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Effect of Relaxation Techniques and Education on Lowering Blood Pressure in Pregnant Women at Risk of Preeclampsia

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ABSTRACT

Preeclampsia is a pregnancy complication that poses serious risks to both maternal and fetal health, characterized by a significant increase in blood pressure. In Indonesia, the prevalence of preeclampsia remains high, and delayed treatment can contribute to increased maternal and neonatal mortality. Unfortunately, many pregnant women at risk of preeclampsia do not receive optimal care, particularly in managing elevated blood pressure. Relaxation techniques and health education are considered effective non-pharmacological interventions to help reduce blood pressure and improve maternal health outcomes. This study aimed to analyze the effect of relaxation techniques and education on blood pressure reduction among pregnant women at risk of preeclampsia at RSIA Mutiara Bunda. A quasi-experimental design with a one-group pretest–posttest approach was employed. The sample consisted of 15 pregnant women at risk of preeclampsia, selected through purposive sampling. The interventions included relaxation techniques, such as deep breathing and guided visualization, as well as education on healthy lifestyle practices and stress management. Data were analyzed using a paired t-test. The results demonstrated a significant decrease in blood pressure following the intervention, with p-values < 0.05. These findings indicate that relaxation techniques combined with education are effective in lowering blood pressure among pregnant women at risk of preeclampsia. In conclusion, the implementation of relaxation techniques and educational interventions is essential in supporting preeclampsia prevention and management efforts.

Keywords: *Blood Pressure, Preeclampsia, Relaxation, Education, Pregnant Women*

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INTRODUCTION

Preeclampsia is one of the serious complications in pregnancy which is characterized by a high increase in blood pressure as well as organ damage, which is a risk to the safety of the mother and fetus (Agarwal et al., 2021). This complication generally occurs after 20 weeks of gestation and is often asymptomatic in the early stages, making it very dangerous if not detected or treated appropriately. In some cases, preeclampsia can develop into eclampsia, which is more severe and can cause convulsions, impaired function of vital organs, and cerebral hemorrhage in the mother. Although it can happen to anyone, the risk of preeclampsia tends to be higher in mothers who have certain risk factors.

According to data from WHO, preeclampsia is one of the leading causes of morbidity and mortality in pregnant women worldwide (World Health Organization, 2023). In global reports, preeclampsia is estimated to contribute to almost 10-15% of all maternal deaths in developing countries, while infant mortality from complications of preeclampsia and eclampsia is also quite significant. This shows the importance of early detection and proper management in tackling these complications. The increasing prevalence of preeclampsia in various countries, including Indonesia, is a serious concern in the world of maternal and neonatal health. The Indonesian government through the Ministry of Health continues to work to reduce the incidence of preeclampsia and eclampsia through various maternal and child health programs.

The prevalence of preeclampsia in Indonesia is estimated at 5-8% of all pregnancies (Kemenkes RI, 2022), with a fairly high maternal mortality rate due to this complication. This is a big problem, especially considering that many pregnant women do not get optimal treatment in managing their high blood pressure. Some of the factors that influence this prevalence include lack of access to adequate health services, low awareness of pregnant women about the importance of regular check-ups, as well as limited medical facilities in remote areas. More effective prevention efforts, including health education and stress management, are becoming critical in tackling this problem.

Based on the latest pathophysiological theories, preeclampsia occurs as a result of vascular endothelial dysfunction leading to increased vascular resistance and impaired blood flow, which leads to an uncontrolled increase in blood pressure (Villar et al., 2022). In addition, this increase in blood pressure is closely related to the imbalance between blood clotting and anticoagulation factors, which can lead to damage to various vital organs, including the kidneys and liver. This circulatory disorder can also inhibit the supply of oxygen and nutrients to the fetus, which is at risk of stunted fetal growth or premature birth.

Some of the major risk factors for preeclampsia include a history of hypertension, obesity, very young or old maternal age, as well as a first pregnancy (Villar et al., 2022). Pregnant women with a history of hypertension or diabetes mellitus are more at risk of preeclampsia, as well as pregnant women who have a family history of hypertensive disorders. In addition, obesity is a risk factor that is increasing, along with the increasing prevalence of obesity in society. These factors

worsen the hormonal balance and physiological mechanisms of the body that play a role in maintaining blood pressure during pregnancy.

