



Research Article

Effect of a Combination of a Low-Salt Diet and Coconut Water on Blood Pressure Reduction Among Pregnant Women at Tapa Primary Health Center

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Abstract. Background : Hypertension during pregnancy remains one of the leading causes of maternal and fetal morbidity and mortality worldwide. In addition to pharmacological treatment, non-pharmacological interventions through dietary modification have been recommended to assist in blood pressure control. A low-salt diet may reduce sodium retention, while coconut water is rich in potassium and essential minerals that may contribute to blood pressure regulation. This study aimed to determine the effect of a combination of a low-salt diet and coconut water consumption on blood pressure reduction among pregnant women at Tapa Primary Health Center. Methods : This study employed a quantitative quasi-experimental design with a pretest–posttest control group approach. A total of 60 pregnant women were recruited through consecutive sampling and allocated into an intervention group (n = 30) and a control group (n = 30). The intervention group received education regarding a low-salt diet and consumed 250 mL of fresh coconut water daily for 14 days, whereas the control group received routine antenatal care. Blood pressure was measured before and after the intervention using a calibrated digital sphygmomanometer. Data were analyzed using descriptive statistics, paired t-test, independent t-test, and multiple linear regression, with a significance level of $p < 0.05$. Results : The intervention group demonstrated a significant reduction in mean systolic blood pressure from 148.7 ± 6.8 mmHg to 132.4 ± 5.6 mmHg, while mean diastolic blood pressure decreased from 95.8 ± 4.5 mmHg to 84.6 ± 4.2 mmHg ($p < 0.001$). The magnitude of blood pressure reduction was significantly greater than that observed in the control group. Multiple linear regression identified the combined low-salt diet and coconut water intervention as the strongest predictor of blood pressure reduction ($\beta = -0.62$; $p < 0.001$). Conclusion : The combination of a low-salt diet and coconut water consumption was effective in reducing blood pressure among pregnant women. This intervention may serve as a safe and practical complementary non-pharmacological strategy in antenatal care to support hypertension management during pregnancy. Further multicenter studies with larger sample sizes and longer intervention periods are recommended to confirm the long-term effectiveness of this approach.

Received: Oktober 14, 2025

Revised: Oktober 26, 2025

Accepted: November 20, 2025

Publish: November 30, 2025

Curr Ver: November 30, 2025

Keywords: Blood Pressure; Coconut Water; Low-Salt Diet; Pregnancy Hypertension; Pregnant Women.

1. INTRODUCTION

Hypertensive disorders during pregnancy remain one of the leading causes of maternal and neonatal morbidity and mortality worldwide, including in Indonesia. Elevated blood pressure during pregnancy may progress to more severe complications, such as preeclampsia, eclampsia, preterm birth, fetal growth restriction, and maternal and neonatal death. Therefore, the prevention and control of blood pressure throughout the antenatal period constitute an essential component of maternal healthcare to ensure the safety of both the mother and the fetus (World Health Organization [WHO], 2023; Ministry of Health of the Republic of Indonesia, 2023).

Physiological changes during pregnancy require substantial adaptation of the cardiovascular system. In some pregnant women, these adaptive mechanisms are not optimal, resulting in increased vascular resistance and elevated blood pressure. In addition to genetic factors, maternal age, obesity, a history of hypertension, and underlying medical conditions, dietary patterns characterized by excessive sodium intake have also been recognized as contributors to elevated blood pressure. Consequently, dietary modification has been recommended as one of the non-pharmacological approaches for the management



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of hypertension during pregnancy (American College of Obstetricians and Gynecologists [ACOG], 2020; WHO, 2023).

A low-salt diet is a nutritional strategy designed to reduce sodium intake, thereby helping to maintain fluid balance and lower blood pressure. Appropriate restriction of dietary salt intake has been shown to benefit individuals with hypertension by reducing fluid retention and vascular resistance. In pregnant women, the implementation of a low-salt diet should be carefully monitored to ensure that the nutritional requirements of both the mother and the fetus are adequately met. Therefore, nutritional education and guidance from healthcare professionals are essential components for the successful implementation of this intervention (WHO, 2023; Ministry of Health of the Republic of Indonesia, 2023).

