

The Combination of Pakcoy Juice (*Brassica Rapa L.*) and Antihypertensive Medication in Reducing Blood Pressure in Pregnant Women with Hypertension

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Abstract–Hypertension in pregnant women ranks as the second highest cause of Chronic Kidney Disease (CKD). Hypertension is defined as a minimum diastolic blood pressure of 90 mmHg and a minimum systolic blood pressure of 140 mmHg, with an increase in diastolic and systolic pressure of at least 15 mmHg and 30 mmHg, respectively. This study aims to evaluate the impact of a combination of Pakcoy juice (*Brassica rapa L.*) and antihypertensive medication on blood pressure in pregnant women with hypertension. Using a quasi-experimental design with a One Group Pre-Test – Post-Test without a control group, the study involved 14 pregnant women with hypertension at the Gunung Sugih Community Health Center from January to June 2023 as the population. The results of data analysis indicate a significant influence (p value $0.000 < \alpha: 0.05$) on the reduction of blood pressure after the administration of antihypertensive medication and Pakcoy juice. The discussion emphasizes that Pakcoy juice is effective as a supplement to antihypertensive medication due to its natural content of potassium, calcium, and magnesium, which can reduce blood pressure. Consuming 4,700 milligrams of potassium per day is known to lower blood pressure caused by high sodium intake. In conclusion, the combination of Pakcoy juice and antihypertensive medication has a positive effect of 19% on reducing blood pressure in pregnant women with hypertension at the Gunung Sugih Community Health Center, with a recommendation for health education outreach to prevent hypertension cases in pregnant women.

Keywords: Pakcoy; Blood Pressure; Pregnancy; Hypertension

1. INTRODUCTION

Maternal health has become a primary focus in the global health agenda. This issue is also addressed in the Sustainable Development Goals (SDGs), an initiative agreed upon by the international community. The third goal of the SDGs emphasizes the importance of improving maternal health as an integral part of sustainable development. One critical indicator used to assess maternal health is the Maternal Mortality Rate (MMR). This figure reflects the number of maternal deaths during pregnancy, childbirth, or within 42 days after delivery. Understanding the MMR provides a profound insight into the quality of maternal healthcare services and efforts to enhance them. Improving maternal health extends beyond medical aspects, involving social, economic, and cultural factors that influence access and acceptance of maternal healthcare services. Hence, global and national efforts must continue to be heightened to achieve SDG targets and reduce MMR, ensuring every mother experiences safe pregnancies and childbirths while securing maternal well-being worldwide (Prawiroharjo, 2018).

Maternal Mortality Rate (MMR) is a critical parameter in the assessment of global maternal health. According to the World Health Organization (WHO), in 2017, approximately 810 mothers died due to complications related to pregnancy and childbirth (WHO, 2017). It is crucial to note that MMR predominantly occurs in low- and middle-income countries, with about 94% of cases reported in those regions (WHO, 2019). The situation is equally serious in Indonesia. According to the Ministry of Health of the Republic of Indonesia, the number of maternal deaths in 2019 reached 4,197 cases and significantly increased to 6,856 cases in 2021 (Kemenkes RI, 2021). Further analysis reveals that around 76% of MMR cases occur during the childbirth and postpartum phases, with a breakdown of 24% during pregnancy, 36% during childbirth, and 40% postpartum. Therefore, a profound understanding of the distribution and risk factors associated with MMR, both globally and within the national context, plays a crucial role in formulating effective prevention and intervention strategies to reduce maternal deaths caused by pregnancy and childbirth factors.

The Maternal Mortality Rate (MMR) not only reflects global challenges in efforts to improve maternal health but also demonstrates specific dynamics at the national and regional levels, including in the province of Lampung. According to data from the World Health Organization (WHO), in 2017, approximately 810 mothers worldwide died due to complications related to pregnancy and childbirth (WHO, 2017). A profound understanding of the causes of MMR is essential for designing effective prevention strategies. In Indonesia, including Lampung, the maternal health situation indicates a significant level of severity. According to the Ministry of Health of the Republic of Indonesia, in 2019, Lampung reported 4,197 cases of Maternal Mortality, which rapidly increased to 6,856 cases in 2021 (Kemenkes RI, 2021). Examining national data indicating the causes of Maternal Mortality, research by Liszayanti (2019) noted that 30.3% of MMR cases in Indonesia were caused by hemorrhage, 28.8% were related to hypertension, 7.3% resulted from infections, 1.8% were due to prolonged labor, and 1.6% were associated with abortion, with the remaining 40.8% attributed to various other factors.

Based on the data, hypertension in pregnant women ranks second as the leading cause of Maternal Mortality Rate (MMR). Hypertension is a condition where an individual has a minimum diastolic blood pressure of 90 mmHg and a minimum systolic blood pressure of 140 mmHg, with an increase in diastolic and systolic pressure of at least 15 mmHg

and 30 mmHg, respectively. Hypertension occurring after 20 weeks of pregnancy is known as pregnancy-induced hypertension, while hypertension occurring before 20 weeks is referred to as severe hypertension (Andriyani, 2021). Hypertension in pregnant women poses a serious risk factor that can lead to complications for both the mother and the baby. When blood pressure increases significantly, it can disrupt blood flow to the placenta, which, in turn, may hinder fetal growth and increase the risk of premature birth. Pregnancy-induced hypertension can also lead to conditions such as preeclampsia or eclampsia, serious conditions that can endanger the lives of both the mother and the baby. Early detection and appropriate management of hypertension in pregnant women are crucial to reducing the risk of complications and improving maternal health. Regular monitoring of blood pressure and appropriate medical interventions play a crucial role in maintaining the health of pregnant women and preventing MMR.

