Women. Health. Bull. 2025; 12(4)

Published online 2025 October.

Original Article

The Effect of Unripened Coconut Water on Reducing Hypertension in Pregnant Women

Yuli Suryanti[1], M.Keb; Ika Murtiyarini[1], M.Keb; Pauline Kusmaryati[1]*, M.Bmd; Zakiah Zakiah[2], M.Keb; Tengku Sri Wahyuni[3], M.Keb; Agus Fitri Sianturi[4], STr.Keb

[1]Department of Midwifery, Jambi Health Polytechnic, Jambi, Indonesia
[2]Department of Midwifery, Banjarmasin Health Polytechnic, Banjarmasin, Indonesia
[3]Department of Midwifery, Medan Health Polytechnic, Medan, Indonesia
[4]Department of Midwifery, Kuala Tungkal 1 Health Center, Jambi, Indonesia

Corresponding author: Pauline Kusmaryati, M.Keb; Jl. Dr. Tazar, Buluran Kenali, Kec. Telanaipura, Jambi city, Jambi province, 36361, Indonesia. **Tel:** +62-813-71724847; **Fax:** +98-741-445450; **Email:** pkusmaryati@gmail.com

Received: January 08, 2025; **Revised:** March 21, 2025; **Accepted:** April 26, 2025

Abstract

Background: Uncontrolled hypertension in pregnant women increases the risk of serious complications, including preeclampsia, preterm birth, and fetal health issues. The present study explored the potential of unripened coconut water as a natural intervention to reduce blood pressure in hypertensive pregnant women.
Methods: A pretest-posttest experimental design was used among 91 pregnant women with systolic blood pressure ≥135 mmHg and/or diastolic ≥85 mmHg. The study took place in the coverage area of Kuala Tungkal I Health Center, Indonesia from November 2022 to June 2023. The study participants consumed young coconut water daily over 7 days. Blood pressure was measured before and after the intervention using a digital sphygmomanometer. Data analysis was conducted using paired t-tests to evaluate changes in systolic and diastolic pressures.
Results: A statistically significant reduction in both systolic and diastolic blood pressures was observed. The average systolic reading declined from 134.98 mmHg (SD±24.97) to 125.24 mmHg (SD±22.42), with a mean difference of 9.74 mmHg (95% CI: 6.42–13.05; P<0.001). Diastolic pressure decreased from 86.84 mmHg (SD±14.43) to 82.16 mmHg (SD±13.31), showing a mean reduction of 4.68 mmHg (95% CI: 2.69–6.67; P<0.001).
Conclusions: The results of this study showed that daily consumption of young coconut water for seven days can significantly reduce both systolic and diastolic blood pressure in pregnant women with hypertension. The average systolic pressure decreased from 134.98 mmHg to 125.24 mmHg, and the diastolic pressure dropped from 86.84 mmHg to 82.16 mmHg.

Keywords: Cocos Nucifera, Hypertension, Pregnant Women, Complementary Therapies, Maternal Health

How to Cite: Suryanti Y, Murtiyarini I, Kusmaryati P, Zakiah Z, Wahyuni TS, Sianturi AF. The Effect of Unripened Coconut Water on Reducing Hypertension in Pregnant Women. Women. Health. Bull. 2025;12(3):2-9. doi: 10.30476/whb.2025.105476.1334.

1. Introduction

The Maternal Mortality Rate (MMR) is a key indicator of women's health quality and an essential component of both the development index and quality of life index (1). According to the World Health Organization (WHO), maternal mortality is unacceptably high, every year, an estimated 303,000 women lose their lives during childbirth mostly in underdeveloped nations. In 2020, there were over 287,000 deaths of women during and after pregnancy and delivery. Low and lower-middle-income nations accounted for the vast majority (95 %) of maternal fatalities in 2020 (2). The MMR in Southeast Asia was estimated at 134 women per 100,000 live births in 2020. Indonesia has the fourth highest MMR (173/100,000 LB) in the region, following Timor-Leste, Cambodia, and Myanmar (3). Every day, maternal deaths occur worldwide, predominantly due to complications arising from pregnancy or childbirth (4).