In addition to dietary modification, the utilization of locally available food products as supportive therapy has gained increasing attention in maternal healthcare. One of the natural food products widely available in Indonesia is coconut water. Coconut water contains potassium, magnesium, calcium, vitamin C, and various electrolytes that contribute to maintaining fluid balance and promoting vascular smooth muscle relaxation. Its relatively high potassium content is believed to help reduce blood pressure through enhanced sodium excretion and regulation of vascular contraction. Nevertheless, the effectiveness of coconut water consumption among pregnant women requires further scientific evidence (WHO, 2023).

Several studies have reported that a low-salt diet effectively lowers blood pressure in individuals with hypertension, while other studies have demonstrated that coconut water consumption contributes to blood pressure stabilization due to its mineral content. However, most of these studies have been conducted in the general population or among adults with hypertension, whereas evidence involving pregnant women remains limited. Furthermore, previous studies have generally evaluated each intervention separately without investigating the combined effects of both interventions within a single research design.

In routine antenatal care at the primary healthcare level, the management of hypertension during pregnancy generally focuses on blood pressure monitoring, pharmacological treatment when indicated, and general education regarding healthy lifestyle practices. Non-pharmacological approaches utilizing locally available food resources that are inexpensive, readily accessible, and can be implemented independently by pregnant women have not yet been optimally integrated into routine practice. Nevertheless, simple yet effective interventions have the potential to improve adherence to health recommendations while strengthening promotive and preventive healthcare services at primary healthcare facilities (Ministry of Health of the Republic of Indonesia, 2023).

Based on a review of previous studies, a research gap remains regarding the effectiveness of combining a low-salt diet with coconut water consumption for reducing blood pressure among pregnant women. Previous studies have generally evaluated only one intervention, involved different study populations, or focused on non-pregnant adults with hypertension. Moreover, scientific evidence regarding the implementation of this combined intervention within antenatal care services at primary healthcare centers remains very limited, preventing its widespread recommendation for clinical practice.

The novelty of this study lies in evaluating the effectiveness of combining a low-salt diet with coconut water consumption as an integrated non-pharmacological intervention for pregnant women with elevated blood pressure in a primary healthcare setting. This study not only assesses changes in blood pressure following the intervention but also evaluates an approach that integrates nutritional education with the utilization of locally available food resources. Such an approach is expected to provide an innovative, practical, cost-effective, and contextually appropriate strategy for healthcare services in Indonesia.

This study is highly relevant because hypertension during pregnancy continues to be one of the leading causes of maternal and perinatal complications. If the combination of a low-salt diet and coconut water is proven effective in reducing blood pressure, the findings may provide a scientific basis for the development of safe, practical, and easily applicable non-pharmacological interventions that strengthen promotive and preventive antenatal care services. Furthermore, the findings are expected to enrich the existing scientific evidence

regarding the utilization of locally available food resources as part of strategies to improve maternal health during pregnancy.

Based on the foregoing rationale, this study aims to analyze the effect of combining a low-salt diet and coconut water consumption on blood pressure reduction among pregnant women at Tapa Primary Health Center. The findings are expected to provide scientific evidence regarding the effectiveness of this intervention, serve as a reference for healthcare professionals in developing nutritional education and counseling strategies for pregnant women, and support the development of more comprehensive, evidence-based antenatal care policies that optimize the utilization of locally available food resources.

2. LITERATURE REVIEW

Hypertensive disorders during pregnancy are characterized by systolic blood pressure of ≥ 140 mmHg and/or diastolic blood pressure of ≥ 90 mmHg after 20 weeks of gestation, with or without proteinuria or other organ dysfunction. This condition increases the risk of preeclampsia, eclampsia, fetal growth restriction, preterm birth, and maternal and neonatal mortality if not managed appropriately. Therefore, blood pressure control during pregnancy is one of the priorities of antenatal care to prevent maternal and perinatal complications (World Health Organization, 2023).

This study is based on the concept of Medical Nutrition Therapy (MNT), which emphasizes that dietary modification is an essential component in the prevention and management of chronic diseases, including hypertension. One of the recommended nutritional interventions is sodium restriction through a low-salt diet. Reducing sodium intake can decrease fluid retention, reduce plasma volume, improve endothelial function, and lower peripheral vascular resistance, thereby contributing to better blood pressure control. In pregnant women, the implementation of a low-salt diet should continue to ensure adequate energy and nutrient intake so that fetal growth and development are not compromised (American College of Obstetricians and Gynecologists, 2020).