Reducing the incidence of hypertension during pregnancy is considered a crucial step in decreasing the rates of morbidity and mortality for both the mother and the fetus. Effective management of hypertension during pregnancy has a positive impact on preventing potential risks that could endanger the health of the pregnant woman and the developing baby. Jasmine (2021) emphasizes the importance of proper management of this condition, involving vigilant monitoring and appropriate medical interventions. By optimally managing hypertension during pregnancy, the risk of complications such as preeclampsia or premature birth can be minimized. Careful handling can also help maintain blood flow to the placenta, ensuring the healthy growth of the fetus, and reducing the likelihood of events that could threaten the lives of both the mother and the baby. Therefore, focusing on effective management of hypertension in pregnant women is not only preventive but also proactive in achieving safer and healthier pregnancy outcomes. Early prevention efforts and proper care during pregnancy can have a significant impact in reducing the negative effects of hypertension, creating a better environment for fetal development, and improving the well-being of the mother.

The reduction of blood pressure in pregnant women experiencing hypertension can be pursued through both pharmacological and non-pharmacological approaches. One of the non-pharmacological therapies that can be applied is dietary management focusing on a diet rich in vegetables and high in potassium, incorporating Pakcoy (*Brassica rapa L*)-based foods in the form of juice or green smoothies. Apart from adding flavor variety to food consumption, Pakcoy has diverse nutritional content. Pakcoy, being rich in protein, plant-based fats, calories, carbohydrates, fiber, calcium, magnesium, sodium, calcium, phosphorus, iron, Vitamin A, Vitamin B, and Vitamin C, provides essential nutrients to support the health of pregnant women. As a leafy vegetable, Pakcoy not only contributes to nutritional diversity but also serves as a source of essential vitamins and minerals. Research by Damayanti et al. (2019) indicates that Pakcoy can be a crucial component in nutritional improvement and blood pressure management. By integrating Pakcoy into daily dietary patterns, particularly through the consumption of juice or green smoothies, it can positively contribute to lowering blood pressure in pregnant women with hypertension while providing essential nutrition required for a healthy pregnancy. Therefore, this non-pharmacological therapy offers a sustainable and holistic option for managing hypertension in pregnant women.

Pakcoy, rich in potassium, calcium, and magnesium, has proven to contribute to lowering blood pressure naturally. Potassium plays a crucial role in balancing the effects of sodium, helping control fluid and electrolyte balance in the body, thus reducing blood pressure. Calcium and magnesium also have positive effects on the cardiovascular system, aiding in the relaxation of blood vessels and reducing blood pressure. According to the American Journal of Clinical Nutrition, consuming 4,700 milligrams of potassium every day can effectively lower blood pressure caused by high sodium intake (Fahrudin, 2019). This suggests that regulating potassium intake, as found in Pakcoy, can be a natural strategy for managing blood pressure. Further support comes from the findings of Mayangsari's research (2020), where a decrease in blood pressure occurred in clients given Pakcoy green smoothies for one week. The combination of these findings indicates that Pakcoy, with its nutritional content, has the potential as a natural option to help lower blood pressure in individuals, providing a healthy and nutritious alternative to support cardiovascular health.

Pakcoy, commonly used in various dishes such as soups, pickles, stir-fries, and others, is a rich and beneficial source of nutrition. Pakcoy contains a high amount of beta-carotene, along with vitamins C and B, serving as antioxidants. Additionally, Pakcoy contains iron, calcium, and phosphorus. Its rich nutritional content makes Pakcoy an excellent choice, especially for pregnant women. Pakcoy helps prevent anemia and provides essential nutritional support during pregnancy. Moreover, Pakcoy has the potential to combat hypertension, heart disease, and reduce the risk of various types of cancers. Pakcoy contains secondary metabolites with antioxidant properties. Research findings, as presented by Juliarti (2021), indicate that Pakcoy consumption can significantly reduce total cholesterol levels compared to the control group. Therefore, besides being a delicious food ingredient, Pakcoy also brings substantial health benefits, proving its role in supporting nutritional balance and mitigating the risk of cardiovascular diseases (Juliarti, 2021).

During pregnancy, the need for folate significantly increases. Folate, or vitamin B9, is a crucial nutrient that plays a vital role in tissue and cell formation, especially in the early stages of fetal development. Insufficient folate intake during pregnancy can pose serious risks, including neural tube defects such as spina bifida and anencephaly. To ensure an adequate folate supply during pregnancy, it is important for pregnant women to consume foods rich in folate, and one excellent choice is to include dark leafy vegetables in their daily diet, such as pakcoy.

Pakcoy, which is a dark leafy green vegetable, is rich in folate and other nutrients such as iron, calcium, and vitamins. The contribution of folate in pakcoy is essential to support the optimal development of fetal cells and tissues. By regularly consuming pakcoy, pregnant women can ensure sufficient folate intake, helping prevent neural tube defects

in the fetus. Therefore, emphasizing the inclusion of vegetables like pakcoy in the diet of pregnant women is a highly positive step to support health and optimal development during pregnancy (Fahrudin, 2019).

This research is relevant given the background of hypertension cases among pregnant women at Puskesmas Gunung Sugih. The data for hypertension cases in 2021 recorded 27 cases of pregnant women, with one maternal death and 40 infants born with low birth weight (LBW), where preterm birth was one of the main causes. By November 2022, one maternal death and 40 infants born with LBW were identified. Hypertension cases in pregnant women continue to be a concern, reaching 14 cases by July 2023. Although midwives at Puskesmas Gunung Sugih have been conducting counseling to address hypertension cases, there has been no evaluation of the effectiveness of pakcoy juice as a potential method for reducing blood pressure in pregnant women with hypertension. Therefore, this study aims to explore and measure the impact of the combination of Pakcoy juice and antihypertensive drugs on reducing blood pressure in pregnant women with hypertension at Puskesmas Gunung Sugih. By conducting this research, it is hoped that a more effective solution can be found to address hypertension cases in pregnant women and contribute positively to maternal health in the area.

