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Effect of Red Ginger and Lemongrass Decoction on Blood Pressure in Hypertensive Elderly

Muhammad Rizman Akmal, Dewi Siti Oktavianti*, Yenni Malkis, Gaung Eka Ramadhan
Department of Nursing, Sekolah Tinggi Ilmu Kesehatan Pertamedika, Jakarta, Indonesia
*Corresponding Author : dewi.sitioktavianti@stikes-pertamedika.ac.id

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ABSTRACT

Background:Hypertension is a common chronic disease among the elderly and may lead to serious complications such as stroke,heart failure,and visual impairment.Globally,hypertension affects approximately 1.28 billion adults,with only a limited proportion achieving adequate blood pressure control.Therefore,alternative non-pharmacological therapies are needed. Red ginger and lemongrass contain bioactive compounds with antioxidant,anti-inflammatory,and vasodilatory properties that may help reduce blood pressure.This study aimed to examine the association between the consumption of boiled red ginger and lemongrass water and blood pressure reduction among elderly patients with hypertension..

Methods: This study employed a quasi-experimental design using a pretest–posttest approach without a control group. A total of 32 elderly hypertensive patients were selected using consecutive sampling.Participants received boiled red ginger and lemongrass water twice daily for seven consecutive days, consisting of 7 g of red ginger and 6 g of lemongrass boiled in 300 mL of water.Blood pressure was measured using a sphygmomanometer,and data were analyzed using the paired t-test.

Results: The mean systolic blood pressure decreased from 170.53 ± 11.33 mmHg before the intervention to 155.50 ± 7.37 mmHg after the intervention, representing a mean reduction of 15.03 mmHg. Similarly, the mean diastolic blood pressure decreased from 85.72 ± 1.54 mmHg to 80.86 ± 1.31 mmHg, with a mean reduction of 4.86 mmHg. Paired t-test analysis revealed that both reductions were statistically significant ($p = 0.001$; $p < 0.05$). These findings indicate that the administration of boiled red ginger and lemongrass water was effective in reducing blood pressure among elderly patients with hypertension.

Conclusion: Consumption of boiled red ginger and lemongrass water was associated with reduced blood pressure among elderly patients with hypertension.Further studies with larger samples and controlled designs are recommended.

INTRODUCTION

Hypertension is known as a “silent killer” because, in most cases, it does not show any symptoms until it develops into stroke or heart attack, which may result in death (Sinaga et al., 2024). According to the Indonesian Ministry of Health (Kementerian Kesehatan, 2024), hypertension or high blood pressure is the leading cause of death worldwide, with 90–95% of cases classified as essential hypertension (Kementerian Kesehatan RI, 2024). Hypertension can

be defined as a persistent blood pressure condition in which the systolic blood pressure exceeds 140 mmHg and the diastolic blood pressure exceeds 90 mmHg (Saghiv & Sagiv, 2020).

According to the World Health Organization (2023), approximately 1.28 billion adults aged 30–79 years worldwide suffer from hypertension, with two-thirds of them living in low- and middle-income countries (World Health Organization, 2025). Only about 42% of individuals with hypertension have received a diagnosis and treatment, meaning that less than half of the adult population is adequately managed. Furthermore, only around 21%, or 1 in 5 individuals with hypertension, have successfully controlled their condition. Hypertension itself is one of the leading causes of death globally and is considered one of the most common chronic diseases found in society (Carey et al., 2022).

According to the European Society of Cardiology, hypertension affects more than one billion people worldwide and remains a major public health concern. Its prevalence is expected to continue increasing due to population aging and the growing trend of sedentary lifestyles, with the number of affected individuals projected to reach 1.5 billion by 2025. Hypertension is also considered one of the leading causes of premature mortality globally, contributing to nearly 10 million deaths in 2015, including 4.9 million deaths from ischemic heart disease and 3.5 million deaths from stroke. Furthermore, hypertension is closely associated with several serious health conditions, including heart failure, atrial fibrillation, chronic kidney disease, peripheral artery disease, and cognitive decline (Mancusi et al., 2021).