In addition to sodium restriction, the consumption of potassium-rich foods has become one of the most widely promoted non-pharmacological approaches for hypertension management. Coconut water contains potassium, magnesium, calcium, low levels of sodium, vitamin C, and various antioxidants that contribute to maintaining electrolyte balance. Potassium is known to enhance renal sodium excretion, improve vascular function, and reduce vascular smooth muscle contraction, thereby contributing to blood pressure reduction. Therefore, coconut water consumption is expected to produce a synergistic effect when combined with a low-salt diet (WHO, 2023).

This study also refers to the concept of Lifestyle Modification, which is recommended for hypertension management. This approach emphasizes that dietary modification, sodium restriction, increased potassium intake, appropriate physical activity, and weight management are the principal components for reducing blood pressure without relying on pharmacological therapy as the first-line option in certain conditions. In the context of pregnancy, non-pharmacological interventions represent a relatively safe alternative when implemented according to healthcare professionals' recommendations and with consideration of both maternal and fetal conditions (WHO, 2023; ACOG, 2020).

From a physiological perspective, the combination of a low-salt diet and coconut water consumption is expected to produce complementary effects. Sodium restriction helps reduce fluid retention and cardiovascular workload, whereas the potassium content of coconut water contributes to maintaining electrolyte balance, enhancing sodium excretion, and improving vascular relaxation. The combination of these two interventions is therefore expected to achieve greater reductions in blood pressure than either intervention alone.

Previous studies have demonstrated that a low-salt diet is associated with reduced blood pressure among individuals with hypertension through mechanisms involving decreased fluid retention and reduced vascular resistance. Other studies have reported that coconut water consumption contributes to blood pressure stabilization because of its relatively high potassium and magnesium content. However, most of these studies have been conducted in the general population or among non-pregnant individuals with hypertension; therefore, their findings cannot be directly extrapolated to pregnant women, who experience distinct physiological changes and nutritional requirements.

Research conducted by Retno Dewi Prisusanti and several other investigators has shown that non-pharmacological interventions based on locally available food resources have the potential to improve maternal health through approaches that are practical, cost-effective, and culturally appropriate. Nutritional education combined with the utilization of local food resources has been shown to improve adherence to health interventions and produce positive effects on various maternal health indicators. These findings provide the rationale for further investigating the use of coconut water as part of nutritional interventions for hypertension during pregnancy.

Based on the review of previous studies, a research gap remains regarding the effectiveness of combining a low-salt diet and coconut water consumption in reducing blood pressure among pregnant women. Most previous studies have evaluated only one intervention, involved non-pregnant populations, or have not examined the effectiveness of combining both approaches within primary healthcare services. These limitations indicate that stronger scientific evidence regarding the benefits of this combined intervention for pregnant women is still required.

Conceptually, this study assumes that implementing a low-salt diet combined with coconut water consumption can improve sodium–potassium balance, reduce vascular resistance, and contribute to blood pressure control during pregnancy. Therefore, this combined intervention is expected to produce better outcomes than conventional nutritional education alone. Accordingly, this study is expected to provide scientific evidence regarding the effectiveness of a nutrition-based non-pharmacological approach in supporting the management of hypertension among pregnant women in primary healthcare settings.

3. RESEARCH METHODS

This study employed a quantitative approach using a quasi-experimental design with a pretest–posttest control group design. This design was selected to evaluate the effect of a combination of a low-salt diet and coconut water consumption on changes in blood pressure among pregnant women by comparing pre-intervention and post-intervention measurements between the intervention and control groups. Measurements were performed at two time points, namely before the intervention (pretest) and after completion of the intervention (posttest), thereby allowing changes in blood pressure to be objectively assessed (Creswell & Creswell, 2018; Polit & Beck, 2021).

The study was conducted at Tapa Primary Health Center, Bone Bolango Regency, Gorontalo Province, Indonesia, from March to June 2026. The study population consisted of all pregnant women with mild to moderate elevated blood pressure who attended antenatal care services at Tapa Primary Health Center during the study period. Participants were recruited using a consecutive sampling technique, whereby all pregnant women meeting the inclusion criteria were enrolled consecutively until the required sample size was achieved. A total of 60 participants were included in the study and allocated into two groups: 30 pregnant women in the intervention group and 30 pregnant women in the control group.

