

## Effects of Young Coconut Water Consumption on Blood Pressure in Menopausal Women with Hypertension: A Non-randomized Controlled Trial Study

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### Informasi Artikel

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### Abstract

Hypertension is a non-communicable disease that is a global problem in both developed and developing countries and is the cause of stroke as the second death and third disability. Efforts are needed to reduce and control the prevalence of hypertension by utilizing nonpharmacological therapies, such as consuming young coconut water consumption. Therefore, this study aims to evaluate the effect of young coconut water consumption on reducing high blood pressure in menopausal women. A nonrandomized controlled trial study with a pretest-posttest control group design was chosen as the design of this study, which was conducted at the Community Health Center of Pekalongan, East Lampung Regency. A consecutive sampling technique was used to select eligible participants among menopausal women diagnosed with mild and moderate hypertension by medical personnel, totalling 16 treatment groups and 16 control groups. The treatment group was given the intervention of consuming young coconut water 300 ml morning and evening for 7 days and taking standard hypertension medication. Meanwhile, the control group took standard hypertension medication. Participants had their blood pressure checked using an aneroid tensimeter before and after treatment. Data were analyzed using a paired t-test with a confidence level ( $\alpha$ ) of 0.05 to prove the treatment effect on blood pressure reduction. The results found that the treatment of drinking young coconut water affected reducing systole blood pressure (p-value 0.016) and diastole (p-value 0.007). The average decrease in systolic and diastolic blood pressure pre and post-treatment was 11.25 mmHg and 9.87 mmHg after participants were controlled by taking standard hypertension medications. Consumption of drinking young coconut water can be used as a companion option for hypertension treatment by the community.

### Keywords:

Hypertension  
young coconut water  
blood pressure reduction  
menopause

### Abstrak

Hipertensi merupakan penyakit tidak menular menjadi masalah global baik di negara maju dan berkembang dan menjadi penyebab stroke sebagai kematian kedua dan kecacatan ketiga. Perlu upaya menurunkan dan mengendalikan prevalensi hipertensi dengan memanfaatkan terapi nonfarmakologi, seperti mengkonsumsi konsumsi minum air kelapa muda. Oleh karena itu, penelitian ini bertujuan untuk membuktikan mengevaluasi pengaruh konsumsi air kelapa muda terhadap penurunan tekanan darah tinggi pada perempuan menopause. Studi *nonrandomized controled trial* dengan *pretest posttest control group design* dipilih sebagai disain penelitian ini yang dilaksanakan di Pusat Kesehatan Masyarakat Pekalongan, kabupaten Lampung Timur. Teknik *consecutive sampling* digunakan untuk memilih partisipan yang memenuhi syarat diantara perempuan menopause yang didiagnosis hipertensi ringan dan sedang oleh tenaga medis berjumlah 16 kelompok perlakuan dan 16 kelompok control. Kelompok perlakuan diberikan intervensi mengkonsumsi air kelapa muda 300 ml pagi dan sore selama 7 hari dan minum obat hipertensi standar. Sedangkan, kelompok control minum obat stardar hipertensi. Partisipan dilakukan pemeriksaan tekanan darah menggunakan tensimeter aneroid sebelum dan sesudah diberikan perlakuan. Data dianalisis menggunakan *paired t-test* dengan tingkat kepercayaan ( $\alpha$ ) 0,05 untuk membuktikan efek perlakuan terhadap penurunan tekanan darah. Hasil penelitian menemukan bahwa perlakuan minum air kelapa muda berpengaruh terhadap penurunan tekanan darah systole (p-value 0,016) dan diastole (p-value 0,007). Rata-rata penurunan tekanan darah sistolik dan diastolik *pre* dan *post* perlakuan masing-masing 11,25 mmHg dan 9,87 mmHg, setelah partisipan dikontrol dengan minum obat standar hipertensi. Konsumsi minum air kelapa muda dapat dijadikan pilihan pendamping pengobatan hipertensi oleh masyarakat.