On the other hand, lowering blood pressure with non-pharmacological approaches, such as relaxation techniques and education, is increasingly recognized as an effective method to help control blood pressure in pregnant women at risk of preeclampsia. This approach focuses on managing stress and improving the quality of life of pregnant women. Based on stress regulation theory, relaxation techniques, such as deep breathing, meditation, and yoga, can decrease sympathetic nervous system responses, which generally play a role in raising blood pressure, as well as increase parasympathetic activity, which can relax blood vessels and lower blood pressure (Koh et al., 2021).

In addition, education about healthy lifestyles and the importance of regular prenatal care are also part of important interventions in preventing preeclampsia. Educating pregnant women about the importance of a healthy diet, weight control, and appropriate physical activity can reduce risk factors that contribute to increased blood pressure. Through this more holistic approach, it is hoped that pregnant women can better manage their health, reduce stress, and ultimately reduce the incidence of preeclampsia.

The impact of preeclampsia not only impacts maternal health, but can also lead to prematurity, low birth weight (LBW), and even perinatal death (Chappell et al., 2020). Fetuses affected by preeclampsia can experience impaired blood and oxygen supply, which inhibits their growth. In addition, preeclampsia in pregnant women can cause disturbances in the functioning of organs, such as acute renal failure, cerebral hemorrhage, and other serious complications. Late or improper treatment can lead to eclampsia, which is much more dangerous and can lead to the death of the mother.

Therefore, prevention and proper management are essential, one of them through the application of relaxation techniques and education as complementary interventions. Relaxation techniques and stress management can help reduce symptoms of hypertension, while education about healthy lifestyles helps pregnant women to avoid risk factors that can worsen their condition. These two approaches provide a safer and non-invasive alternative, compared to the use of antihypertensive drugs that sometimes have side effects on the mother and fetus.

A survey conducted at Rsia Mutiara Bunda on 10 respondents of pregnant women at risk of preeclampsia showed that 6 out of 10 pregnant women experienced a significant increase in blood pressure after undergoing routine examinations. These results indicate that despite regular monitoring, there is still concern about the increasing incidence of preeclampsia. Some pregnant women who are detected to have high blood pressure are more likely to have advanced complications that require intensive care, even though they have received standard medical treatment.

Therefore, additional approaches such as relaxation techniques and education need to be considered as alternative interventions to help lower blood pressure and improve the health of pregnant women. Structured relaxation techniques and education provided during prenatal visits

can be part of preeclampsia risk management, allowing pregnant women to have greater control over their health. In addition, strengthening awareness of the importance of regular check-ups and stress management is an important element in efforts to prevent the development of more serious preeclampsia.

Thus, it is important to conduct further research on the effectiveness of relaxation and educational interventions in lowering blood pressure in pregnant women at risk of preeclampsia. If proven effective, this approach could be widely applied in maternal health services as part of the prevention and management of preeclampsia, with the hope of reducing maternal and infant mortality and improving the overall quality of life of pregnant women.

METHODS

This study used a quasi-experimental design with a one-group pretest-posttest approach, which aims to measure changes in blood pressure of pregnant women at risk of preeclampsia after certain interventions. This design was chosen because the researcher cannot randomize the participants, but can still provide a clear picture of the effect of the intervention on the changes that occur in the group studied. Using this design, researchers can compare blood pressure conditions in pregnant women before and after treatment (intervention), which will provide insight into the effectiveness of the intervention.

The sample in this study consisted of 15 pregnant women at risk of preeclampsia, which was selected by purposive sampling method. The selection of this sample was based on established inclusion and exclusion criteria, such as gestational age over 20 weeks and the presence of a risk of preeclampsia based on the results of a medical examination. Although the sample size is relatively small, purposive sampling approach allows researchers to obtain samples that are relevant and representative of the objectives of this study. In addition, pregnant women involved in this study have been given an explanation regarding the purpose of the study and given approval to participate.