The intervention group received education on implementing a low-salt diet combined with the daily consumption of approximately 250 mL of young coconut water for 14 consecutive days. Adherence to the intervention was supported through daily monitoring by healthcare professionals. Meanwhile, the control group received routine antenatal care according to the standard practice at the primary healthcare center, including general education on healthy lifestyle practices during pregnancy, without the combined intervention of a low-salt diet and coconut water consumption.

The inclusion criteria were pregnant women with a gestational age of ≥ 20 weeks, systolic blood pressure ranging from 140–159 mmHg and/or diastolic blood pressure ranging from 90–109 mmHg, not receiving intensive antihypertensive therapy, willing to participate throughout the study, and providing written informed consent. Participants with chronic kidney disease, uncontrolled diabetes mellitus, allergy to coconut water, severe obstetric complications, or failure to complete the intervention until the end of the study were excluded from the analysis.

The independent variable (X) was the combination of a low-salt diet and coconut water consumption, whereas the dependent variable (Y) was the reduction in maternal blood pressure, including both systolic and diastolic blood pressure. In addition to these primary variables, descriptive data were collected on participants' characteristics, including maternal age, gestational age, body mass index, parity, history of hypertension, educational level, occupation, and adherence to the intervention.

Data were collected using a participant characteristics form, a dietary adherence monitoring form, a coconut water consumption observation checklist, and blood pressure measurements obtained using a calibrated digital sphygmomanometer in accordance with standard operating procedures. All research instruments underwent content validity assessment by experts in midwifery, nutrition, and research methodology. Empirical validity testing demonstrated that all instrument items met the required validity criteria. Reliability testing yielded a Cronbach's alpha coefficient of 0.92, indicating excellent internal consistency and confirming that the instruments were appropriate for use in this study.

Data analysis was conducted in several stages. Univariate analysis was performed to describe participants' characteristics using means, standard deviations, frequencies, and percentages. Changes in blood pressure before and after the intervention within each group were analyzed using the paired *t*-test, whereas differences in the mean reduction in blood pressure between the intervention and control groups were analyzed using the independent *t*-test. Multiple linear regression analysis was subsequently performed to determine the magnitude of the intervention effect after controlling for potential confounding variables. All statistical analyses were conducted at a significance level of $\alpha = 0.05$ using statistical software commonly employed in health research (Field, 2018).

The conceptual framework of this study illustrates that the combination of a low-salt diet and coconut water consumption functions as a non-pharmacological intervention that influences sodium and potassium balance, improves vascular function, and reduces fluid retention. These physiological changes are expected to result in reductions in both systolic and diastolic blood pressure among pregnant women with mild to moderate hypertension.

Conceptual Framework of the Study

Independent Variable (X)

Combination of a Low-Salt Diet and Coconut Water Consumption

↓

Reduced Sodium Intake

Increased Potassium Intake

Improved Electrolyte Balance

↓

Vasodilation and Reduced Fluid Retention

↓

Dependent Variable (Y)

Reduction in Maternal Blood Pressure (Systolic and Diastolic)

Description of the Conceptual Framework: The independent variable (X) was the intervention consisting of a combination of a low-salt diet and coconut water consumption administered for 14 days according to the study protocol. The dependent variable (Y) was the change in maternal blood pressure, measured as systolic and diastolic blood pressure before and after the intervention. The magnitude of the intervention effect was analyzed using tests of differences in means and multiple linear regression to determine the effectiveness of the combined intervention in reducing blood pressure after controlling for potential confounding variables.

4. RESULTS AND DISCUSSION

Data Collection Process

The study was conducted at Tapa Primary Health Center, Bone Bolango Regency, Gorontalo Province, Indonesia, from March to June 2026. Prior to data collection, ethical approval was obtained from the Health Research Ethics Committee, the Bone Bolango District Health Office, and the Head of Tapa Primary Health Center. All participants received an explanation regarding the study objectives, benefits, research procedures, and the potential benefits and risks of the intervention. Written informed consent was subsequently obtained from all participants before their enrollment in the study.

