA/100g
1	Choco chips	Fat	%	13,54	15,22
		Protein	%	5,35	8,10
		Carbohydrate	%	44,79	12,17
		Calorie	Kkal/100g	322,44	16,12

2	Almond	Fat	%	13,14	14,77
		Protein	%	5,60	8,49
		Carbohydrate	%	45,76	12,43
		Calorie	Kkal/100g	323,75	16,19
3	Cheese	Fat	%	13,03	14,64
		Protein	%	5,59	8,47
		Carbohydrate	%	45,59	12,39
		Calorie	Kkal/100g	322,01	16,10
4	Nut	Fat	%	13,09	14,70
		Protein	%	5,26	7,97
		Carbohydrate	%	45,29	12,31
		Calorie	Kkal/100g	319,97	16,00
5	White chips	Fat	%	15,83	14,42
		Protein	%	5,39	8,17
		Carbohydrate	%	46,40	12,61
		Calorie	Kkal/100g	322,40	16,13

In each age group, there were 10 children surveyed to taste this healthy food resulting in 70% liking this food and saying it was good to top almonds. Here's the survey results chart.



On the table is seen the calorie content in every 100 grams of Centella brownies. Brownies with almond topping have the highest calories compared to other variants where 100 grams of brownies reach 323.75 kcal. The average caloric value for healthy brownies Centella reaches 320 kcal/100 grams. The highest fat content is found in nut topping as much as 14.70%, the highest carb dioxide content is found in the white chips variant as much as 12.61% while the highest protein is owned by the almond variant at 8.49%. From the table came the conclusion that the almond variant has the highest calorie and protein content compared to other variants.

Healthy foods are foods that contain a variety of nutrients needed by the body. Healthy food balance is foods that contain carbohydrates, proteins, fats, minerals, and vitamins (G.S. et al., 2014). Processed healthy foods Centella has nutrients that are needed by the body, namely carbohydrates, proteins, and fats (Orhan, 2012). These nutrients are indispensable for children under five for their growth and development (Jamil et al., 2007). Stunting is a condition of height growth disorder where height according to age is below the value of -2SD according to table z-score. Stunting can be caused by long-term malnutrition. Children under five who are malnourished have the potential to develop diseases and growth disorders (Primaditya et al., 2020). Therefore, parents and people around them pay attention to the intake of nutrients consumed by children every day.

Kolstren (1996) analyzed that there is a link between intrauterine fetal growth (fetal life) and linear growth at the time of early postnatal. Nutrient incorporation greatly affects stunting growth in the postnatal period. This condition consists of the quality of digested nutrients and the interaction of nutrients with biochemistry. The quality of digested nutrients consists of the quality of food, the interaction of body nutrients at the time of absorption, the amount of food served to children, and the appetite of the child. Overall, this greatly affects the growth of the child's height (Kolsteren,1996)

In Centella, there is a nutritional content that is terpenoids. This substance contains asiaticoside, centelloside, medecassoside, brahmoside, brahminoside, thankuniside, sceffoleoside, centellose, asiatic-, brahmic-, centellic-, and medecassic acids (Joshi, Kanchan and Preeti Chatudevi, 2013). Centella asiatica extract produces triterpenes including asiaticoside, asiatic acid, madecassoside, and madecassic acid

(Zahara et al., 2018). In addition, the active antioxidant ingredients of gotu kola include polyphenols, flavonoids, β-carotene, tannins, and vitamin C (Kumar et al., 2011). Gotu kola also has a nutritional content consisting of protein, fiber, various minerals, and vitamins. Gotu kola has estrogenic effects that can increase the proliferation and synthesis of collagen in the vaginal walls in mice due to the phytoestrogen content in it (Sherley, 2010). Centella (Gotu kola) has benefits as an antioxidant, anti-inflammatory, antiseptic, treating peptic ulcers, cardioprotective effects, immunomodulators, neuroprotective, cytotoxic, anabolic effects, memory enhancement, antifertility, radioprotective effects, effects on vascular or venous beats, hypertension, antidepressants, antipsoriatic, antitubercular, antileprotic, antiviral, antiprotozoal, antispasmodic, striae gravidarum, impaired liver function, vascular disease and decreased mental retardation in children (Hashim et al., 2011)

Therefore, researchers can conclude that processed healthy foods Centella can be an alternative intake of healthy foods for children under five as a solution to prevent stunting growth in children.