2. RESEARCH METHODS

This type of research employs a quasi-experimental design, according to Sugiyono (2020), quasi-experiment as a study that closely approaches a true experiment with the aim of directly testing the cause-and-effect relationship of the independent variable's influence on the dependent variable. The research design uses a One Group Pre-Test – Post-Test Design Without a Control Group. The researcher's design is as follows:

$$O_1 \rightarrow X_1 \rightarrow X_2 \rightarrow O_2$$

Figure 1. Pseudo Experimental Research Design (Sugiyono, 2020)

Explanation:

O1: Blood pressure measurement before intervention.

O2: Blood pressure measurement after intervention.

X1: Administration of medical treatment.

X2: Administration of Pakcoy juice.

This study focuses on the population of hypertensive pregnant women at the Gunung Sugih Community Health Center during the period of January-June 2023, totaling 14 individuals. Population, in research terms, refers to all individuals in a specific area with certain characteristics that are the focus of the study (Sugiyono, 2020). The sampling method employed is total sampling, where the entire population serves as the sample since the number is less than 100 people, following Sugiyono's recommendation (2020). Regarding the sample selection, inclusion and exclusion criteria are outlined. Hypertensive pregnant women with blood pressure above 140/90 mmHg at the Gunung Sugih Community Health Center, and those without any other diseases except hypertension during pregnancy, fall within the inclusion criteria. On the other hand, exclusion criteria include pregnant women who are currently ill, unwilling to be respondents, and dislike the consumption of Pakcoy vegetables. Thus, the research sample consists of 14 hypertensive pregnant women who meet the inclusion criteria and are not affected by the exclusion criteria. This process is expected to provide an accurate representation to understand the impact of the combination of Pakcoy juice and antihypertensive drugs on reducing blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center.

This study is specifically conducted at the Gunung Sugih Community Health Center, serving as the focal point of the research to obtain relevant and accurate data regarding the impact of the combination of Pakcoy juice and antihypertensive drugs on pregnant women with hypertension. The Gunung Sugih Community Health Center was chosen as the research location because it is representative in depicting the population of pregnant women with hypertension who are the subjects of the study. The research was carried out during the period from January to June 2023. This timeframe was chosen to provide a comprehensive and in-depth overview of blood pressure changes in pregnant women with hypertension after receiving the intervention with a combination of Pakcoy juice and antihypertensive drugs. Selecting a long time frame also allows researchers to observe the long-term effects of this combination and consider the variability that may occur during this period. Thus, the selection of the research location and time is expected to provide relevant and beneficial information for the development of knowledge in the field of hypertensive pregnant women's health.

The operational definition in this study refers to a specific elaboration of each variable based on the observed characteristics. According to Nursalam (2018), operational definitions help interpret these variables to be measured clearly. The operational definition encompasses two main variables: Intervention (Pakcoy juice and antihypertensive drugs) and Dependent Variable (Blood pressure reduction). The Intervention variable is operationalized as the administration of standard antihypertensive drugs for hypertensive pregnant women, with the addition of consuming a specific amount of Pakcoy juice (*Brassica rapa L.*). This process is measured using a measuring glass, and the result is recorded as "Juice Consumed" on an ordinal scale. Meanwhile, the Dependent Variable focuses on the reduction of blood pressure in hypertensive pregnant women. This process is measured using a checklist and a sphygmomanometer, with the

results represented as pre-test and post-test MAP values. If the MAP value exceeds 90, further intervention is needed. This elaboration provides a systematic framework for observing and measuring the impact of the combination of Pakcoy juice and antihypertensive drugs on blood pressure in hypertensive pregnant women at Gunung Sugih Health Center.

The research instruments serve as tools for researchers to collect data, ensuring relevance to the research focus. The instruments involved include a respondent identity sheet covering respondent characteristics such as age, pregnancy age, parity, education level, and occupation. Additionally, an observation sheet is used to observe blood pressure changes before and after interventions, particularly post-consumption of Pakcoy juice (*Brassica rapa L*). A sphygmomanometer is the blood pressure measuring instrument utilized in this study. The equipment for making Pakcoy juice involves a blender, glass, and knife, while the ingredients include fresh Pakcoy 25 grams, water, honey, and lime juice. The juice processing includes steps such as handwashing, preparing tools and ingredients, vegetable preparation, cleaning, soaking in saltwater, washing with running water and boiled water, soaking in warm water with salt, washing all surfaces and tools, putting vegetables into the blender, adding boiled water, blending until smooth, and serving in a 200 ml cup. Pakcoy juice can be stored in the refrigerator and is best consumed within an hour of preparation while cold. All these instruments are used to provide a comprehensive understanding of the impact of Pakcoy juice and antihypertensive drugs on hypertensive pregnant women at Puskesmas Gunung Sugih.

The data collection technique in this study involves gathering primary data through field research. The administrative procedures begin with submitting a research permit application to the head of the community health center. Subsequently, the determination of the research sample is conducted according to inclusion and exclusion criteria. The next step involves seeking permission and agreement from the respondents, including the signing of a consent form as a form of informed consent for those willing to become research participants. Informed consent is delivered by the researcher visiting each respondent at their home, providing explanations about the purpose and benefits of the research. The technical research procedures include preparing research instruments and Pakcoy juice (*Brassica rapa L*) in one glass. A pre-test is conducted by measuring blood pressure before the consumption of medical drugs or Pakcoy juice. Respondents are then allowed to consume hypertension medication prescribed by a doctor. The post-test involves measuring blood pressure after 30 minutes of consuming medical drugs. While waiting for the post-test, the intervention group is given an explanation about the research and the technique of consuming Pakcoy juice. The intervention is carried out after the first post-test, involving the provision of Pakcoy juice in one glass with a volume of 200 ml. The juice is directly given to pregnant women after processing, within a maximum of one hour after preparation. Juice administration is done twice a day, at 8:00 AM and 4:00 PM, for seven days. The final post-test is conducted by measuring blood pressure after the consumption of medical drugs and Pakcoy juice.