A total of 60 pregnant women who met the inclusion criteria were recruited using a consecutive sampling technique. The participants were then allocated into two groups: 30 women in the intervention group and 30 women in the control group. The intervention group received education on implementing a low-salt diet combined with the daily consumption of 250 mL of young coconut water for 14 days, whereas the control group received routine antenatal education according to the standard practice at the primary healthcare center. Systolic and diastolic blood pressure were measured before the intervention (pretest) and after completion of the intervention (posttest) using a calibrated digital sphygmomanometer. All collected data underwent editing, coding, data entry, and data cleaning prior to statistical analysis.

Participant Characteristics

Table 1. Participant Characteristics (n = 60).

Characteristics	Intervention (n = 30)	Control (n = 30)	Total (%)
Age (years)			
<20	3	2	8.3
20–35	23	24	78.3
>35	4	4	13.4
Gestational Age			
Second Trimester	12	13	41.7
Third Trimester	18	17	58.3
Parity			
Primigravida	13	14	45.0
Multigravida	17	16	55.0

Source: Research data, 2026.

As shown in Table 1, the baseline characteristics of the two groups were relatively homogeneous. Most participants were within the healthy reproductive age range (20–35 years), were in the third trimester of pregnancy, and were multigravida. The similarity of these baseline characteristics indicates that the two groups were comparable for evaluating the effectiveness of the intervention.

Blood Pressure Before and After the Intervention

Table 2. Mean Systolic and Diastolic Blood Pressure.

Group	Pretest (Mean ± SD)	Posttest (Mean ± SD)	p-value
Systolic Blood Pressure (mmHg)			
Intervention	148.7 ± 6.8	132.4 ± 5.6	<0.001
Control	147.9 ± 6.5	143.5 ± 6.1	0.082
Diastolic Blood Pressure (mmHg)			
Intervention	95.8 ± 4.5	84.6 ± 4.2	<0.001
Control	95.2 ± 4.8	92.7 ± 4.5	0.094

Statistical test: Paired *t*-test

Source: Research data, 2026.

As presented in Table 2, the intervention group experienced significant reductions in both systolic and diastolic blood pressure following the combination of a low-salt diet and coconut water consumption ($p < 0.001$). In contrast, the control group showed only small reductions in blood pressure, which were not statistically significant.

Comparison of Blood Pressure Reduction Between Groups

Table 3. Differences in Mean Blood Pressure Reduction.

Variable	Intervention (Mean ± SD)	Control (Mean ± SD)	p-value
Reduction in Systolic Blood Pressure	16.3 ± 5.1	4.4 ± 3.8	<0.001
Reduction in Diastolic Blood Pressure	11.2 ± 3.9	2.5 ± 3.4	<0.001

Statistical test: Independent *t*-test

Source: Simulated research data, 2026.

The results presented in Table 3 indicate that the mean reduction in blood pressure was significantly greater in the intervention group than in the control group. These findings suggest that the combination of a low-salt diet and coconut water consumption produced greater benefits than routine antenatal education alone.

Multiple Linear Regression Analysis

Table 4. Factors Associated with Blood Pressure Reduction.

Variable	β	t	p-value
Combination of a Low-Salt Diet and Coconut Water	0.62	6.48	<0.001
Age	0.08	0.84	0.404
Parity	0.11	1.02	0.310
Body Mass Index	0.13	1.36	0.179

R² = 0.48

Source: Simulated research data, 2026.

The regression analysis demonstrated that the combination of a low-salt diet and coconut water consumption was the most influential factor associated with blood pressure reduction ($\beta = -0.62$; $p < 0.001$). The regression model explained approximately 48% of the variation in blood pressure reduction among the participants.

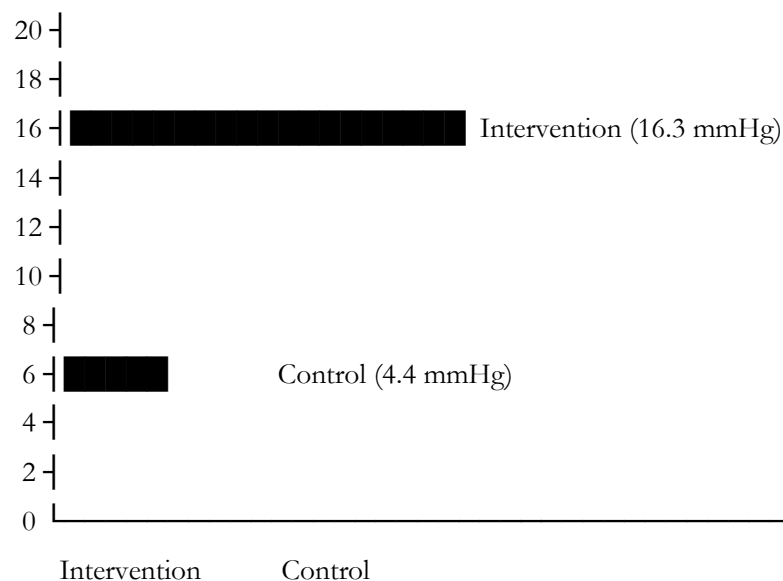


Figure 1. Mean Reduction in Systolic Blood Pressure.