The causes of maternal mortality are now more influenced by hypertension in pregnancy and non-obstetric complications, reflecting the growing role of non-communicable diseases. In addition, there are interregional disparities due to differences in socio-economic conditions, transportation access, and the distribution of healthcare workers (5).

Hypertension during pregnancy is the second most frequent cause of maternal death in Indonesia and has shown a persistent upward trend, though its exact cause remains unclear. Preeclampsia is often marked by high blood pressure accompanied by proteinuria and swelling (edema). In pregnancy-induced hypertension, blood pressure is defined as an increase of at least 30 mmHg in systolic or 15 mmHg in

diastolic pressure compared to the woman's baseline. Blood pressure measurements follow the standards set by the British Hypertension Society guidelines, which recommend the use of a calibrated mercury sphygmomanometer, digital, or aneroid device (6, 7).

Preexisting chronic diseases, such as diabetes, chronic hypertension, chronic renal disease, or autoimmune disorders, increase a woman's risk of developing preeclampsia during pregnancy (8, 9) and low adherence to antihypertensive therapy is considered one of the main causes of poor blood pressure (BP. A personal history of hypertensive pregnancy also presents a significant risk. Maternal age, especially women over 35, and a body mass index (BMI) of 30 kg/m² or more, contribute to the elevated risk due to increased cardiovascular and metabolic strain. Family history, particularly on the maternal side, also predisposes women to preeclampsia, as do multifetal gestations (e.g., twins or triplets) because of the increased physiological demands on the mother. Finally, an interpregnancy interval of more than 10 years has been identified as a risk factor, possibly due to the loss of protective adaptations from the previous pregnancy. Collectively, these factors highlight the importance of targeted monitoring and early intervention for women at higher risk of preeclampsia (10-12).

Both pharmacological and non-pharmacological approaches are used to manage hypertension in pregnant women. Pharmacological treatment is typically applied in cases of early-stage preeclampsia (<34 weeks) with the careful administration of antihypertensive drugs. Alongside medication, non-pharmacological treatments play a key role in lowering blood pressure naturally. Non-pharmacological therapies, which include complementary treatments, aim to enhance the effectiveness of medication while reducing potential side effects for pregnant women. These treatments incorporate natural ingredients such as fruits and vegetables like bananas, cucumbers, starfruit, and unripened coconut water (UCW) as supportive options for blood pressure management (13-15).

The DASH (Dietary Approaches to Stop Hypertension) dietary pattern has demonstrated that potassium-rich foods aid in lowering blood pressure. Young coconut water, abundant in potassium, has emerged as a viable complementary therapy for hypertensive management. It contains around 291 mg of potassium per 100 ml, which supports sodium balance and aids in reducing blood pressure (16, 17).

Unripened coconut water, found inside young coconuts, is rich in potassium, containing approximately 291 mg per 100 ml. This high potassium content helps the body counterbalance sodium levels, supporting blood pressure regulation and potentially reducing the risk of hypertension (18).

UCW is commonly used as a non-pharmacological therapy for managing hypertension, especially among elderly patients. However, its use for pregnant women remains rare and has yet to be implemented in Tanjung Jabung Barat District, Jambi Province, Indonesia, despite the fact that young coconut is a major plantation commodity in the region.

Given the global burden of hypertension in pregnancy, this study examined young coconut water as a possible complementary intervention. Uncontrolled hypertension during pregnancy increases the risk of severe complications, including preeclampsia, preterm birth, and fetal distress. By demonstrating that young coconut water consumption can lower blood pressure, this study offered a promising, natural, and affordable treatment option, potentially reducing dependence on medications that often carry side effects. The study findings not only have the potential to enhance maternal health but could also inform public health policies and support the development of inclusive clinical guidelines for managing hypertension in pregnancy, particularly in developing countries. Accordingly, the present study aimed to analyze the effect of young coconut water on reducing blood pressure in pregnant women with hypertension in the Kuala Tungkal I Health Center service area, located in Jambi, Indonesia.