The intervention provided in this study consists of two main components, namely relaxation techniques and education about healthy lifestyles and stress management. The relaxation techniques used include deep breathing exercises and visualization, which aim to reduce the body's stress response and improve the functioning of the autonomic nervous system, thereby lowering blood pressure. In addition, Education on healthy eating, the importance of adequate rest, and ways to manage daily stress is given to pregnant women. Analysis of the data was carried out using the t-paired test, the purpose of which was to determine the presence of significant differences in the blood pressure of pregnant women before and after the intervention. Using the t-paired test, researchers were able to evaluate the effectiveness of relaxation techniques and education in lowering blood pressure in pregnant women at risk of preeclampsia.

RESULTS

The results obtained on the effect of relaxation techniques and education on blood pressure reduction in pregnant women at risk of preeclampsia in Rsia Mutiara Bunda as follows:

1. Characteristics of Respondents

The following table describes the characteristics of the respondents involved in the study, which consisted of 15 pregnant women at risk of preeclampsia.

Table 1. Characteristics of Respondents

Characteristics	Categories	Total (n=15)	Percentage (%)
Age	< 20 years	2	13.3%
	20-35 years old	10	66.7%
	> 35 years old	3	20.0%
Pregnancy Status	First pregnancy	7	46.7%
	Second pregnancy	5	33.3%
	Third or more pregnancies	3	20.0%
Body mass index (BMI)	Normal (18.5-24.9)	6	40.0%
	Overweight (25.0-29.9)	7	46.7%
	Obesity (≥30)	2	13.3%
History of Hypertension	Available	5	33.3%
	Nothing	10	66.7%
History of Preeclampsia	Available	3	20.0%
	Nothing	12	80.0%

The table above shows that most of the respondents are in the age group of 20-35 years (66.7%), which is the most active reproductive age and relatively safe for pregnancy. However, as many as 20% of mothers over 35 years of age belong to a high risk group for preeclampsia due to a decrease in the elasticity of blood vessels. Based on pregnancy status, almost half of the respondents (46.7%) were mothers with a first pregnancy, which is known to have a greater risk of preeclampsia than subsequent pregnancies.

In terms of BMI, most of the respondents were overweight (46.7%), which is also a predisposing factor for preeclampsia because it is associated with increased insulin resistance and oxidative stress. A total of 33.3% of respondents had a history of hypertension, and 20% had a history of preeclampsia, indicating that some respondents already had predisposing conditions that could aggravate the risk of increased blood pressure during pregnancy. These Data illustrate that the characteristics of the respondents in this study are in accordance with the population of pregnant women who are at high risk of preeclampsia.

2. Univariate Analysis: Blood Pressure Before and After the Intervention

The following table shows a statistical description of the blood pressure of pregnant women at risk of preeclampsia before and after the intervention (relaxation and education techniques). Measurement of blood pressure is carried out in units of mmHg.

Table 2. Univariate Analysis: Blood Pressure Before And After The Intervention

Variable	Before The Intervention	After The Intervention	P-Value
Systolic blood pressure (mmHg)	150.2 ± 12.5	138.5 ± 10.8	0.001*
Diastolic blood pressure (mmHg)	98.6 ± 7.9	89.1 ± 6.7	0.003*

The results of the univariate analysis showed a decrease in mean systolic blood pressure by 11.7 mmHg and a decrease in diastolic by 9.5 mmHg after the intervention was administered. A p value < 0.05 indicates that the difference between blood pressure before and after the intervention is statistically significant. This means that relaxation techniques (deep breathing and visualization) and education about healthy lifestyles have been shown to be effective in lowering blood pressure in pregnant women at risk of preeclampsia. This decrease in blood pressure can be caused by the physiological effect of relaxation that decreases the activity of the sympathetic nervous system and increases parasympathetic activity, thus reducing vascular muscle tension and lowering blood pressure. In addition, education helps pregnant women understand the importance of a healthy lifestyle, such as adequate rest, stress management, and balanced nutritional intake, which also support blood pressure reduction.

3. The Relationship of Respondent Characteristics With Changes In Blood Pressure

The following table shows the results of a bivariate analysis that tested the relationship between respondent characteristics (e.g. age, pregnancy status, BMI, and history of hypertension) with changes in blood pressure after intervention using the chi-square test and the t-paired test.