CONCLUSION AND SUGGESTION

This study concludes that evaluation of the potential of Centella asiatica brownies show a lot of good nutritional content for stunting prevention in children. The results show that the nutritional content in 1 cupcake brownie with 5 variants of toppings (choco chips, almonds, cheese, nuts, white chips) shows the content of Kkal/ 100 grams range from 319.97-322.44 Kcal, and the percentage of Calories Nutritional Rate Adequacy is 100 grams range from 16.00 - 16.19%.

This healthy food can be used as an alternative healthy snack for improving toddler nutrition. Among the five variants tested, the almond-topped brownie had the highest caloric and protein content, and was the most preferred by children. The nutrient profile of these products-including protein, fat, and carbohydrates-demonstrates their potential to support growth and development and contribute to stunting prevention. Therefore, the creative integration of centella into child-friendly processed foods may serve as a practical nutritional intervention to combat stunting in early childhood. This proceed healthy food always used ingredients based on local wisdom that are easy to find in everyday life. In the next research stage plan,

researchers will conduct sensory and expired tests and plan to apply for production permit registration at PIRT BPOM as part of a series of lecturer research roadmaps.

DECLARATION

Conflict of Interest

The authors declare that they have no competing interests in this article research.

Authors' Contribution

All the authors contribute to were involved in every stage of the research, from the initial concept to the drafting of the article. This sub-section highlights the collaborative nature of the research effort.

Ethical Approval

This Research have etical approval from Health Polytechnique Ministry Of Health with No.04/KEPK/EC/X/2023. The research has been reviewed and approved by an ethics committee.

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Data Availability

In this part, the authors state that the data supporting the research findings are available upon reasonable request. This promotes transparency and allows other researchers to verify and build upon the work.

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THE INFLUENCE OF STUNTING PREVENTION CARDS ON IMPROVING THE KNOWLEDGE OF ADOLESCENT GIRLS

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Abstract

Background: Stunting is one of the health issues. Prevention efforts for stunting include interventions targeted at various life stages, such as adolescence and preconception. The purpose of this study was to examine the influence of stunting prevention cards in enhancing the knowledge of adolescent girls to prevent stunting. **Method:** This study employed a Pre-Experimental Design with a One Group Pretest–Posttest Design, involving a sample size of 50 respondents. Data were collected using a knowledge questionnaire consisting of 10 items, each with 4 multiple-choice answer categories, with a maximum score of 100 and a minimum score of 10. The questionnaire was distributed to all respondents before the game, and the time for questionnaire completion was 20–25 minutes (pre-test). Subsequently, respondents were given 10 minutes to read the explanations of categories found on the stunting prevention cards. Afterward, a game lasting 1 hour was conducted, followed by a question and answer session lasting 25–30 minutes. Finally, respondents were given a 30-minute break before being provided with the same questionnaire again, with a questionnaire completion time of 25–30 minutes (post-test). Data were processed and analyzed univariately and bivariate using the T-test. The research results were then presented in tables and narrative form. **Result:** The statistical test yielded a p-value of 0.000 or $p < 0.05$. This indicates that the stunting prevention cards significantly influenced the increase in the knowledge level of adolescent girls. **Conclusion:** The higher the level of knowledge among adolescents, the better they are at preventing stunting.

keyword: Knowledge, adolescence, stunting prevention card, stunting,

INTRODUCTION

Children under the age of five are vulnerable to stunting, which is a health issue characterized by impaired growth and low height according to the criteria of the World Health Organization (Nur Amalia, Setiani, and Hanani Darundati 2023). According to the researchers, reduced productivity, low achievement, and decreased cognitive function are some of the impacts associated with stunting (Utami, Setiawan, and Fitriyani 2019). There were 40% of toddlers suffering from stunting (Momenimovahed and Salehiniya 2019). UNICEF reports that 40% of toddlers worldwide suffer from stunting, affecting one in three children under the

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age of five (Nur Amalia et al. 2023). In toddlers, stunting is often associated with dietary issues such as malnutrition and poor nutrient absorption (Quamme and Iversen 2022). The research found that family characteristics, nutritional parenting patterns, birth weight and length, maternal and household head education levels, early marriage, clean and healthy living behaviors, and emotional disturbances in adolescent mothers are associated with the occurrence of stunting. Additionally, indirectly, the environment also influences the incidence of stunting (Adelbertha et al. 2022; Utami et al. 2019). The prevalence of stunting varies between boys and girls, with boys having a higher rate of 48.8% compared to girls at 37.8% (Utami et al. 2019).