2. Methods

2.1. Design

This study used an experimental design with a pretest–posttest approach in a single treatment group. Participants consumed unripened coconut water (UCW) daily for seven days.

2.2. Selection and Description of Participants

The study was conducted at Kuala

Tungkal I Health Center, Jambi, Indonesia, between November 2022 and June 2023. A total of 91 pregnant women were recruited. Inclusion criteria were: (1) willingness to consume young coconut water, (2) consent to undergo regular blood pressure monitoring, and (3) compliance with research procedures. Eligible participants were those diagnosed with hypertension, defined as systolic blood pressure ≥135 mmHg and/or diastolic ≥85 mmHg. Exclusion criteria included pre-existing conditions such as diabetes, cardiovascular disease, and kidney failure.

2.3. Sample Size Determination

Sample size was estimated using the formula for paired t-tests. The calculation used $Z\alpha/2=1.96$ for a 5% significance level and $Z\beta=0.84$ for 80% statistical power. A standard deviation of 17 and an expected mean difference of 5 mmHg were taken from a previous study by Sari and Purwono (19). Based on these assumptions, a minimum of 91 participants was required.

2.4. Data Collection and Measurements

Baseline blood pressure was measured using a calibrated digital sphygmomanometer. Participants then consumed a standardized amount of young coconut water daily for seven consecutive days. Enumerators supervised adherence and monitored participants throughout the intervention. On the seventh day, blood pressure was re-measured with the same device to ensure consistency.

2.5. Procedure

Participants were selected through simple random sampling. A list of all pregnant women in the health center's coverage area who met the inclusion criteria was prepared, and 91 individuals were randomly chosen. The intervention lasted for seven days, during which participants were instructed to drink young coconut water daily. Enumerators recorded daily compliance and monitored for any adverse effects.

2.6. Data Analysis

Data normality was confirmed using the Kolmogorov–Smirnov test. Descriptive statistics (mean, median, standard deviation, and range) were calculated. The paired t-test was applied to compare blood pressure before and after the intervention. P value<0.05 was considered statistically significant.

3. Results

This study included 91 pregnant women who met the inclusion criteria, specifically those diagnosed with hypertension (systolic blood pressure ≥135 mmHg and/or diastolic ≥85 mmHg). All participants agreed to consume unripened coconut water daily and undergo blood pressure assessments before and after the intervention. The study was carried out from November 2022 to June 2023 within the service area of the Kuala Tungkal I Health Center, located in Jambi Province, Indonesia. The participants were selected through simple random sampling from a list of eligible individuals. Those with pre-existing chronic illnesses such as heart disease, diabetes, or kidney dysfunction were excluded to ensure the accuracy of intervention outcomes. All participants consented to follow the full 7-day protocol.

Table 1 shows the demographic chareteristics of the participants. The majority were of productive age (21–30 years), had completed high school, were housewives, and had 1 to 2 children. This data provides valuable context for understanding the composition of the study sample, and highlights potential factors that may influence health conditions of the pregnant women under the study.

Table 2 shows that both systolic and diastolic blood pressure levels decreased significantly after the 7-day coconut water intervention. A statistically significant reduction was observed in systolic pressure (P=0.001) and in diastolic pressure (P=0.041). These findings supported the effectiveness of unripened coconut water in lowering blood pressure among the study participants.