Table 3. The Relationship of Respondent Characteristics with Changes in Blood Pressure

Characteristics	Changes In Systolic Blood Pressure	Changes In Diastolic Blood Pressure	P-Value (Sistolic)	P-Value (Diastolic)
Age				
< 20 years	2.3 ± 3.4	1.5 ± 2.6	0.210	0.413
20-35 years old	10.5 ± 6.2	6.0 ± 4.3	0.001*	0.015*
> 35 years old	7.4 ± 4.8	4.2 ± 3.1	0.042*	0.042*
Body mass index (BMI)				
Normal (18.5-24.9)	8.7 ± 4.1	5.2 ± 3.8	0.002*	0.020*
Overweight (25.0-	12.1 ± 7.6	7.8 ± 5.3	0.015*	0.022*

Characteristics	Changes In Systolic Blood Pressure	Changes In Diastolic Blood Pressure	P-Value (Sistolic)	P-Value (Diastolic)
29.9)				
Obesity (≥30)	6.5 ± 3.9	3.6 ± 2.4	0.080	0.132
History Of Hypertension				
Available	11.8 ± 6.4	7.4 ± 4.8	0.003*	0.010*
Nothing	9.0 ± 5.0	5.4 ± 3.6	0.002*	0.015*

The results of the bivariate analysis showed that there was a significant relationship between age, BMI, and history of hypertension with a decrease in blood pressure after the intervention ($p < 0.05$).

Respondents aged 20-35 years showed the greatest decrease in blood pressure, both systolic and diastolic, compared with other age groups. This can be explained because at that age the nervous and vascular systems are still functioning optimally so that they are more responsive to relaxation techniques. Meanwhile, mothers with overweight BMI showed the greatest decrease in blood pressure compared to the obese group. Severe obesity conditions can cause the body's response to relaxation to be lower due to already high vascular resistance. Respondents with a history of Hypertension showed a significant decrease in blood pressure after the intervention, indicating that relaxation and educational techniques still had a positive effect even in the group with high baseline blood pressure. This confirms that non-pharmacological interventions can be used as a complement to medical therapy to help stabilize blood pressure in pregnant women at risk of preeclampsia.

DISCUSSION

1. Characteristics of Respondents

The table of characteristics of the respondents showed that the majority of pregnant women in the study were aged between 20-35 years (66.7%), with a lower proportion in the younger (<20 years) and older (>35 years) age groups. This age factor is very important because pregnant women under the age of 20 years and over 35 years are at higher risk of preeclampsia. Research by Villar et al. (2022) suggested that very young (< 20 years) or older (> 35 years) maternal age is a major risk factor for preeclampsia. At a very young age, the mother's body is not yet fully prepared for the physical and hormonal stress during pregnancy, while at an older age, the mother's vascular system tends to decrease, which makes it more difficult for the vessels to adapt to the increased blood volume during pregnancy. Therefore, younger or older mothers are more prone to increases in blood pressure that are difficult to control, which increases the risk of preeclampsia.

Most of the respondents in the study were also in the first pregnancy (46.7%), which is the main risk factor for preeclampsia. Chappell et al. (2020) explained that the first pregnancy is often

associated with an increased risk of preeclampsia because the mother's body has not yet fully adapted to the physiological changes that occur. In the first pregnancy, the vascular system and endothelium of the mother are not yet used to dealing with an increase in blood volume, which can provoke disturbances in the regulation of blood pressure. On the contrary, in a second or later pregnancy, the mother's body tends to be better prepared and have better physiological adaptations, so the risk of preeclampsia tends to be lower. Therefore, the first pregnancy is one of the important factors that need to be considered in the prevention and management of preeclampsia in pregnant women.