The stages of data processing, as explained by Hastono (2018), involve several steps. Editing is carried out to check the completeness of data in the questionnaires and respondent identities. Coding involves the classification of data based on specific codes or numbers that have been determined. Data transfer is done by inputting the data into a computer program. Data tabulation is performed by summarizing the research data in tables according to the needs and objectives of the study. Subsequently, data analysis is conducted, consisting of univariate and bivariate analyses. Univariate analysis involves the description of the frequency distribution of each criterion or category of the variables under investigation, as outlined by Notoatmodjo (2017). The formula for univariate analysis is used to calculate the sought percentage by considering the sample frequency for each question and the overall sample size. Bivariate analysis, in turn, aims to understand the relationship between independent and dependent variables. In this study, bivariate analysis involves an independent t-test to evaluate the effectiveness of the intervention group compared to the control group, with the condition that the data is normally distributed. However, if the data is not normally distributed, an alternative test used is the Wilcoxon test.

3. RESULT AND DISCUSSION

Table 1. Characteristics of Respondents

Respondent Characteristics	Frequency	%
Age		
< 20 Years	2	14,3
20-35 Years	4	28,6
> 35 Years	8	57,1
Pregnancy Age		
First Trimester	4	28,6
Second Trimester	10	71,4

Parity			
	0 children	8	57,1
	3-4 children	6	42,9
Education			
	Junior High School (SMP)	6	42,9
	Senior High School (SMA)	8	57,1
Occupation			
	Homemaker (IRT)	14	100

Source: Primary Data 2023

Based on the data presented in Table 1, it can be concluded that the characteristics of the respondents, who are pregnant women with hypertension at Puskesmas Gunung Sugih, show several patterns. The majority of respondents, totaling 8 individuals (57.1%), fall within the age range of over 35 years. Meanwhile, a total of 10 individuals (71.4%) are in the second trimester of pregnancy. Pregnant women who are primigravida or have parity of 0 children reach a total of 8 individuals (57.1%). In terms of education, 8 individuals (57.1%) have completed high school education. All respondents, 14 individuals (100%), work as housewives (IRT). This analysis of characteristics provides a relevant overview of the profile of pregnant women with hypertension at Puskesmas Gunung Sugih, which can serve as a foundation for further research related to the impact of interventions on this group.

Based on the findings of this research, it was observed that the characteristics of the respondents, namely pregnant women with hypertension at the Gunung Sugih Community Health Center, were dominated by individuals aged above 35 years, totaling 8 people (57.1%). This finding is consistent with the study by Chalid (2018), which noted that the majority of respondents with hypertension fall into the age group above 35 years. The consistency of these findings indicates that the age pattern of respondents in hypertensive conditions appears similar to previous research. Moreover, this finding is supported by the studies of Hariati (2020) and Mayangsari (2020), which recorded that the majority of respondents experiencing hypertension during pregnancy were in the age range above 35 years. The alignment of these findings adds validity to the information regarding the age characteristics of respondents in the context of pregnancy with hypertension at the Gunung Sugih Community Health Center. In other words, it can be concluded that the age pattern of respondents, dominated by the age group above 35 years, is not only a local phenomenon but also reflects a general trend in the population of pregnant women with hypertension. The implication is that efforts for the prevention and management of hypertension during pregnancy need to be more focused on this age group, as a preventive measure in line with consistent findings from various previous studies.

Pregnancy in women at extreme ages, specifically below 20 years or above 35 years, carries a high risk and can lead to serious complications during the pregnancy period. Age is a significant factor in the occurrence of hypertension during pregnancy. At the age below 20 years, pregnant women have a higher risk of experiencing hypertension. This is linked to the fact that, biologically, the development of reproductive organs has not reached an optimal level at that age. On the other hand, at the age above 35 years, pregnant women undergo degenerative processes that cause structural and functional changes in peripheral blood vessels, contributing to changes in blood pressure. The elevated level of hypertension correlates with increasing age, as there are structural changes in large blood vessels. This results in narrowing of the vessel lumen and increased rigidity of vessel walls, ultimately raising systolic blood pressure. The age range of 20-35 years is considered a relatively safe time for pregnancy, with the lowest risk of maternal morbidity and mortality. This finding aligns with the research by Febyan and Pamaron (2020), indicating that within this age range, the maternal body tends to respond more effectively to pregnancy without significant risks of complications. Therefore, a profound understanding of the impact of age on pregnancy can serve as a foundation for more effective prevention and risk management efforts during the pregnancy period.

Therefore, it can be concluded that the majority of respondents in this study fall within the age range of 20-35 years, which is considered a reproductive age group generally associated with a healthy reproductive period. However, occurrences of hypertension in pregnant women within this group may be attributed to several risk factors. One of the primary factors is overweight or obesity, which can elevate blood pressure and increase the risk of hypertension during pregnancy. Furthermore, a lack of physical activity or a sedentary lifestyle can also play a role as a risk factor. Habits of being less active or having a sedentary lifestyle can impact overall health conditions, including an increased risk of hypertension during pregnancy. Additionally, a history of hypertension before pregnancy or a family history of hypertension can be significant predictors for the development of hypertension during pregnancy. With a profound understanding of these risk factors, appropriate preventive efforts and interventions can be implemented to reduce the incidence of hypertension in pregnant women. Education on the importance of maintaining a healthy weight, adopting an active lifestyle, and monitoring family health history can be effective preventive measures in addressing the risk of hypertension during the pregnancy period.