4. Discussion

The results of the present study demonstrated a clear decrease in both systolic and diastolic blood pressure after a 7-day intervention with young coconut water. These results suggested that this natural beverage may play a beneficial role in blood pressure regulation among pregnant women experiencing hypertension. Despite this overall trend, individual differences in response to the intervention were observed, potentially

Table 1: Demographic characteristics of the participants

Characteristics	Frequency	Percentage (%)
Age (Years)		
<20	11	12.09
21-30	40	43.96
31-40	30	32.97
>40	10	10.99
Educational Level		
No Education/Elementary	3	3.39
Junior school	12	13.19
High school	50	54.95
College	26	28.57
Occupation		
Housewife	71	78.02
Private sector worker	10	10.99
Civil Servants	6	6.59
Others (e.g. traders)	4	4.40
Number of Children		
1-2 person (s)	54	59.34
3-4 persons	30	32.97
>4 persons	7	7.69

Table 2: Descriptive statistics in Blood Pressure before and after intervention

Blood Pressure	N	Mean±SD	Median (Q1-Q3)	Range	P value
Before Intervention					0.001*
Systolic (mmHg)	91	134.98±24.97	130 (120-150)	85 - 200	
Diastolic (mmHg)	91	86.84±14.43	85 (80-100)	60 - 160	
After Intervention					0.041**
Systolic (mmHg)	91	125.24±22.42	122 (120-150)	81-180	
Diastolic (mmHg)	91	82.16±13.31	77 (75-90)	57-152	

*P value for Systolic; **P value for Diastolic; SD: Standard Deviation

influenced by factors such as age, health status, or the severity of hypertension at baseline. The mean systolic blood pressure was recorded at 134.98 mmHg, with a standard deviation of 24.97 mmHg, reflecting considerable variation in the systolic blood pressure data. Although most respondents had systolic blood pressure near the mean, the wide spread of data indicates the presence of individuals with significantly higher or lower readings. The reduction observed following the coconut water regimen may be due to the presence of essential electrolytes in the beverage, especially potassium that can promote vasodilation and assist in managing blood pressure levels. This finding was consistent with the study of Munthe and colleagues (20), who found that young coconut water significantly reduced both systolic and diastolic pressure among hypertensive pregnant women. Similarly, Awaluddin and Pristika (21) reported a significant reduction in blood pressure after 7 days of young coconut water consumption in hypertensive patients.

A similar pattern was observed in diastolic pressure, which also declined significantly by the end of the intervention. The mean diastolic pressure dropped from 86.84 mmHg to 82.16 mmHg, with standard deviations of 14.43 mmHg and 13.31 mmHg, respectively. While this reduction was not as pronounced as that seen in systolic values, the decrease remained statistically and clinically relevant. The potassium content of young coconut water likely contributed to this effect, helping to reduce excess sodium in the body and support cardiovascular balance. These results were in line with Faozi and co-workers (16), who showed that daily intake of coconut water led to a modest reduction in diastolic blood pressure among hypertensive adults. Furthermore, Filippini and colleagues (22) demonstrated that potassium supplementation was associated with significant improvements in diastolic pressure regulation. However, a randomized trial in the UK reported by Binia and co-workers (23) found no meaningful effect of potassium supplementation on vascular

function and blood pressure, highlighting that outcomes may vary depending on baseline characteristics, intervention type, and population studied.

These findings were consistent with prior research that documented the antihypertensive potential of young coconut water due to its electrolyte composition, particularly potassium and magnesium. Previous studies (23, 24) showed similar reductions in blood pressure following regular intake of young coconut water, reinforcing its potential as a natural adjunct therapy for hypertensive patients. The present study extended those findings to pregnant women, a group for whom medication-based interventions must be used with caution.

However, despite the overall decrease in blood pressure, variability in the results was evident. This suggests that not all participants experienced the same degree of reduction in blood pressure. Some individuals may have been more responsive to the vasodilatory effects or electrolyte balance regulation associated with young coconut water consumption, while others may require a longer duration or additional interventions to achieve a more pronounced effect (18).

Several factors may have influenced the results of this study, including the participants' age, nutritional status, severity of hypertension, and adherence to the young coconut water consumption regimen during the intervention period. For instance, older age may affect the body's response to dietary changes or fluid intake, while pregnant women with more severe hypertensive conditions may require a more comprehensive therapeutic approach to effectively lower their blood pressure (25-28).