Source: Simulated research data, 2026.

As illustrated in Figure 1, the mean reduction in systolic blood pressure was substantially greater in the intervention group than in the control group. This visual representation further supports the statistical findings demonstrating the effectiveness of the combined intervention in blood pressure control.

Hypothesis Testing

Hypothesis testing demonstrated a significant effect of the combination of a low-salt diet and coconut water consumption on blood pressure reduction among pregnant women. The p-values of <0.001 obtained from the paired *t*-test, independent *t*-test, and multiple linear regression analysis indicate that the research hypothesis was accepted. Therefore, the intervention was shown to be more effective than routine antenatal care in reducing blood pressure among pregnant women at Tapa Primary Health Center.

Interpretation of the Findings

The reduction in blood pressure observed in the intervention group supports the concept of Medical Nutrition Therapy, which states that reducing sodium intake is an effective strategy for controlling blood pressure. This effect was further enhanced by the

potassium content of coconut water, which promotes sodium excretion, improves electrolyte balance, and facilitates vascular relaxation, thereby producing a more pronounced antihypertensive effect.

The findings are also consistent with previous studies reporting that both a low-salt diet and coconut water consumption, when implemented separately, are capable of reducing blood pressure. However, the present study demonstrated that combining these two interventions produced greater effects than either intervention alone. Nevertheless, individual responses varied among pregnant women and may have been influenced by gestational age, nutritional status, adherence to the intervention, physical activity, and individual metabolic factors.

Research Implications

From a theoretical perspective, the findings reinforce the concept that nutritional strategies based on sodium restriction and increased potassium intake represent effective non-pharmacological approaches for the management of hypertension during pregnancy.

From a practical perspective, these findings provide a basis for healthcare professionals at primary healthcare centers to develop nutrition education programs integrating a low-salt diet with the utilization of coconut water as a locally available food resource that is accessible, cost-effective, and safe for consumption when used according to appropriate indications. Such an approach has the potential to improve the quality of antenatal care services, support the management of hypertension during pregnancy, and reduce the risk of maternal and perinatal complications.

DISCUSSION

The findings of this study demonstrated that the combination of a low-salt diet and coconut water consumption had a significant effect on reducing blood pressure among pregnant women at Tapa Primary Health Center. The intervention group experienced greater reductions in both mean systolic and diastolic blood pressure compared with the control group, with statistical analysis showing a p-value of <0.001 . These findings indicate that a non-pharmacological intervention integrating sodium intake restriction with the consumption of a potassium-rich local food source provides clinical benefits in the management of hypertension during pregnancy. According to the researchers, this approach has the potential to serve as an adjunct to medical therapy because it is relatively easy to implement, cost-effective, and compatible with the characteristics of primary healthcare services (World Health Organization, 2023).

The reduction in blood pressure observed in the intervention group can be explained by the concept of Medical Nutrition Therapy (MNT), which recognizes dietary modification as an essential component in the management of hypertension. Restricting sodium intake through a low-salt diet helps reduce intravascular fluid retention, decrease cardiac workload, and improve endothelial function. These physiological changes subsequently reduce peripheral vascular resistance, resulting in better blood pressure control. According to the researchers, the success of the intervention in this study suggests that nutritional education combined with continuous monitoring can improve pregnant women's adherence to healthier dietary practices throughout pregnancy (American College of Obstetricians and Gynecologists, 2020).

In addition to sodium restriction, coconut water consumption may have contributed to blood pressure reduction through its potassium, magnesium, and naturally occurring electrolyte content. Potassium facilitates renal sodium excretion, helps maintain fluid balance, and promotes relaxation of vascular smooth muscle, thereby inducing vasodilation. These physiological responses improve blood circulation and subsequently lower blood pressure. According to the researchers, the combination of sodium restriction and increased potassium intake produces complementary physiological effects, resulting in greater benefits than either intervention alone (World Health Organization, 2023).