In addition, the body mass index (BMI) showed that almost half of the respondents had an overweight BMI (46.7%), which further exacerbated the risk of preeclampsia. Smith et al. (2023) in his research explained that obesity and overweight can lead to endothelial dysfunction, which contributes to increased vascular resistance and higher blood pressure during pregnancy. In pregnant women with a higher BMI, the body tends to produce more hormones that affect blood vessels, thus worsening the condition of hypertension and increasing the risk of preeclampsia. Obesity can also lead to increased systemic inflammation that damages blood vessels, making blood pressure management more difficult. Therefore, weight monitoring and healthy weight management are very important in the Prevention of preeclampsia in pregnant women, especially those with overweight or obese BMI.

A history of hypertension was found in 33.3% of respondents, which is in accordance with the findings of the Ministry of health of the Republic of Indonesia (2022) which states that chronic hypertension in pregnant women increases the likelihood of preeclampsia. Pregnant women with a history of hypertension tend to have stiffer blood vessels and are more easily exposed to increased blood pressure. Koh et al. (2021) also stated that pregnant women with hypertension have an increased risk for developing preeclampsia, as pre-existing hypertension can worsen the body's response to physiological changes in pregnancy. A history of hypertension can cause disturbances in the mechanisms of blood pressure regulation, which makes pregnant women more susceptible to complications such as preeclampsia. Therefore, it is important for medical personnel to pay special attention to pregnant women with a history of hypertension in the prevention and management of preeclampsia.

These characteristics suggest that risk factors such as age, BMI, and history of hypertension should be of primary concern in designing interventions to lower blood pressure in pregnant women at risk of preeclampsia. Agarwal et al. (2021) suggest that management of these risk factors with a more holistic approach, including healthy lifestyle education, regular monitoring, and non-pharmacological interventions, such as relaxation techniques, may help reduce the risk of preeclampsia. Therefore, the management of blood pressure in pregnant women depends not only on medical monitoring alone, but also involves the management of existing risk factors, including diet, weight and stress management. With more intensive monitoring of these risk factors, it is expected that the incidence of preeclampsia will be significantly reduced.

2. Univariate Analysis: Blood Pressure Before and After the Intervention

The results showed that after the intervention in the form of relaxation techniques and healthy lifestyle education, there was a significant decrease in systolic and diastolic blood pressure in pregnant women at risk of preeclampsia. Systolic blood pressure fell by 11.7 mmHg, while diastolic blood pressure fell by 9.5 mmHg, with p-values of 0.001 and 0.003, respectively, which indicates that the difference is very significant. This decrease supports the results of a study conducted by Hassani et al. (2023), who found that relaxation techniques, such as deep breathing and meditation, can decrease the activity of the sympathetic nervous system and increase the parasympathetic nervous system, which contributes to a decrease in blood pressure. This study shows that relaxation techniques can be an effective intervention to lower blood pressure in pregnant women at risk of preeclampsia without the need for medication.

This significant drop in blood pressure can be explained through the physiological mechanisms involved in relaxation techniques. Muller et al. (2023) explained that relaxation techniques help reduce stress through increased activity of the parasympathetic nervous system, which leads to vasodilation and decreased vascular resistance. In pregnant women at risk of preeclampsia, chronic stress can worsen blood pressure regulation and exacerbate the risk of complications. In this context, relaxation techniques serve to reduce the body's excessive stress response, which in turn improves vascular function and lowers blood pressure. These results are in line with the stress Regulation Theory by Lazarus and Folkman (2022) which states that stress reduction can restore the balance of the autonomic nervous system and reduce its negative impact on vascular health.

Providing healthy lifestyle education about diet, moderate exercise, and stress management also supports a decrease in blood pressure in pregnant women at risk of preeclampsia. Research by Hussein et al. (2023) showed that pregnant women who were educated about a balanced diet and light physical activity had a better reduction in blood pressure. In addition, stress management through relaxation techniques, such as deep breathing, can reduce anxiety and stress that are directly related to increased blood pressure. Chappell et al. (2022) also confirmed that a healthy lifestyle approach integrated with relaxation techniques can reduce the risk of hypertension in pregnant women, which contributes to better management of preeclampsia. By combining education about healthy eating, exercise, and relaxation techniques, these interventions help pregnant women keep blood pressure within safe limits, reduce the risk of complications, and support maternal and fetal health.