**Kata kunci:** Hipertensi, air kelapa muda, penurunan tekanan darah, menopause.

## INTRODUCTION

Hypertension is a non-communicable disease that is a global problem in both developed and developing countries (WHO, 2023; Mills et al, 2020), defined as an increase in diastole blood pressure > 90 mmHg or systole > 140 mmHg (Apriliani et al., 2021; Ardian, 2018). Hypertension contributes to deaths in the world of 55% of the 55.4 million deaths attributed to cardiovascular including ischemic heart disease, and stroke (WHO, 2020). Hypertension is closely related to human lifestyle which is also a major risk factor in coronary heart disease, heart failure, and stroke, and makes hypertension referred to as the silent killer (Purwono, et al., 2020; Kemenkes RI, 2020). The prevalence of hypertension by the World Health Organization (WHO) in the world is currently estimated at 22%, Southeast Asia ranks third highest at more than 35% in adults (Kemenkes, 2020). The prevalence of hypertension in the world will continue to increase, it is predicted that by 2025 an increase of 29% of adults in the world will be affected by hypertension (Maring et al., 2022). In Indonesia, the prevalence of hypertension has an increasing trend, in 2013 the Basic Health Research Report recorded 25.8% and in 2018 the results of the Basic Health Research recorded an increase to 34.1%. Meanwhile, the prevalence of hypertension in Lampung province is still below the national average but has increased from 7.4% in 2013 to 15.10% compared to 2018 (Kemenkes RI, 2018).

Based on gender characteristics, the prevalence of hypertension in women is greater (36.85%) than hypertension in men (31.34%) (Kemenkes RI., 2018). Generally, people with hypertension are  $\geq$  40 years old, but can occur at fertile age 15 - 49 years with a rate of  $\pm$  28.2%. (Halim, 2023). Hypertension rates in women of childbearing age can affect pregnancy, gestational hypertension 10%, pre-eclampsia 3-10%, and eclampsia 24%. Meanwhile, hypertension during pregnancy is one of the main causes of maternal mortality. The Indonesian Kemenkes reports that hypertension is the main source of maternal death at 33.07% (Kemenkes RI, 2020).

The high prevalence of hypertension and its effects have received global and national attention to be controlled and prevented. Hypertension in menopause needs to get proper treatment with pharmacological and nonpharmacological or complementary therapies. Complementary therapy for hypertension cases in menopause can be done by consuming green young coconut water. Young green coconut water can reduce blood pressure because it can increase High-Density Low (HDL) and prevent plaque formation in the vascular bed (Hermawati & Dewi, 2014). Hypertension in menopause needs to get proper treatment with pharmacological and nonpharmacological or complementary therapies. The provision of pharmacological therapy in cases of hypertension has become a standard of medical services in health facilities, both types of diuretic drugs, arteriolar vasodilators, and angiotensin antagonists. (Muttaqin, 2009). Meanwhile, nonpharmacological or complementary hypertension therapy is still in development to be applied in all health facilities and needs to get support from research results. Complementary therapy for hypertension cases in menopause can be done by consuming green young coconut water. Young green coconut water can reduce blood pressure because it can increase High Density Low (HDL), and prevent plaque formation in the vasculature (Hermawati & Dewi, 2014).

Previous studies have found that the consumption of young coconut water has a significant and beneficial effect on lowering blood pressure in patients with hypertension (Binaiyati & Asnindari, 2017; Fitriani et al., 2023; Laya & Dwisetyo, 2023; Nadila et al., 2022; Shubhashree et al., 2014; Zulaikhah, 2019). However, many of these studies focused on participants in adults and the elderly, both men and women, with the treatment of 250-300 ml of coconut water therapy once a day. This research focuses on menopausal women participants and modifies the experimental group given to drink green variant young coconut water from previous research 1 time a day to 2 times a day with the same dose of drinking young coconut water, namely 300 ml, and a special population in menopausal women. The population of menopausal women was selected in the area of the Community Health Center in Pekalongan, East Lampung district, Indonesia, which still has coconut plantations planted in the community's yard. This study aims to prove the effect of young coconut water consumption on reducing high blood pressure in menopausal women in Pekalongan Community Health Center, East Lampung. This study is expected to contribute to complementary therapy by utilizing young coconut water which is widely found in some communities on the island of Sumatra, Indonesia.

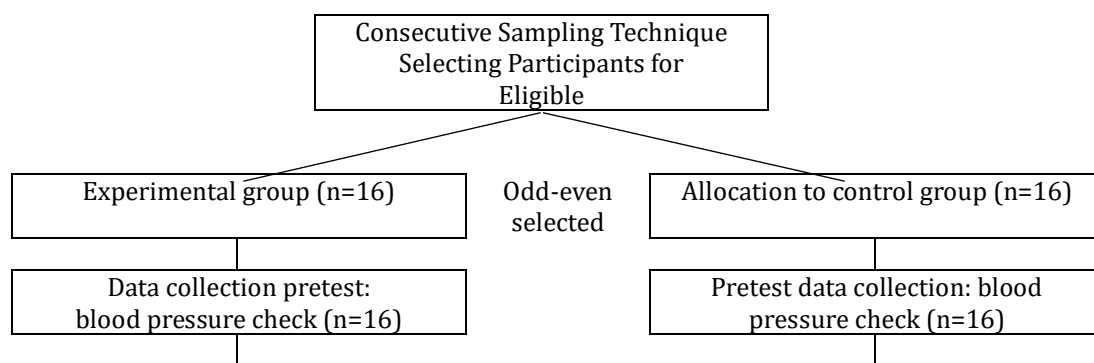
**METHODS**

This study used a nonrandomized controlled trial design (*quasi-experiment*) with a *pretest-posttest control group design*. The location was at the Pekalongan Health Center in 2019. Participants as research samples were menopausal women diagnosed with mild and moderate hypertension by medical personnel who visited the Community Health Center in Pekalongan East Lampung in March 2019 and met the research inclusion criteria.