In Indonesia, according to the Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) (2023) and the 2011–2021 cohort study on non-communicable diseases (NCDs), hypertension is identified as the highest risk factor contributing to the fourth leading cause of death, with a percentage of 10.2%. Data from the SKI 2023 further indicate that 59.1% of disabilities affecting vision, hearing, and mobility among individuals aged 15 years and older are caused by acquired diseases, of which 53.5% are non-communicable diseases, particularly hypertension (22.2%) (Jannati R et al, 2024).

Factors influencing hypertension are generally classified into two categories: modifiable and non-modifiable risk factors. Non-modifiable risk factors include genetic predisposition, sex, and age, whereas modifiable risk factors comprise stress, obesity, dietary patterns, and smoking habits (Khoiry et al., 2022). The occurrence of hypertension is also associated with both uncontrollable and controllable risk factors. Uncontrollable risk factors include heredity, sex, race, and age, while controllable risk factors include obesity, lack of exercise or physical activity, smoking habits, coffee consumption, sodium sensitivity, and low potassium levels (Rachmawati et al., 2021).

A persistent increase in blood pressure over a prolonged period may lead to various complications, including kidney damage (renal failure), heart disorders such as coronary heart disease, and brain damage resulting in stroke. If not detected early and managed with appropriate treatment, hypertension may ultimately lead to death (Maula, 2020). Triggering factors for cardiovascular complications include diabetes, with a prevalence of 15–20%, dyslipidemia characterized by increased levels of LDL cholesterol and triglycerides by approximately 30%, and overweight or obesity, which reaches 40%. In addition, hyperuricemia is found in around 25% of cases, while metabolic syndrome occurs in approximately 40% of patients. Unhealthy lifestyle behaviors, such as smoking, alcohol consumption, and lack of physical activity, also play an important role in increasing the risk. The presence of one or more of these risk factors may significantly increase the likelihood of coronary heart disease, stroke, and kidney disorders in patients with hypertension (Husaini & Fonna, 2024).

As individuals age, they experience physiological changes, such as reduced arterial elasticity and increased vascular stiffness, which contribute to elevated blood pressure. Common symptoms experienced by patients with hypertension include headache, fatigue, neck discomfort, blurred vision, and irregular heartbeat (Rahman & Kartinah, 2021). Cardiac complications of hypertension include left ventricular hypertrophy, atrial fibrillation, heart failure, and coronary artery disease. One of the major cardiovascular complications is Left Ventricular Hypertrophy (LVH), which is considered an early manifestation of hypertensive heart disease. LVH occurs as an adaptive response of the left ventricle to increased systemic

blood pressure, aiming to reduce ventricular wall stress through thickening of the cardiac muscle (Chu et al., 2024).

Efforts to manage hypertension can be carried out through both pharmacological and non-pharmacological therapies. Pharmacological therapy refers to treatment using medications or compounds that affect the patient's blood pressure. Although pharmacological treatment can reduce high blood pressure, long-term use may cause side effects such as headache, weakness, dizziness, impaired liver function, palpitations, and nausea. Meanwhile, non-pharmacological therapy can be implemented through lifestyle modification and complementary therapies, such as hydrotherapy (foot soaking) and physical exercise (Oktavianti & Insani, 2022). Non-pharmacological treatment refers to therapeutic approaches that do not involve the consumption of medications, including reflexology massage, exercise, cupping therapy, and the use of herbal beverages (Iqbal & Handayani, 2022).

One of the non-pharmacological approaches to hypertension management is the use of medicinal plants with therapeutic properties. Certain plants possess antihypertensive effects due to their potassium content, antioxidant properties, diuretic effects, anti-adrenergic activity, and vasodilatory effects. The use of natural ingredients that are economical and have minimal adverse effects represents a beneficial strategy for addressing health problems. Numerous medicinal and herbal plants have potential antihypertensive properties. In general, the mechanisms of medicinal plants in reducing blood pressure involve inducing vasodilation and inhibiting the angiotensin-converting enzyme (ACE) (Ali et al., 2022).

One of the herbal plants with potential antihypertensive properties is ginger. Ginger contains several bioactive compounds, including gingerol, shogaol, flavonoids, and essential oils, which are known to possess antioxidant, anti-inflammatory, and vasodilatory effects. These compounds may help lower blood pressure by promoting vascular relaxation, improving blood circulation, reducing oxidative stress, and inhibiting the activity of the angiotensin-converting enzyme (ACE), which plays an important role in blood pressure regulation. In addition, the warming effect produced by ginger may contribute to improved peripheral circulation. Ginger is widely cultivated and commonly used as a traditional herbal remedy in Indonesia and other Asia-Pacific countries (Rahmi & Adam, 2025).