Based on the research findings, it is revealed that the characteristics of the respondents, namely pregnant women with hypertension at the Gunung Sugih Community Health Center, mostly fall within the second trimester of pregnancy, with a total of 10 individuals (71.4%). This finding consistently aligns with the study by Chalid (2018), which also noted that hypertension commonly occurs during the second trimester of pregnancy. This pattern indicates a consistency in the occurrence of hypertension among pregnant women during the mid-pregnancy stage. Other studies supporting this finding include research conducted by Hariati (2020) and Mayangsari (2020), which also indicate that the incidence of hypertension tends to be more dominant during the second trimester of pregnancy. The consistency of these findings adds additional validity to the information regarding the distribution of pregnancy age among pregnant women with hypertension at the Gunung Sugih Community Health Center. The consistency between the findings of this research and previous studies provides a stronger foundation for understanding the pattern of hypertension occurrence in pregnant women at the Gunung Sugih Community Health Center. Therefore, further investigation is needed to explore factors that may influence the tendency of hypertension occurrence during the second trimester of pregnancy, so that prevention and management efforts can be more targeted and effective.

Gestational hypertension is an elevation in blood pressure that occurs after reaching the 20th week of pregnancy. Typically, this condition is not accompanied by the presence of protein in the urine or damage to organs. In pregnant women experiencing gestational hypertension, blood pressure tends to return to normal after the childbirth process, as indicated by Febyan and Pemaron (2020). However, it should be emphasized that hypertension in pregnant women does not always occur in the second trimester. On the contrary, gestational hypertension can develop at any stage of pregnancy after the 20th week. This condition may not always be associated with protein in the urine or organ damage. Therefore, it is concluded that gestational hypertension can occur in any trimester after reaching the 20th week of pregnancy and may not always be accompanied by protein in the urine or organ damage. These factors need to be carefully considered in the monitoring and management of pregnancy to understand and address potential health risks that may arise.

Based on the research findings, it is evident that the characteristics of the respondents, namely pregnant women with hypertension at the Gunung Sugih Community Health Center, mostly have parity of 0 children (primigravida), with a total of 8 individuals (57.1%). This finding is consistent with the study by Chalid (2018), which also indicates that primigravida pregnant women mostly experience hypertension. Other research results supporting this finding include studies by Hariati (2020) and Mayangsari (2020), which show that primigravida pregnant women are significantly more vulnerable to hypertension. Primigravida parity, or the first pregnancy, may carry additional risks for the development of hypertension in pregnant women. Factors such as the body's adaptation to the first pregnancy and lack of previous experience can contribute to an increased risk of hypertension. Therefore, a deeper understanding of these factors can provide insights into the causes and management of hypertension in primigravida pregnant women at the Gunung Sugih Community Health Center. The alignment of these findings with previous research indicates the need to involve specific prevention and management approaches for the primigravida pregnant women group in efforts to reduce the risk of hypertension during pregnancy.

Graviditas, encompassing the number of pregnancies regardless of gestational age, is a crucial factor in understanding the risk of hypertension in pregnant women. Several factors influence the occurrence of hypertension during pregnancy, with a specific focus on the primigravida condition, especially in young primigravida. Additionally, recurrent deliveries can also be a significant risk factor. Theoretically, primigravida has a higher risk of experiencing hypertension during pregnancy, especially in women who are first exposed to chorionic villi. This is due to the imperfect formation of the immunological mechanism, particularly the formation of blocking antibodies performed by HLA-G (human leukocyte antigen G) against placental antigens. Disturbances in the process of trophoblast implantation into the maternal decidua tissue are related to the imperfection of the formation of these blocking antibodies. This theory suggests that in the first pregnancy, blocking antibodies against placental antigens can be a cause of hypertension and may even evolve into a condition of pregnancy toxemia. Furthermore, primigravida is also susceptible to stress during the delivery process. Emotional stress can lead to an increase in the release of corticotropin-releasing hormone (CRH) by the hypothalamus, subsequently increasing cortisol production. The effects of cortisol include an increase in sympathetic response, which can result in an elevation of heart rate and blood pressure (Febyan and Pemaron, 2020). A profound understanding of these factors is essential for planning appropriate interventions to manage and prevent the risk of hypertension in pregnant women, especially in primigravida.

Therefore, it can be concluded that the condition of hypertension in pregnant women is often associated with primigravida status. This factor arises because primigravida carries a higher risk of developing hypertension during pregnancy. Vulnerable to stress during the childbirth process, women experiencing their first pregnancy face significant adaptation challenges that can impact hormonal responses and body balance. Stress during childbirth can trigger the release of corticotropin-releasing hormone (CRH) by the hypothalamus, subsequently increasing cortisol production. Cortisol, as the primary stress hormone, affects the cardiovascular system by enhancing sympathetic responses, leading to an increase in cardiac output and blood pressure. The combination of imperfect immunological mechanisms in the first pregnancy and physiological responses to stress can create an environment conducive to the occurrence of hypertension in primigravida pregnant women. A profound understanding of the relationship between primigravida conditions, childbirth stress, and increased risk of hypertension can serve as the basis for better intervention planning, including stress

management during pregnancy and more intensive health monitoring for primigravida pregnant women to reduce the risk of hypertension that could negatively impact the health of both the mother and the fetus.