The sample of this study was calculated using a single sample to estimate the mean (Sastroasmoro & Ismail, 2016). The results of the minimum sample calculation used the results of Binaiyati's (2017) research with  $P = 0.009$ ,  $Z\alpha = 1.96$ ,  $Q = (1-P) = 0.991$ ,  $d = 0.05$  and an estimated drop out of 10%, so this study recruited 16 participants for each experimental group and control group. During the treatment for the experimental group and control group, participants followed until the completion of the study, so the data analyzed were 16 experimental groups and control groups. Samples, as participants were selected using non-probability sampling, namely consecutive sampling, which is a technique of taking all samples that come in sequence and meet the selection criteria, are included in the study until the required number of subjects is met (Sastroasmoro & Ismail, 2016). Sampling procedures are taken if they meet the inclusion and exclusion criteria with procedures: (1) The patient was a menopausal woman who visited the Pekalongan Health Center, both new visits and old visits (there was a history of hypertension); (2) The results of the medical examination of the patient were diagnosed with primary hypertension in the category of mild hypertension and moderate hypertension for both the experimental and control groups. Meanwhile, the criteria for exclusion of research samples if: (1) the participant's examination results were categorized as severe hypertension and (2) hypertension was diagnosed as a comorbidity with other diseases such as kidney disease or diabetes mellitus.

The research instruments used 3 sets, namely 1) a Questionnaire to ask about the patient's identity and conduct interviews on hypertension history, drug compliance, and lifestyle modification; 2) a tensimeter with the aneroid type used to measure blood pressure before and after the intervention conducted by the researcher and green young coconut water prepared by the researcher; and 3) An observation sheet to record the results of pre-treatment and post-treatment blood pressure checks and interviews for compliance with taking medication at night during treatment, so that if it is known to take medicine in the morning it is excluded from Participants.

Data collection was carried out after obtaining informed consent from participants. This data collection was done through observation before (pretest) and after (posttest) treatment for 7 days. The experimental group was given the treatment of consuming 300 ml of green young coconut water in the morning and evening for 7 days and taking standard hypertension medication from the Public Health Center. Young green coconut water was prepared and delivered by the researcher to the participants' homes. Meanwhile, the control group was given the treatment of drinking standard hypertension drugs from the Public Health Center. During the treatment, participants were interviewed to ensure compliance with taking routine nighttime medication, not taking blood pressure-lowering herbal medicine according to the informed consent, and to ensure that no one dropped out. Data was collected for analysis of 16 experimental groups and 16 control groups (see flow of research implementation figure 1).