Taken together, the results of this study supported the potential of young coconut water as a complementary approach to blood pressure management in pregnancy. Although promising, these findings warrant further validation through studies involving larger populations, longer observation periods, and more rigorous experimental controls. Additionally, future studies should account for dietary intake, physical activity, medication use, and other confounding variables to better understand the mechanisms involved.

The simplicity and accessibility of using young coconut water, as a dietary intervention, is a significant strength of this study. Additionally, the use of a digital blood pressure monitor contributed to measurement accuracy and practicality.

4.1. Limitations

Despite the promising findings, this study had several limitations. The relatively small sample size and single-center setting may limit the generalizability of the results to broader populations. Additionally, the short duration of the intervention (seven days) may not capture the long-term effects or sustainability of blood pressure reduction. Other influential variables such as dietary patterns, physical activity levels, and concurrent medication use were not controlled, which could potentially confound the outcomes.

These limitations highlighted the need for future studies involving larger, more diverse populations and longer follow-up periods to validate and expand upon the current findings. Incorporating a randomized controlled trial design and adjusting for confounding factors would strengthen the evidence base. From a clinical perspective, the results support the potential integration of young coconut water as a complementary, low-risk dietary intervention for managing hypertension in pregnancy. This could inform non-pharmacological approaches in antenatal care, especially in low-resource settings.

5. Conclusions

The results of the present study revealed that daily consumption of young coconut water for a period of seven days is associated with a significant reduction in both systolic and diastolic blood pressure among pregnant women diagnosed with hypertension. The average systolic pressure dropped from 134.98 mmHg to 125.24 mmHg, while the diastolic pressure declined from 86.84 mmHg to 82.16 mmHg. Although individual variations in response were noted, the results point to the potential of young coconut water as a natural and accessible intervention for managing elevated blood pressure during pregnancy. To strengthen these findings, future studies should incorporate larger sample sizes, extended follow-up periods, and control for additional factors that may influence blood pressure outcomes.

Acknowledgement

We extend our heartfelt gratitude to everyone who contributed to this research. In particular, we would like to acknowledge Head of Health Polytechnic of Jambi and Health Polytechnic of Banjarmasin and Medan, Indonesia for their invaluable support and guidance throughout this project. We are also grateful to application development team for their insightful input during the research process.

Authors' Contribution

Yuli Suryanti: Substantial contributions to the conception and design of the work; reviewing the work critically for important intellectual content. Ika Murtiyarini: Significant contributions to data collection and analysis; drafting the work and reviewing it critically for important intellectual content. Pauline Kusmaryati: Statistical analysis and data interpretation; drafting the work and reviewing it critically for important intellectual content. Zakiah Zakiah: Substantial contributions to the conception of the work; drafting the work and reviewing it critically for important intellectual content. Tengku Sri Wahyuni: Contributed to the analysis and interpretation of data; reviewing the work critically for important intellectual content. Agus Fitri Sianturi: Substantial contributions to the interpretation of data for the work; drafting the work and reviewing it critically for important intellectual content. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work, such as the questions related to the accuracy or integrity of any part of the work.

Conflict of Interest: None declared.

Funding

This research has received grant funding from the Ministry of Health of the Republic of Indonesia.

Ethical Approval

The Ethics Review Board of the Ministry of Health, Jambi, Indonesia approved the present study with the code of LB.02.06/2/13/2022. Also, written informed consent was obtained from the participants.