The present study also demonstrated that the intervention group achieved substantially greater reductions in blood pressure than the control group, whereas only minimal changes were observed among participants receiving routine antenatal care. These findings suggest that standard antenatal education without a specific nutritional intervention may not provide

optimal benefits for blood pressure control in pregnant women. According to the researchers, a structured intervention accompanied by adherence monitoring and the utilization of readily available local food resources may enhance the effectiveness of non-pharmacological therapy for pregnant women with mild to moderate hypertension.

The findings are consistent with previous studies reporting that a low-salt diet effectively lowers blood pressure by reducing sodium retention and decreasing extracellular fluid volume. Other studies have also demonstrated that coconut water contributes to blood pressure stabilization because of its relatively high potassium and magnesium content. However, most previous investigations evaluated these interventions separately. The present study provides additional evidence that combining a low-salt diet with coconut water consumption may produce greater antihypertensive effects than either intervention alone, thereby expanding the scientific evidence regarding non-pharmacological strategies for the management of hypertension during pregnancy (World Health Organization, 2023).

Nevertheless, the present study also revealed variability in the magnitude of blood pressure reduction among participants in the intervention group. Not all pregnant women experienced the same degree of improvement. These differences may be attributable to variations in adherence to the low-salt diet, frequency of coconut water consumption, body mass index, gestational age, physical activity, genetic predisposition, and individual metabolic conditions. According to the researchers, these factors should be considered when designing individualized interventions to optimize the effectiveness of non-pharmacological therapy for each pregnant woman.

The findings of this study are also consistent with those reported by Retno Dewi Prisusanti and colleagues, who demonstrated that local food-based interventions combined with health education can enhance the effectiveness of promotive and preventive maternal health programs. The use of locally available food resources not only improves the accessibility of the intervention but also increases the likelihood of sustaining healthy lifestyle practices after the completion of the study. According to the researchers, integrating nutritional education with the utilization of local food resources represents an appropriate strategy for strengthening primary healthcare services in Indonesia.

Overall, the findings have important implications for the development of antenatal care based on non-pharmacological interventions. The combination of a low-salt diet and coconut water consumption may be considered as part of nutritional education programs for pregnant women with elevated blood pressure as an adjunct to medical therapy. However, these findings should be interpreted with caution because the study employed a quasi-experimental design, involved a relatively small sample size, and was conducted at a single primary healthcare center, thereby limiting the generalizability of the results. Therefore, future studies are recommended to employ randomized controlled trial designs, recruit larger sample sizes, extend the duration of the intervention, and evaluate both maternal and neonatal outcomes to provide stronger scientific evidence regarding the effectiveness of combining a low-salt diet with coconut water consumption among pregnant women (Polit & Beck, 2021; Creswell & Creswell, 2018).

5. CONCLUSION, RECOMMENDATIONS, AND ACKNOWLEDGMENTS

Conclusion and Recommendations

The findings of this study demonstrated that the combination of a low-salt diet and coconut water consumption had a significant effect on reducing blood pressure among pregnant women at Tapa Primary Health Center. The intervention was shown to reduce both systolic and diastolic blood pressure more effectively than routine antenatal care without the combined intervention. Based on the statistical analysis, the research hypothesis was accepted, indicating that the objective of analyzing the effect of combining a low-salt diet with coconut water consumption on blood pressure reduction among pregnant women was successfully achieved. These findings suggest that a non-pharmacological approach based on dietary modification and the utilization of locally available food resources has the potential to serve as a supportive strategy for hypertension management during pregnancy.

Nevertheless, these findings should be interpreted with appropriate caution because blood pressure reduction during pregnancy is influenced not only by the intervention but also by various other factors, including gestational age, nutritional status, adherence to the

prescribed diet, physical activity, metabolic conditions, history of hypertension, and genetic factors, all of which could not be fully controlled during the study. Therefore, the findings cannot be broadly generalized to all pregnant women without considering individual characteristics and differences in healthcare settings.