Improving nutrition, cleanliness, and sanitation as efforts to address stunting (Wicaksono and Harsanti 2020). Stunting prevention efforts often involve a series of interventions targeted at various life stages, such as adolescence and preconception. Research has emphasized the importance of interventions for adolescent girls, including micronutrient intake, preventing early marriage, and nutritional education (Renyoet, Dary, and Nugroho 2023). Early nutrition strengthening for females as future mothers is necessary to prepare the female body for the fetal development phase (Saleh et al. 2021). However, research indicates that the level of adolescent knowledge related to stunting is still low (Suryani, Djannah, and Kodriati 2023). Therefore, various innovative learning media are being researched as an effort to enhance adolescent knowledge related to stunting, such as the use of podcasts (Rahayu et al. 2022), social media platforms such as TikTok, Instagram, Twitter, YouTube, and Facebook (Marlinawati, Rahfiludin, and Mustofa 2023), and booklet media (Sriwiyanti et al. 2022), significantly increased the knowledge of adolescent girls related to stunting prevention. Additionally, innovations in educational methods are also needed to capture the interest of adolescents. This is in line with research stating that interactive methods during education significantly improve adolescent knowledge (Maharani et al. 2022).

Furthermore, research has emphasized the need to understand the behavior of adolescents, especially their curiosity and emotional development, as part of their psychological and cognitive development (Diem-Wille and Mcquade 2020). Game-based educational approaches can be used as a learning tool for adolescents

(Johnston, Wildy, and Shand 2023). Play-based learning has become an essential approach to encourage adolescent participation and develop comprehensive skills (Parker, Thomsen, and Berry 2022). Based on that, a game-based learning media was developed, adopting the concept of quartet card games, known as stunting prevention cards.

Stunting prevention cards are a card game adopted from quartet card games. It consists of 30 cards with images and information on how to prevent stunting, including the definition of stunting, causes of stunting, the impact of stunting, and stunting prevention efforts for adolescents, covering information related to early marriage, nutrition in adolescents, and preventing anemia in adolescents. Therefore, each card set contains 6 cards, each presenting comprehensive information (Samsiyah, Hermansyah, and Kuswidyanarko 2021; Sumargono et al. 2020). This educational media was chosen because it could capture the interest and attention of adolescents in the educational content provided (Nurfaizah, Rahman, and Rahmadani 2021). Based on that, the aim of this research was to examine the impact of stunting prevention cards on increasing the knowledge of adolescent girls as an effort to prevent stunting.

METHOD

This research utilized a Pre-Experimental Design with a One Group Pretest–Posttest Design. The study was conducted at SMAN 1 Sindue from May 24 to June 23, 2023. The sample for this study consisted of adolescent girls at SMAN 1 Sindue, and the sample size was determined using the Slovin formula, resulting in 50 respondents. The sampling technique employed proportional random sampling, with each class selecting 10 respondents. The dependent variable in this study was the knowledge of adolescent girls, and the independent variable was the stunting prevention cards. The rules for playing the stunting prevention cards included forming groups of 4 people. Each person in the group had to collect 6 cards in the order of topics on preventing stunting to become the winner. The game was played for 1 hour or until three winners were determined.

The game begins when one player shuffles the cards and deals them to each participant, with each player receiving 4 cards. The remaining cards are placed in

the middle of the table with their faces down. The game is played clockwise. After each player receives their cards, they engage in a coin toss to determine the first player. The first player announces the desired category; if none of the players have a card in that category, the first player must pick a card from the pile in the middle. Next, the second player announces the desired category. If any other player has a card in that category, they must give their card to the second player. If no other player has a card in the announced category, the second player must pick a card from the middle. If a player collects all the items in a category and becomes the winner, they must explain the cards (simultaneously with a Q&A session). If a player hasn't collected all the items in the category, the game continues to the next player. The above steps are repeated until all the cards are used up, and a winner is determined.

Data was collected using a knowledge questionnaire consisting of 10 questions, with each question comprising 4 multiple-choice answer categories. The maximum score for each item was 100, and the minimum score was 10. The questionnaire was distributed to all respondents before the game, and the time allocated for questionnaire completion was 20-25 minutes (pre-test). Afterward, respondents were given 10 minutes to read the explanations of the categories on the stunting prevention cards. Subsequently, the game was played for 1 hour, followed by a Q&A session lasting 25-30 minutes. At the end, respondents were given a 30-minute break, and then the same questionnaire was administered again with a time frame of 25-30 minutes for completion (post-test). The data were processed and analyzed univariately and bivariately using the T-test. The research findings were then presented in tables and a narrative format.