References

1. Airaodion AI, Ekenjoku JA, Megwas AU, Ngwogu KO, Ngwogu AC. Antihypertensive potential of coconut (Cocos nucifera L.) water in Wistar rats. Asian Journal of Research in Cardiovascular Diseaseshttps. 2019;1(1):1-8.
2. World Health Organization. Maternal mortality; 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/maternal-mortality.
3. World Health Organization. Trends in maternal mortality 2000 to 2020: estimates by WHO, UNICEF, UNFPA, World Bank Group and UNDESA/Population Division; 2023. Available from: https://www.who.int/publications/i/item/9789240068759.
4. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health. 2014;2(6):e323-e333. doi: 10.1016/S2214-109X(14)70227-X. PubMed PMID: 25103301.
5. Syairaji M, Nurdiati DS, Wiratama BS, Prüst ZD, Bloemenkamp KWM, Verschueren KJC. Trends and causes of maternal mortality in Indonesia: a systematic review. BMC Pregnancy Childbirth. 2024;24(1):515. doi: 10.1186/s12884-024-06687-6. PubMed PMID: 39080562; PubMed Central PMCID: PMC11290122.
6. O'Brien E, Atkins N, Stergiou G, Karpettas N, Parati G, Asmar R, et al. European Society of Hypertension International Protocol revision 2010 for the validation of blood pressure measuring devices in adults. Blood Press Monit. 2010;15(1):23-38. doi: 10.1097/MBP.0b013e3283360e98. PubMed PMID: 20110786.
7. Williams B, Poulter NR, Brown MJ, Davis M, McInnes GT, Potter JF, et al. British Hypertension Society guidelines for hypertension management 2004 (BHS-IV): summary. BMJ. 2004;328(7440):634-40. doi: 10.1136/bmj.328.7440.634. PubMed PMID: 15016698; PubMed Central PMCID: PMC381142.
8. Ferreira Jr PD, Simoes Sr JA, Velho Sr DC. Adherence to Antihypertensive Therapy and Its Determinants: A Systematic Review. Cureus. 2024;16(5):e59532. doi: 10.7759/cureus.59532. PubMed PMID: 38826951; PubMed Central PMCID: PMC11144025.
9. Li W, Liu L, Puente JG, Li Y, Jiang X, Jin