Based on the research findings, it is known that the characteristics of respondents, namely pregnant women with hypertension at Puskesmas Gunung Sugih, mostly have completed high school education, totaling 8 individuals (57.1%). This research aligns with the study by Irianti (2021), which indicates that the majority of respondents have completed high school education. Similarly, research by Lovita (2018) and Marlina (2022) also shows that a significant number of respondents have completed high school education. Low education is a risk factor for the occurrence of hypertension in pregnant women, where education level is one of the most important resources that enables mothers and families to provide proper care for pregnant women. Besides contributing to healthcare and disease prevention, education is a crucial factor in health promotion. The higher someone's education level, the easier it is for them to engage in social interactions and comprehend general and nutritional information (Mursiyam et al., 2018). The level of education serves as a means to respond well to received information. The higher one's education level, the easier it is for them to accept information and the more experiences they possess. Insufficient education can hinder the understanding of a person's attitude toward newly introduced values. The higher someone's education level, the greater their desires and expectations. In this research, women's desires and expectations involve acquiring and transforming knowledge to improve their condition, thereby avoiding hypertension during pregnancy (Astuti, 2021). Therefore, it can be concluded that in this study, respondents with secondary education (high school) but experiencing hypertension during pregnancy may be attributed to family economic factors that have not adequately met the nutritional needs of pregnant mothers in terms of both quality and quantity, eventually leading to hypertension during pregnancy.

Based on the research findings, it is known that the characteristics of respondents, namely pregnant women with hypertension at Puskesmas Gunung Sugih, mostly work as housewives (IRT), totaling 14 individuals (100%). This research aligns with the study by Ernawati (2019), which indicates that the majority of respondents are either unemployed or housewives. Similarly, the research by Prahesti (2020) shows that the majority of respondents work as housewives. Occupations influence economic status. Health needs, such as the provision of health facilities and nutritional requirements, can be met if a family has economic capabilities. The type of occupation affects a person's economic condition; weak economic conditions due to the nature of the job can impact health status because insufficient consumption of nutritious food can lead to hypertension, and infrequent health check-ups, especially for pregnant women, can also affect maternal health. Working can improve the family's socio-economic status. Working mothers have their own income, so they are not dependent on their husbands to meet their nutritional needs (Pratiwi, 2018). Therefore, it can be concluded from this study that the majority of respondents who experience hypertension during pregnancy are housewives. This is because, as housewives, their income comes from their husbands; if the husband's income is low, it can impact their health status due to insufficient consumption of nutritious food and infrequent health check-ups, especially during pregnancy. This situation can disrupt maternal health and lead to hypertension during pregnancy. Additionally, pregnant women who are housewives often spend their time at home, limiting their access to information from external sources except through mass media.

Table 2. The distribution of MAP (Mean Arterial Pressure) blood pressure frequencies before and after the administration of antihypertensive medication in pregnant women with hypertension at the Gunung Sugih Community Health Center in the year 2023

Group (Antihypertensive Medication)	Mean	Minimal	Maximal
Pre Test	113,886	102	120,7
Post Test (Obat Anti Hipertensi)	95,929	93	98,7

Source: Primary Data 2023

Based on the data in Table 2, it was found that the average blood pressure score before the administration of antihypertensive drugs in pregnant women with hypertension at the Gunung Sugih Community Health Center is 113.886. Meanwhile, the average blood pressure score after the administration of antihypertensive drugs in pregnant women with hypertension at the Gunung Sugih Community Health Center is 95.929. This comparison analysis indicates a significant decrease in blood pressure after the administration of antihypertensive drugs in pregnant women at the Gunung Sugih Community Health Center. The difference between the average scores before and after treatment suggests the effectiveness of antihypertensive drug intervention in managing blood pressure in the population of pregnant women with hypertension at the Gunung Sugih Community Health Center. These findings provide a basis for further research on the impact and benefits of using antihypertensive drugs during pregnancy with hypertension at that level of healthcare service.

The results of this study are consistent with the findings in the research conducted by Chalid (2018), stating that the occurrence of hypertension in pregnant women can be caused by various factors, one of which is age with an average blood pressure (MAP) above 100. Similar findings were also revealed in the study by Hariati (2020), indicating that various factors, including parity with systolic blood pressure above 140, can be a cause of hypertension in pregnant

women. Furthermore, the research by Mayangsari (2020) also confirms that hypertension in pregnant women can stem from various factors, including a history of hypertension. Therefore, the alignment of these findings provides stronger confirmation to the idea that hypertension in pregnant women is a multifactorial condition. Factors such as age, parity, and a history of hypertension may contribute together or separately to an increased risk of hypertension during pregnancy. The implications are that a thorough understanding of these factors is crucial in designing more effective strategies for prevention and management to reduce the incidence of hypertension in pregnant women. Hence, further research is needed to explore the complex interactions among these factors and their impact on the health of pregnant women, guiding more targeted prevention efforts.

The cause of hypertension during pregnancy remains a mystery to this day. Despite numerous theories being proposed to explain the occurrence of hypertension during pregnancy, none of them are considered absolute truths. While the cause is still not fully disclosed, clinical manifestations begin to appear early in pregnancy. Hidden changes in pathophysiology accumulate throughout pregnancy and eventually become clinically evident. Clinical signs of hypertension during pregnancy are suspected to occur due to vasospasm, endothelial dysfunction, and ischemia. Although the impact of hypertension on the mother is often described in various organ systems, clinical manifestations are frequently complex and overlapping. Hypertension is considered the most important sign for establishing a diagnosis of hypertension during pregnancy. Diastolic pressure reflects peripheral resistance, while systolic pressure reflects the volume of cardiac output. In cases of preeclampsia, increased vascular reactivity may begin as early as the 20th week of pregnancy, but hypertension is generally detected in the second trimester. High blood pressure in preeclampsia is labile and follows a normal circadian rhythm (Imaroh et al., 2018). While much is still to be understood about the root causes of hypertension during pregnancy, understanding the clinical manifestations and the pathophysiological processes provides a foundation for more effective treatment and management efforts to minimize the risks and impacts on the health of pregnant women.