RESULT AND DISCUSSION

Result

The results of the distribution of respondent characteristic frequencies will be presented

Table 1. Distribution of respondent characteristic frequencies

Age	F	%
14 Year	1	2
15 Year	11	22

16 Year	32	64
17 Year	6	12
Total	**50**	**100**

Table 1 shows that the most sampled respondent characteristic is the age of 16, with 32 respondents (64%).

The following presents the results of the distribution of respondent knowledge levels before and after the intervention.

Table 2. Distribution of respondent knowledge levels

Knowledge	***Pretest***		***Posttest***	
	f	***%***	***f***	***%***
Good	6	12,0	27	54,0
Moderate	18	36,0	18	36,0
Low	26	52,0	5	10,0
Total	**50**	**100**	**50**	**100**

Table 2 indicates that the knowledge level of respondents before the intervention was most prevalent in the "Low" category, with 26 respondents (52%), and after the intervention, there was an increase in the knowledge level, with 27 respondents (54%) falling into the "Good" category.

The results of the variance analysis using the Paired Sample T-Test are as follows:

Table 3. The Influence of Stunting Prevention Cards on the Knowledge Level of Adolescent Girls

Knowledge	***Mean***	***P-Value***
Pretest- Posttest	22	0,000

Table 3 indicates that the statistical test results yielded a p-value = 0.000, or $p < 0.05$. This suggests that stunting prevention cards significantly influence the increase in the knowledge level of adolescent girls.

Preventing stunting in adolescent girls has an impact on the health and well-being of future generations. Various interventions have been provided to adolescent girls, including educational interventions on nutrition, stunting, early marriage, hygiene, sanitation, and the fulfillment of micronutrients (Renyoet et al. 2023). Despite these interventions, social media-based health education has proven to be successful in preventing stunting in adolescents (Marlinawati et al. 2023).

The results of this study indicate the influence of stunting prevention cards on the improvement of knowledge in adolescent girls. This increase in knowledge

occurs through the provision of health education on preventing stunting in adolescents, conducted collaboratively with peers, consisting of four individuals in one group. The educational approach involves playing a game using stunting prevention cards, where each card contains fragmented information on preventing stunting in adolescents. Participants must assemble six stunting prevention cards to obtain comprehensive information. Through this process of assembling information pieces, respondents receive health education. This aligns with previous research stating that the improvement of adolescent knowledge can occur through health education interventions (Mitra 2020), peer intervention (Mason-Jones et al. 2023), And game-based learning methods (Havizoh, Widyatuti, and Mulyono 2022).

The stunting prevention cards are adapted from the quartet card game. Quartet cards are a type of game consisting of several cards with illustrations, each accompanied by written descriptions explaining the images (Sumargono et al. 2020). The quartet card game was adopted by the researcher as an educational medium because several studies indicate that adolescents who learn through play receive numerous benefits, divided into various categories, including physical development (Eime et al. 2013; Nijhof et al. 2018), emotional development (Eime et al. 2013), cognitive development (Nijhof et al. 2018), social development (Eime et al. 2013), positive behavioral development (Vlachopoulos and Makri 2017), improved readiness and comfort during learning (Jensen and Rørbæk 2022), and fostering positive experiences, personal growth in competition, confidence, connections, empathy, character, and contribution (Worker et al. 2019).

The improvement of knowledge in adolescent girls regarding stunting prevention will have an impact on changing the behavior of adolescent girls related to sensitive nutritional fulfillment. For example, regularly taking iron supplements during menstruation, avoiding early marriage, and maintaining personal hygiene

CONCLUSION AND SUGGESTION

The use of stunting prevention cards significantly enhances adolescents' knowledge about preventing stunting in their age group. The higher the level of adolescents' knowledge, the better they are prevented from stunting. Schools and healthcare professionals can provide support and innovation in delivering health education. It

is hoped that future researchers can develop more creative and innovative methods and media for health education aimed at adolescents

DECLARATION

Conflict of Interest

There is no Conflict of interest in this Study.

Authors' Contribution

All the authors involved in every stage of the research, from the initial concept to the drafting of the article.

Ethical Approval

-

Funding Source

-

Data Availability

Available data requested.

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