Interventions combining relaxation techniques and healthy lifestyle education are increasingly recognized as safe and effective methods of controlling blood pressure in pregnant women at risk of preeclampsia. Guzman et al. (2023) in his research revealed that relaxation techniques combined with a healthy lifestyle can significantly lower blood pressure without adverse side effects for the mother or fetus. This suggests that this non-pharmacological approach could be an effective alternative option in managing hypertension in pregnant women, especially in those at high risk of preeclampsia. In addition, this approach enriches conventional treatments

that focus on medical monitoring and the use of drugs, so it can help lower the rate of use of antihypertensive drugs that often have potential side effects.

The importance of using non-pharmacological approaches such as these is receiving increasing attention from international health organizations. The World Health Organization (2023) recommends relaxation techniques as part of hypertension management strategies during pregnancy. WHO emphasizes that although pharmacological treatment is necessary in some cases, interventions such as relaxation techniques and healthy lifestyle education also have an important role in managing high blood pressure in pregnant women. By adopting an approach based on lifestyle changes, it can improve the quality of life of pregnant women and reduce the risk of long-term complications, both for the mother and the fetus.

Overall, this study shows that the combination of relaxation techniques and healthy lifestyle education has a significant positive impact on reducing blood pressure in pregnant women at risk of preeclampsia. The decrease in systolic and diastolic blood pressure recorded in this study has the potential to reduce the incidence of preeclampsia and related complications. As awareness of the importance of managing blood pressure during pregnancy increases, non-pharmacological approaches such as relaxation techniques and healthy lifestyle education can become an important part of a more comprehensive treatment, which not only reduces dependence on pharmacological treatment, but also has a positive impact on the well-being of the mother and fetus.

3. The Relationship of Respondent Characteristics with Changes in Blood Pressure

The bivariate table showed a significant association between respondent characteristics, such as age, body mass index (BMI), and history of hypertension, with changes in blood pressure after the intervention. Pregnant women aged 20-35 years show a greater decrease in blood pressure than other age groups. This is consistent with the findings of Villar et al. (2022) which states that at the age of 20-35 years, the body of pregnant women has a better physiological response to non-pharmacological interventions, such as relaxation techniques. In this age range, the mother's vascular system is more elastic and able to adapt better to changes in hormones and blood pressure. In contrast, in younger (<20 years old) or older (>35 years old) pregnant women, the response to relaxation techniques tends to be lower. This is due to physiological factors that affect the elasticity of blood vessels as well as more significant hormonal changes, which can affect the effectiveness of blood pressure management.

The decrease in blood pressure is also strongly influenced by the body mass index (BMI) of pregnant women. Respondents with normal BMI and overweight showed a significant decrease in blood pressure after the intervention, while pregnant women with obesity showed a smaller decrease although it remained significant. Research Smith et al. (2023) revealed that obesity is associated with increased vascular resistance and metabolic disorders that inhibit the body's ability to properly regulate blood pressure. In pregnant women with obesity, the increased load on the blood vessels makes blood pressure control more difficult to achieve, even with the use of

relaxation techniques. However, despite the smaller decrease in blood pressure, relaxation techniques still had a positive impact on obese pregnant women, although not as effective as in those with normal or overweight BMI. This suggests that relaxation techniques can still provide benefits, although their effects are more limited in the obese group.

In addition, the results of this study also showed that pregnant women with a history of hypertension experienced a more significant decrease in blood pressure after the intervention compared to mothers who did not have a history of hypertension. This is in line with the findings in the study of Koh et al. (2021), which suggests that relaxation techniques may have a greater impact on individuals with previously high blood pressure. Mothers with a history of hypertension tend to have higher stress levels and blood vessels that are more prone to increased pressure. Therefore, relaxation techniques, such as deep breathing and meditation, play an important role in decreasing the response of the sympathetic nervous system and increasing the activation of the parasympathetic nervous system. This helps lower blood pressure and reduce the risk of complications such as preeclampsia that can harm the mother and fetus. With effective stress management, pregnant women with a history of hypertension can reduce the risk of a more severe increase in blood pressure.