Interacting factors contribute to hypertension during pregnancy. The presence of pregnancy conditions, especially twin pregnancies, maternal age, family history of hypertension, pre-existing hypertension, high body mass index, and inadequate calcium consumption can all be potential causes of hypertension during pregnancy. Pregnancy can exert additional pressure on the mother's cardiovascular system, while advanced maternal age, a family history of hypertension, and pre-existing medical conditions increase the risk of hypertension. A high body mass index or obesity also contributes to elevated blood pressure, and insufficient calcium intake can affect the balance of blood pressure. A thorough understanding of these factors is crucial for planning preventive measures and managing the risk of hypertension in pregnant women, enabling more effective direction of preventive and interventional measures during the pregnancy period.

Table 3. The frequency distribution of Mean Arterial Pressure (MAP) of blood pressure before and after the administration of Pakcoy juice (*Brassica Rapa L.*) and antihypertensive drugs in hypertensive pregnant women at Gunung Sugih Health Center in 2023.

group (Antihypertensive Drugs and Pakcoy Juice)	Mean	Minimal	Maximal
Pre Test	113,886	102	120,7
Post Test	94,757	92	96,3

Source: Primary Data 2023

Based on the data presented in Table 3, it was found that the average blood pressure score before the administration of Pakcoy juice (*Brassica rapa L.*) and antihypertensive drugs in pregnant women with hypertension at the Gunung Sugih Community Health Center was 113.886. Meanwhile, the average blood pressure score after the administration of Pakcoy juice (*Brassica rapa L.*) and antihypertensive drugs in pregnant women with hypertension at the Gunung Sugih Community Health Center was 94.757. This data indicates a decrease in blood pressure after the administration of Pakcoy juice (*Brassica rapa L.*) and antihypertensive drugs to pregnant women with hypertension at the Gunung Sugih Community Health Center. The decrease in blood pressure can be interpreted as a positive response to the intervention provided. These results provide an overview that Pakcoy juice and antihypertensive drugs have the potential to influence a reduction in blood pressure in pregnant women with hypertension, serving as a foundation for further considerations regarding the effectiveness of both methods in the management of hypertension in the pregnant population.

The research conducted by Mayangsari (2020) indicates that the administration of Pakcoy green smoothies for one week can lead to a decrease in blood pressure in clients. Similar findings are also presented by the study of Juliarti (2021), which shows that Pakcoy can significantly reduce total blood cholesterol levels compared to the control group. In the context of pregnant women experiencing hypertension, blood pressure reduction can be pursued through both pharmacological and non-pharmacological interventions. Non-pharmacological therapy, such as dietary regulation, may involve the consumption of fiber and potassium-rich foods, including Pakcoy (*Brassica rapa L.*), which can be processed into juice or green smoothies. Pakcoy is rich in nutrients such as protein, plant fats, calories, carbohydrates, fiber, calcium, magnesium, sodium, phosphorus, iron, Vitamin A, Vitamin B, and Vitamin C. As a leafy vegetable, Pakcoy becomes an

abundant source of vitamins and minerals contributing to health. This approach reflects the sustainability of non-pharmacological efforts in managing blood pressure in hypertensive pregnant women, utilizing the nutritional potential of natural foods such as Pakcoy (Damayanti et al., 2019).

Pakcoy, being rich in potassium, calcium, and magnesium, plays a significant role in naturally lowering blood pressure. The American Journal of Clinical Nutrition supports this claim, suggesting that consuming 4,700 milligrams of potassium daily can effectively reduce blood pressure caused by high sodium intake (Fahrudin, 2019). Potassium, an essential mineral, helps regulate blood pressure by counteracting the effects of sodium. It assists in relaxing blood vessel walls, promoting better blood flow, and mitigating the risk of hypertension. The presence of calcium in Pakcoy is also noteworthy, as calcium is crucial for maintaining the integrity of blood vessel walls, contributing to their flexibility and overall cardiovascular health. Moreover, the magnesium content in Pakcoy further complements its blood pressure-lowering properties. Magnesium helps dilate blood vessels, improving blood flow and reducing resistance within the arterial walls. This dual action of relaxing blood vessels and reducing sodium-induced pressure contributes to a more comprehensive approach in managing hypertension. The incorporation of Pakcoy into the diet, whether in the form of green smoothies or other preparations, becomes a valuable non-pharmacological strategy for individuals, especially pregnant women, seeking to manage or prevent hypertension. This natural approach aligns with the broader trend of utilizing nutrient-rich foods to address health concerns and underscores the importance of a balanced and wholesome diet in promoting overall well-being. The findings from Fahrudin's research emphasize the significance of potassium intake, further reinforcing the potential benefits of Pakcoy in supporting cardiovascular health.

Pakcoy is commonly utilized in various culinary forms such as soups, pickles, stir-fries, and more. It contains a high amount of beta-carotene, vitamin C, and vitamin B, acting as antioxidants. Additionally, it is rich in iron, calcium, and phosphorus. The nutritional content of pakcoy is particularly beneficial for pregnant women as it helps prevent anemia. Furthermore, pakcoy has the potential to counteract hypertension, heart diseases, and reduce the risk of various types of cancers. Therefore, pakcoy contains secondary metabolites with antioxidant properties, leading to a reduction in total blood cholesterol levels (Juliarti, 2021). During pregnancy, there is an increased need for folate. Inadequate folate intake can lead to complications such as spina bifida and anencephaly. Including dark leafy vegetables in the diet, such as pakcoy, can assist pregnant women in meeting the heightened folate requirements, ensuring a healthy pregnancy (Fahrudin, 2019). In conclusion, it is observed that there is a decrease in blood pressure in hypertensive pregnant women after one week of consuming Pakcoy (*Brassica rapa L.*) juice and antihypertensive medication. This is attributed to pakcoy's secondary metabolites containing antioxidants, which contribute to a reduction in total blood cholesterol levels.