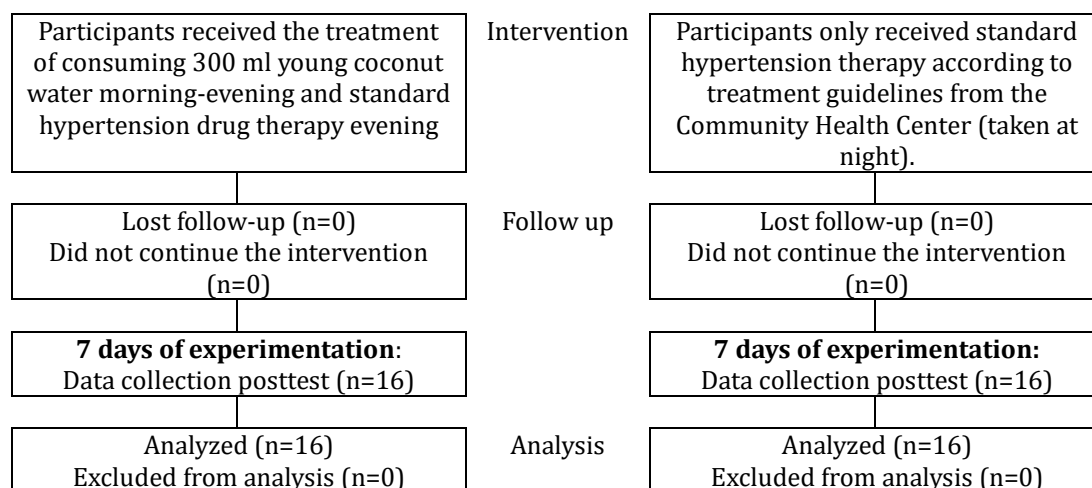


Figure 1. Flowchart of research between experimental and control groups

Univariate analysis to determine the average decrease in blood pressure before and after treatment and bivariate analysis using the Wilcoxon Signed Rank Test due to non-normally distributed data analysis results (Table 1). Wilcoxon Signed Rank Test was used to prove the hypothesis that there is an effect of drinking young coconut water on lowering blood pressure in hypertensive patients using the SPSS software application.

Table 1. Normality Test of Pre and Post-Blood Pressure Measurement Results

Pre and Post Blood Pressure of Treatment Group	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Systole_Pre_Control	0,204	16	0,075	0,912	16	0,125
Systole_Post_Control	0,290	16	0,001	0,760	16	0,848
Distole_Pre_Control	0,250	16	0,009	0,820	16	0,503
Distole_Post_Control	0,385	16	0,000	0,719	16	0,274
Systole_Pre_Intervention	0,148	16	0,200*	0,960	16	0,653
Systole_Post_Intervention	0,242	16	0,013	0,912	16	0,124
Diastole_Pre_Intervention	0,091	16	0,200*	0,959	16	0,648
Diastole_Post_Intervention	0,188	16	0,135	0,892	16	0,061
Systole	0,290	16	0,001	0,760	16	0,848
Diastole	0,385	16	0,000	0,719	16	0,274
Decrease_Systole	0,189	16	0,129	0,923	16	0,186
Decrease_Distole	0,236	16	0,018	0,809	16	0,358

## RESULTS AND DISCUSSION

The results of the analysis in Table 2 show the tendency of participants who took standard hypertension drugs combined with drinking young coconut water 300 ml morning and evening doses for 7 days to experience a decrease in mean systolic BP of 21.31 and diastolic BP of 9.06. The results of the Wilcoxon Signed Rank Test obtained there is an effect of drinking young coconut water on reducing systolic BP (p-value 0.016) and reducing systolic BP (p-value 0.007) in the intervention group with a decrease of 21.31 mmHg and 9.06 mmHg respectively.

Table 3 shows that there is an effect of drinking young coconut water 300 ml morning and evening doses for 7 days combined with taking standard medication on reducing systole BP (p-value 0.014) and diastole BP (p-value 0.038) in the intervention group with a decrease of 11.31 mmHg for systole BP and 9.87 for diastole BP.

Table 2. Average Blood Pressure Analysis Results of Intervention Group and Control Group

Group	Mean BP Before and After Intervention	P-value
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	TD	Before	After	Decline	
Intervention Group	Systolic	156.63 mmHg	135.31 mmHg	21.31 mmHg	0,016
	Diastolic	91.69 mmHg	82.63 mmHg	9.06 mmHg	0,007
Control Group	Systolic	155.31 mmHg	143.75 mmHg	11.56 mmHg	0,014
	Diastolic	90.00 mmHg	88.13 mmHg	1.88 mmHg	0,007

**Table 3. Results of bivariate analysis of the effect of treatment on blood pressure reduction in the intervention group and control group**

Variables	Group	Mean BP Decrease	Difference in BP Decrease	95% CI: Lower-Upper	P-value
Systolic BP	Intervention	21,31	11,25	129,25-141,37	0,041
	Control	9,06		140,45-147,05	
Diastolic BP	Intervention	11,56	9,87	79,76-85,49	0,038
	Control	1,88		85,23-91,02	

Menopausal women are an age group at risk of hypertension because they have exceeded the age of 40 years. Age  $\geq$  40 years according to WHO has experienced thickening of the arterial wall caused by the accumulation of collagen substances in the muscle layer, resulting in a decrease in vascular elasticity (stiffness). (Rudnicka et al., 2020). In addition, an increase in age triggers an increase in peripheral resistance, sympathetic activity, and a decrease in sensitivity to the baroreceptor reflex as a regulator of blood pressure, resulting in a risk of hypertension (Alfie & Cuffaro, 2019).

The management of hypertension can be done nonpharmacologically or complementary therapy becomes a companion to conventional therapy and choice, one of the complementary therapies is to apply young coconut water therapy (*cocos nucifera*). This study found that there was significant effect of nonpharmacological therapy of drinking young coconut water with controlled routine therapy of taking standard hypertension drugs there was a significant effect on reducing systolic blood pressure (p-value 0.041) and diastolic (p-value 0.038) in menopausal women with hypertension. The decrease in systolic BP was 21.31 with a difference of 11.25 mHg and a decrease in diastolic BP of 11.56 with a difference of 9, 87 by drinking young coconut water every day 300 ml morning and evening doses for 7 days.