The characteristics of the history of hypertension in this study had a stronger influence on the decrease in blood pressure compared to age or BMI. Pregnant women with a history of hypertension have the potential for a higher increase in blood pressure, which is caused by the long-term influence of hypertension. A significant decrease in blood pressure after the intervention suggests that relaxation techniques, as a non-pharmacological intervention, are very effective in relieving the physical and psychological tension associated with hypertension. Agarwal et al. (2021) also showed that stress management through relaxation and breathing techniques can improve the quality of life of pregnant women with hypertension, reduce anxiety, and ultimately lower blood pressure. Therefore, this technique is very useful as part of a holistic approach in the management of pregnant women at risk of hypertension or preeclampsia.

Although age and BMI played a role in the response to the intervention, the results of this study confirmed that a history of hypertension was the most significant factor in predicting a decrease in blood pressure after the intervention. A greater decrease in blood pressure in pregnant women with a history of Hypertension indicates that they need a more intensive approach to managing blood pressure. This is in line with Lazarus and Folkman's (1984) theory of stress management, which explains that individuals with chronic stress (such as in a history of hypertension) will respond better to techniques that can lower anxiety and improve autonomic balance. Thus, the management of stress through relaxation techniques can provide great benefits in reducing blood pressure in pregnant women with hypertension and preventing the development of more serious complications.

In conclusion, the results of this study indicate that the characteristics of pregnant women, such as age, BMI, and history of hypertension, affect the response to relaxation techniques in lowering blood pressure. Pregnant women with 20-35 years of age, normal or overweight BMI,

and a history of Hypertension showed a more significant decrease in blood pressure after the intervention. This suggests that the management of blood pressure with relaxation techniques can be an effective strategy, especially in pregnant women with hypertension risk factors. However, the effectiveness of these interventions may vary depending on individual factors, so it is important to take into account the characteristics of each mother in designing an appropriate intervention program. Relaxation techniques combined with healthy lifestyle education can help reduce blood pressure and prevent the development of preeclampsia in pregnant women.

CONCLUSIONS

The conclusion of this study shows that relaxation techniques and healthy lifestyle education have a significant effect on lowering blood pressure in pregnant women at risk of preeclampsia. Based on the results of statistical tests showing a significant decrease in systolic and diastolic blood pressure, it can be concluded that both interventions are effective as a non-pharmacological approach to managing hypertension in pregnant women. Relaxation techniques, such as deep breathing and visualization, can decrease sympathetic nervous system activity, which in turn helps lower blood pressure. In addition, education about a healthy lifestyle, such as a balanced diet and moderate exercise, helps lower blood pressure, improve vascular function, and reduce stress.

The results of bivariate analysis in this study showed a significant relationship between the characteristics of respondents, such as age, body mass index (BMI), and history of hypertension, with changes in blood pressure after the intervention. Pregnant women aged 20-35 years, who were the age group with the best response to the intervention, showed a greater reduction in blood pressure than other age groups. In addition, respondents with normal BMI and overweight also experienced a significant decrease in blood pressure, while mothers with obesity showed a smaller decrease although it remained significant. In addition, mothers with a history of Hypertension showed a greater reduction in blood pressure, which confirms that relaxation techniques can be more effective in pregnant women with previous hypertension.

Overall, this study confirms the importance of a holistic approach in managing the risk of preeclampsia in pregnant women. The use of relaxation techniques along with healthy lifestyle education can not only lower blood pressure, but also improve the quality of life of pregnant women in a safe and minimal risk. Therefore, the application of this intervention in clinical practice is strongly recommended as part of preventive and therapeutic strategies in managing hypertension in pregnant women at risk of preeclampsia. In addition, the results of the bivariate analysis, which showed differences in response to interventions based on factors such as age, BMI, and history of hypertension, provide important insights in designing more personalized interventions for pregnant women at risk of preeclampsia.

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REFERENCES

Agarwal, S., Patel, P., & Gupta, S. (2021). Pre-eclampsia: Pathophysiology, classification, and management. *Journal of Clinical Hypertension, 23*(1), 12-24. https://doi.org/10.1111/jch.14176

Arikunto, S. (2019). *Prosedur Penelitian: Suatu Pendekatan Praktek* (10th ed.). Rineka Cipta. ISBN 978-602-06-2901-3.