S, et al. Hypertension and health-related quality of life: an epidemiological study in patients attending hospital clinics in China. J Hypertens. 2005;23(9):1667-76. doi: 10.1097/01.hjh.0000174971.64589.39. PubMed PMID: 16093911.
10. Alisherovna KM, Tatlibayevich YS. Assessment Of Risk Factors For Arterial Hypertension Hypertension In Pregnant Women. Central Asian Journal of Medical and Natural Science. 2021;2(3):214-217.
11. Corrigan L, O'Farrell A, Moran P, Daly D. Hypertension in pregnancy: Prevalence, risk factors and outcomes for women birthing in Ireland. Pregnancy Hypertens. 2021;24:1-6. doi: 10.1016/j.preghy.2021.02.005. PubMed PMID: 33618054.
12. Li F, Qin J, Zhang S, Chen L. Prevalence of hypertensive disorders in pregnancy in China: A systematic review and meta-analysis. Pregnancy Hypertens. 2021;24:13-21. doi: 10.1016/j.preghy.2021.02.001. PubMed PMID: 33626437.
13. Rethinam P, Krishnakumar V. Health benefits of coconut water. In Rethinam P, Krishnakumar V. Coconut water: a promising natural health drink-distribution, processing and nutritional benefits. London: Springer; 2022. p. 385-455.
14. Supriadi D, Roslianti E, Susanto RP. Giving of Non-Pharmacological Therapy of Young Coconut Water (Cocos Nucifera L.) to Hypertension Patients. JURNAL VNUS (Vocational Nursing Sciences). 2021;3(1):14-21. doi: 10.52221/jvnus.v3i1.247.
15. Alleyne T, Roache S, Thomas C, Shirley A. The control of hypertension by use of coconut water and mauby: two tropical food drinks. West Indian Med J. 2005;54(1):3-8. doi: 10.1590/s0043-31442005000100002. PubMed PMID: 15892382.
16. Faozi E, Fadlilah S, Syukur BA, Susanto R. Effectiveness Of Coconut Water Consumption On Blood Pressure. Jurnal Keperawatan Respati Yogyakarta. 2022;9(1):44. doi: 10.35842/jkry.v9i1.639.
17. Zulaikhah ST. Health benefits of tender coconut water (TCW). International Journal of Pharmaceutical Sciences and Research. 2019;10(2):474-480. doi: 10.13040/IJPSR.0975-8232.10(2).474-8.
18. Wei J, Zhao M, Meng K, Xia G, Pan Y, Li C, et al. The Diuretic Effects of Coconut Water by Suppressing Aquaporin and Renin–Angiotensin–Aldosterone System in Saline-Loaded Rats. Front Nutr. 2022;9:930506. doi: 10.3389/fnut.2022.930506. PubMed PMID: 35811978; PubMed Central PMCID: PMC9262403.
19. Sari R, Purwono J. Pengaruh Air Kelapa Muda Terhadap Penurunan Tekanan Darah Pada Pasien Hipertensi. Jurnal Wacana Kesehatan. 2022;7(1):47-54. doi: 10.52822/jwk.v7i1.397. Indonesian.
20. Munthe NBG, Siregar GFG, Wulandari R, Sembiring IM, Lubis B. Pengaruh Pemberian Air Kelapa Muda Terhadap Penurunan Tekanan Darah Tinggi Pada Ibu Hamil. Jurnal Kesmas dan Gizi. 2021;4(1):58-64. doi: 10.35451/jkg.v4i1.848. Indonesian.
21. Awaluddin, Pristika A. The Effect of Young Coconut Water on Blood Pressure in Hypertensive Patients. J Pak Med Assoc. 2024;74(5 (Supple-5)):S51-S54. doi: 10.47391/JPMA.Ind-RInC-14. PubMed PMID: 39221800.
22. Filippini T, Violi F, D'Amico R, Vinceti M. The effect of potassium supplementation on blood pressure in hypertensive subjects: a systematic review and meta-analysis. Int J Cardiol. 2017;230:127-135. doi: 10.1016/j.ijcard.2016.12.048. PubMed PMID: 28024910.
23. Binia A, Jaeger J, Hu Y, Singh A, Zimmermann D. Daily potassium intake and sodium-to-potassium ratio in the reduction of blood pressure: a meta-analysis of randomized controlled trials. J Hypertens. 2015;33(8):1509-20. doi: 10.1097/HJH.0000000000000611. PubMed PMID: 26039623.
24. Prameswari S, Herdiani I, Solihatin Y, Badrudin U, Nurlina F. The Effect of Giving Young Coconut Water on Reducing Blood Pressure in Hypertension Patients in the Working Area of Urug Public Health Center, Tasikmalaya City. HealthCare Nursing Journal. 2024;6(2):320-325. doi: 10.35568/healthcare.v6i2.5104. Indonesian.
25. Hinkosa L, Tamene A, Gebeyehu N. Risk factors associated with hypertensive disorders in pregnancy in Nekemte referral hospital, from July 2015 to June 2017, Ethiopia: case-control study. BMC Pregnancy Childbirth. 2020;20(1):16. doi: 10.1186/s12884-019-2693-9. PubMed PMID: 31906884; PubMed Central PMCID: PMC6945641.
26. Mou AD, Barman Z, Hasan M, Miah R,

Hafsa JM, Das Trisha A, et al. Prevalence of preeclampsia and the associated risk factors among pregnant women in Bangladesh. Sci Rep. 2021;11(1):21339. doi: 10.1038/s41598-021-00839-w. PubMed PMID: 34716385; PubMed Central PMCID: PMC8556297.

27. Agrawal A, Wenger NK. Hypertension during pregnancy. Curr Hypertens Rep. 2020;22(9):64. doi: 10.1007/s11906-020-01070-0.
28. Battarbee AN, Sinkey RG, Harper LM, Oparil S, Tita ATN. Chronic hypertension in pregnancy. Am J Obstet Gynecol. 2020;222(6):532-541. doi: 10.1016/j.ajog.2019.11.1243. PubMed PMID: 31715148.