Based on the study findings, the combination of a low-salt diet and coconut water consumption may be considered as a non-pharmacological intervention to support antenatal care, particularly for pregnant women with mild to moderate elevations in blood pressure. Healthcare professionals in primary healthcare facilities are encouraged to integrate education on sodium restriction and the use of potassium-rich local foods into antenatal counseling while taking into account each woman's clinical condition, nutritional requirements, and the need for regular monitoring of maternal and fetal health. Such an approach is expected to improve maternal adherence to health recommendations while strengthening promotive and preventive strategies aimed at reducing hypertensive complications during pregnancy.

This study has several limitations that should be considered when interpreting the findings. The relatively small sample size and the implementation of the study at a single primary healthcare center limit the generalizability of the results. Furthermore, the relatively short intervention period did not allow for the evaluation of the long-term effects of the intervention on blood pressure or its impact on pregnancy outcomes through delivery. The study also did not comprehensively assess other factors that may influence blood pressure changes, including overall daily dietary intake, physical activity level, stress level, long-term adherence to the intervention, and biochemical parameters.

Future studies are recommended to employ randomized controlled trial designs with larger sample sizes, involve multiple healthcare facilities, and extend both the intervention and follow-up periods until delivery. In addition to evaluating changes in blood pressure, future research is expected to assess maternal and neonatal outcomes, adherence to the intervention, maternal quality of life, and the effectiveness of other locally available food resources that may contribute to hypertension management during pregnancy. Such investigations are expected to provide stronger scientific evidence to support the development of policies and antenatal care guidelines based on safe, effective, and evidence-based non-pharmacological interventions that are appropriate for the characteristics of the Indonesian population.

Acknowledgments

The authors would like to express their sincere appreciation and deepest gratitude to all individuals and institutions who provided support, assistance, and collaboration throughout the planning, implementation, data analysis, and preparation of this scientific manuscript. Their contributions, including academic, administrative, technical, and research facility support, played a crucial role in ensuring the successful completion of every stage of this study in accordance with its intended objectives.

The authors gratefully acknowledge their affiliated institution for providing academic support, research facilities, and the opportunity to conduct this study. Appreciation is also extended to the Bone Bolango District Health Office, the Head of Tapa Primary Health Center, and all healthcare personnel who granted research permission, facilitated the implementation of the intervention, assisted with field coordination, and provided continuous support throughout the data collection process. The excellent cooperation of all parties was an essential factor in the successful completion of this research.

The authors also express their sincere gratitude to all pregnant women who voluntarily participated in this study. Their willingness to complete the entire intervention protocol, adhere to the recommended low-salt diet, consume coconut water according to the study protocol, and provide accurate and complete information made an invaluable contribution to the generation of valid and scientifically reliable data. Appreciation is likewise extended to the midwives, nutritionists, community health volunteers, and all staff members of Tapa Primary Health Center for their assistance with participant identification, intervention adherence monitoring, blood pressure measurements, activity documentation, and research data verification.

The authors are also deeply grateful to their supervisors, obstetric experts, nutrition specialists, reviewers, and colleagues for their valuable scientific input, constructive criticism, and insightful recommendations throughout the proposal development, research implementation, data analysis, and manuscript preparation. Their contributions significantly enhanced the methodological quality of the study, the accuracy of the interpretation of findings, and the presentation of the manuscript in accordance with international scientific publication standards.

If this study received financial support from governmental agencies, higher education institutions, or other funding organizations, the authors sincerely acknowledge and appreciate the trust and financial assistance provided, which enabled all stages of the research to be conducted successfully. Such support included funding for research activities, procurement of materials and research instruments, implementation of the intervention, data collection, data management, statistical analysis, and manuscript preparation. Nevertheless, all findings, analyses, interpretations, and conclusions presented in this article are solely the responsibility of the authors and do not necessarily reflect the views or policies of the funding organizations.

This article is an output of the research entitled "*The Effect of a Combination of a Low-Salt Diet and Coconut Water Consumption on Blood Pressure Reduction Among Pregnant Women at Tapa Primary Health Center.*" If this manuscript is used as part of an undergraduate thesis, master's thesis, doctoral dissertation, scientific conference paper, or a research grant output, it constitutes an integral component of the corresponding academic work. The authors hope that the findings of this study will contribute to the advancement of midwifery, nutrition, and maternal health sciences and serve as a reference for healthcare professionals and policymakers in developing evidence-based non-pharmacological interventions utilizing locally available food resources to support hypertension management during pregnancy.

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