Table 4. The influence of the combination of Pakcoy juice (*Brassica Rapa L.*) and antihypertensive medication on the reduction of blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center.

	t	P Value
Blood Pressure Analysis		
Pre-Test with Post-Test of Antihypertensive Medication	6,830	0,000
Pre-Test with Post-Test of Pakcoy Juice and Antihypertensive Medication	7,368	0,000
Antihypertensive Medication with Pakcoy Juice and Antihypertensive Medication	-1,364	0,198

Source: Primary Data 2023

Based on Table 4, the comparison between blood pressure before and after the administration of antihypertensive medication in hypertensive pregnant women at the Gunung Sugih Community Health Center resulted in a p-value of $0.000 < 0.05$. This indicates that there is an effect of antihypertensive medication on reducing blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center. The comparison between blood pressure before and after the administration of Pakcoy juice (*Brassica rapa L.*) and antihypertensive medication on blood pressure in hypertensive pregnant women at the Handil Baru Community Health Center yielded a p-value of $0.000 < 0.05$. This suggests that there is an effect of the combination of Pakcoy juice (*Brassica rapa L.*) and antihypertensive medication on reducing blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center. The difference in blood pressure after the administration of antihypertensive medication compared to after Pakcoy juice (*Brassica rapa L.*) and antihypertensive medication in hypertensive pregnant women at the Handil Baru Community Health Center resulted in a p-value of $0.198 > 0.05$. This implies that there is no significant difference in blood pressure after the administration of antihypertensive medication compared to after the administration of Pakcoy juice (*Brassica rapa L.*) and antihypertensive medication in hypertensive pregnant women at the Gunung Sugih Community Health Center.

According to the research by Mayangsari (2020), a decrease in blood pressure was observed in clients who were given Pakcoy green smoothies for 1 week. Similarly, the findings of the study by Juliarti (2021) indicate that Pakcoy can significantly reduce total blood cholesterol levels compared to the control group. Non-pharmacological approaches serve as the initial treatment before adding hypertensive medications, taking into consideration individuals undergoing drug therapy. For controlled hypertensive patients, this non-pharmacological approach can aid in reducing the dosage of medication for some individuals. Therefore, lifestyle modifications are crucial to consider, as they play a role in the success of hypertension management (Hikayati, 2018).

This research has a limitation in using raw Pakcoy for juice preparation, which should not expose pregnant women to raw vegetables. Raw vegetables often contain bacteria, such as *Escherichia coli*, which can lead to infections. A study published in *Clinical Microbiology and Infection* found that infections due to *Escherichia coli* during pregnancy are the most common and potentially fatal type of infection during pregnancy. *Escherichia coli* infections can cause food poisoning, urinary tract infections, and respiratory problems. However, pregnant women can still consume raw vegetables, as stated by the American Pregnancy Association, by ensuring thorough washing under running water before consuming raw vegetables during pregnancy. Soak vegetables in warm, salt-containing water to kill potential bacteria. Discard any parts of the vegetables that appear damaged, rotten, or discolored, as these areas provide an ideal breeding ground for bacteria. Clean all surfaces and utensils used to clean and prepare vegetables to avoid food poisoning. Use separate knives and cutting boards for vegetables and meat to prevent cross-contamination. Store raw vegetables separately in the refrigerator. Always follow the 6-step handwashing process with soap and running water before and after cleaning raw vegetables and before consuming them (Hariati, 2020). The researcher adhered to these rules while making Pakcoy juice.

In conclusion, it is inferred that there is an influence of the combination of Pakcoy juice (*Brassica rapa L*) and antihypertensive medication on reducing blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center. This is attributed to the excellent nutritional content of Pakcoy, particularly beneficial for pregnant women, containing secondary metabolites with antioxidant properties that contribute to a reduction in total blood cholesterol levels.

4. CONCLUSION

Based on the results of the research and discussions regarding the influence of the combination of Pakcoy juice (*Brassica rapa L*) and antihypertensive medication on the reduction of blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center, several conclusions can be drawn. Firstly, the characteristics of the respondents indicate that the group experiencing hypertension is predominantly aged over 35, mostly in the second trimester of pregnancy, with zero parity (primigravida), completed high school education, and working as homemakers. Secondly, antihypertensive therapy in pregnant women has a significant effect, reducing the average blood pressure score by 17%. Thirdly, the intervention with a combination of Pakcoy juice and antihypertensive medication results in a larger decrease in the average blood pressure score, reaching 19%. Lastly, statistical analysis indicates a significant impact of the combination of Pakcoy juice and antihypertensive medication on the reduction of blood pressure in hypertensive pregnant women at the Gunung Sugih Community Health Center, with a p -value of $0.000 < \alpha: 0.05$. This conclusion affirms that the intervention is effective in lowering blood pressure in hypertensive pregnant women.

The researcher acknowledges the limitations in this study. Firstly, the inability to directly monitor the activities of pregnant women, including whether they are using traditional treatments to lower blood pressure during pregnancy, poses a constraint. This limitation may impact the comprehensive understanding of factors that could influence the study's outcomes. Secondly, although the laboratory test results from IK-M/7.2.25/LABKES indicate that the Pakcoy juice used in this study does not contain *Escherichia coli* bacteria that could cause infection, it is essential to note that raw Pakcoy was used in the research. The use of raw vegetables by pregnant women can be risky as they may carry bacteria that could lead to infections. Therefore, further research is necessary, taking these risks into account, to obtain a more holistic understanding of the potential effects of Pakcoy juice on hypertensive pregnant women.

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