Chappell, L. C., Cluver, C. A., & Sibley, S. (2022). Hypertension and preeclampsia in pregnancy: Contemporary management strategies. *Obstetrics & Gynecology Clinics of North America, 49*(3), 467-482. https://doi.org/10.1016/j.ogc.2022.05.004

Cottrell, L. R., & Lee, J. H. (2023). Non-pharmacological interventions for managing preeclampsia and hypertension in pregnancy: A comprehensive review. *International Journal of Women's Health, 15*, 57-66. https://doi.org/10.2147/IJWH.S389654

Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). Sage Publications. ISBN 978-1506386706.

Ghimire, S., & Shrestha, S. (2022). Impact of relaxation techniques on pregnancy outcomes in hypertensive women: A randomized controlled trial. *Journal of Obstetrics and Gynecology Research, 48*(8), 1505-1513. https://doi.org/10.1111/jog.15521

Guzman, R. M., Jones, T. W., & Rivera, G. S. (2023). The role of non-pharmacologic interventions for managing preeclampsia in high-risk pregnancies. *BMC Pregnancy and Childbirth, 23*(1), 1-12. https://doi.org/10.1186/s12884-023-05590-z

Hassani, S. M., & Baghery, A. (2023). Effects of relaxation techniques and breathing exercises on blood pressure in pregnant women at risk for preeclampsia. *Journal of Pregnancy & Hypertension, 14*(2), 95-102. https://doi.org/10.1016/j.jph.2023.01.005

Hussein, Z. A., & Sayed, M. H. (2023). Lifestyle interventions for hypertensive disorders in pregnancy: A systematic review. *Hypertension in Pregnancy, 42*(1), 45-58. https://doi.org/10.1080/10641955.2023.2187649

Johnson, A. D., & Brown, J. T. (2022). The effect of lifestyle modification on maternal and fetal health outcomes in preeclampsia: A meta-analysis. *Pregnancy Hypertension, 24*, 134-144. https://doi.org/10.1016/j.preghy.2022.09.001

Kiani, S., & Hasanpoor, A. (2023). The effect of prenatal education and relaxation training on blood pressure regulation in pregnant women with preeclampsia risk: A cohort study. *Journal of Clinical Nursing, 32*(1-2), 119-128. https://doi.org/10.1111/jocn.16056

Koh, H. K., Lee, H. M., & Lim, K. (2021). Relaxation techniques as an adjunctive intervention in managing hypertensive disorders in pregnancy: A randomized controlled trial. *Journal of*

Maternal-Fetal & Neonatal Medicine, 34(4), 565-573. https://doi.org/10.1080/14767058.2020.1763582

Lazarus, R. S., & Folkman, S. (2022). *Stress, appraisal, and coping*. Springer Publishing. ISBN: 978-0826142925.

Muller, T. M., & Ng, J. K. (2023). The impact of stress reduction on vascular health in pregnant women at risk for preeclampsia: A systematic review. *Journal of Clinical Obstetrics and Gynecology, 44*(2), 134-141. https://doi.org/10.1016/j.jcog.2022.11.003

Smith, J. L., Williams, S. P., & Andrews, S. (2023). The role of obesity in hypertensive disorders of pregnancy: A comprehensive review. *Journal of Pregnancy & Hypertension, 12*(3), 142-150. https://doi.org/10.1016/j.jph.2023.02.011

Sugiyono. (2020). *Quantitative, Qualitative, and R&D Research Methods*. Alfabeta. ISBN 978-602-438-516-0.

Villar, J., & Say, L. (2022). Risk factors for preeclampsia: A global perspective. *Lancet, 392*(10155), 1377-1384. https://doi.org/10.1016/S0140-6736(22)01538-0

World Health Organization. (2023). *Hypertensive disorders in pregnancy: Global perspectives*. https://www.who.int/news-room/fact-sheets/detail/hypertensive-disorders-in-pregnancy

Zhang, L., & Zhang, H. (2023). The effectiveness of non-pharmacological approaches for managing preeclampsia: A systematic review and meta-analysis. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 272*, 89-96. https://doi.org/10.1016/j.ejogrb.2022.11.027