The results of this study are consistent with recent research that the consumption of young coconut water is beneficial for lowering blood pressure in patients with hypertension (Fitriani et al., 2023; Laya & Dwisetoyo, 2023; Nadila et al., 2022; Shubhashree et al., 2014; Zulaikhah, 2019). These studies predominantly recruited elderly research participants, while this study chose menopausal women participants with different hormone production characteristics who are more at risk of hypertension. Coconut water (*cocos nucifera*) is a tropical drink that is favored by consumers because of its distinctive taste and nutritional content, so it has many health benefits (Gerald et al., 2016; Shubhashree et al., 2014). These include preventing and reducing high blood pressure.

*Cocos nucifera* therapy is a therapy that utilizes the high potassium content in young coconut water to lower blood pressure (Petrika, 2019; Morii, et al. 2015). Young coconut water therapy can reduce blood pressure possibly due to several active substance compositions, including potassium or potassium, vitamin C, and vitamin B complex. (Fitriati et al., 2016; Rajamohan & Archana, 2018; Ramadhan, 2019).. Setiadi and Budiman explained that coconut water contains high levels of potassium in coconut water around 317 mg / 125 (Sari & Purwono, 2022). Potassium can function as a diuretic (Chinasa, 2018) (Wei, et al. 2022). Potassium can inhibit the release of renin and cause an increase in sodium and water excretion which then reduces plasma volume, cardiac output, and peripheral pressure resulting in a decrease in blood pressure (Fadlilah & Sucipto, 2021). (Fadlilah & Sucipto, 2021).. Meanwhile, vitamins C and B complex in young coconut water are antioxidants that can prevent and repair damage to blood vessels due to the activity of free radical molecules, so that arterial function can be improved and high blood pressure can be lowered (Airaodion et al., 2020). (Airaodion et al., 2019; Kaaba et al., 2019)



Wei, et al. (2022) explained that the diuretic effect without electrolyte disturbances in therapy utilizes coconut water. A person consuming coconut water regularly increases potassium levels in the plasma. Potassium levels can serve as an important factor in anti-hypertensive ability, which shows potassium-sparing natriuretics. The diuretic effect of coconut water and the underlying mechanism are further explained by studies of the diuretic effect of coconut water by suppressing aquaporin and Renin-Angiotensin-Aldosterone (RAA) systems in Saline-loaded rats. The acute and prolonged diuretic effects of coconut water increased urinary excretion significantly. In addition, coconut water therapy significantly increased urinary sodium and chloride ions, thereby increasing NaCl excretion, but calcium concentration and pH value were not affected. Furthermore, Wei, et al (2022) through their study that in prolonged diuretic experiments in rats, coconut water dramatically increased urine output and urine electrolyte concentrations (Na +, K +, and Cl -). Coconut water can suppress the activation of the renin-angiotensin-aldosterone system (RAAS) by decreasing serum antidiuretic hormone, angiotensin II, and aldosterone levels, and significantly increasing serum atriopeptin levels. These mechanisms trigger blood pressure reduction by utilizing coconut water therapy as an alternative diuretic agent.

This study provides intervention to participants with different doses compared to previous studies. Participants were given 300 ml of young coconut water with a frequency of twice a day, namely drinking in the morning and evening after being controlled through taking standard medication to reduce systole BP (p-value 0.014) and diastole BP (p-value 0.038) in the intervention group with a decrease of 11.31 mmHg for systole BP and 9.87 for diastole BP. The findings of this study prove that young coconut water therapy is effective in reducing blood pressure in menopausal women. Although proven effective, further research is needed with a longer time, even for 2 months to obtain more effective and consistent results in lowering blood pressure.

## CONCLUSION

We found that complementary therapy of young coconut water consumption was shown to significantly reduce blood pressure in menopausal women with hypertension. Therefore, young coconut water consumption can be an additional or complementary therapy in addition to conventional standard hypertension therapy. This study provides implications in community nursing care that patients with hypertension can be given complementary therapy for drinking young coconut water consumption which is still widely found in rural communities in Indonesia. In addition, the importance of education to socialize the benefits of young coconut water as a complementary therapy in reducing young coconut water. However, future research is needed to obtain more effective results. It is necessary to conduct research with a longer time, intervention groups, and varying doses with the administration of young coconut water and randomized controlled clinical trial (RCT) studies.

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