A previous study by Ramadhan et al. (2024) investigated the effect of ginger decoction on blood pressure among elderly patients with hypertension in Wijaya Kusuma, West Jakarta. The study used a quasi-experimental pre-test and post-test design without a control group and involved 22 elderly participants selected through total sampling. The intervention consisted of ginger decoction prepared using 4 grams of ginger and 200 cc of water. Blood pressure was measured using an automatic digital sphygmomanometer before and after the intervention. The results showed that the mean systolic blood pressure decreased from 141.32 ± 10.242 mmHg to 132.59 ± 3.912 mmHg, while the mean diastolic blood pressure decreased from 94.27 ± 10.416 mmHg to 81.55 ± 7.614 mmHg. Statistical analysis using the paired t-test demonstrated a significant reduction in blood pressure after the intervention ($p = 0.001$). These findings suggest that ginger decoction may serve as a potential non-pharmacological approach for blood pressure management in elderly individuals with hypertension (Ramadhan et al., 2024).

Another herbal plant with potential antihypertensive effects is lemongrass. Lemongrass contains several bioactive compounds, including citral, flavonoids, polyphenols, essential oils, calcium, and magnesium, which may contribute to blood pressure reduction through multiple physiological mechanisms. These compounds have antioxidant, anti-inflammatory, vasodilatory, and mild diuretic properties that may help relax vascular smooth muscles, improve blood circulation, reduce oxidative stress, and promote sodium and water excretion. In addition, the calcium and magnesium content in lemongrass may support arterial relaxation and vascular function, thereby helping to lower blood pressure (Kusuma et al., 2023).

A study conducted by Rahayu and Khotimah (2024) examined the use of a lemongrass and honey drink (Serdu) as a non-pharmacological intervention for hypertension management in women. The study employed a pre-experimental one-group pre-test and post-test design and was carried out in the working area of the Singandaru Community Health Center, Serang City, Banten Province. A total of 25 respondents were recruited using a quota sampling technique.

Statistical analysis using the Wilcoxon Signed Rank Test showed that after seven days of intervention, the participants experienced an average reduction of 18 mmHg in systolic blood pressure and 8 mmHg in diastolic blood pressure, with statistically significant results ($p < 0.001$). These findings suggest that the lemongrass-honey drink may have potential as an alternative non-pharmacological approach for blood pressure management, particularly among women with hypertension. Nevertheless, further studies are needed to evaluate its long-term effectiveness and safety, especially in individuals with specific medical conditions (Rahayu & Khotimah, 2024).

A preliminary survey conducted in RT 02 RW 07, Pondok Kacang Timur, South Tangerang City, identified 36 elderly individuals with hypertension. Blood pressure measurements performed on 10 elderly patients, showed that six participants had blood pressure ranging from 140/90 mmHg to 160/90 mmHg, while four participants had blood pressure ranging from 140/90 mmHg to 170/90 mmHg. Interviews with the participants revealed several factors related to poor hypertension management, including low adherence to a low-salt diet, infrequent health check-ups, irregular use of antihypertensive medication, and limited use of herbal therapies. In addition, most participants did not have personal blood pressure monitoring equipment and were unfamiliar with traditional herbal remedies such as red ginger and lemongrass. The researchers also found that two participants had experienced stroke as a complication of hypertension. Based on these findings, this study aimed to examine the association between the consumption of red ginger and lemongrass decoction and blood pressure reduction among elderly patients with hypertension.

METHODS

This study employed a quasi-experimental design using a pretest–posttest approach without a control group. The study population consisted of 50 elderly individuals with hypertension residing in RT 02 RW 07 Pondok Kacang Timur, South Tangerang City. The minimum sample size was calculated using the Lemeshow formula for paired numerical analytic studies, resulting in a required sample of 32 participants. Participants were recruited using a consecutive sampling technique, in which eligible individuals were identified through community health records and blood pressure screening conducted by the research team. Recruitment was carried out sequentially, and all participants who met the inclusion criteria and agreed to participate were enrolled until the required sample size was achieved. Prior to enrollment, the researchers explained the study objectives, procedures, benefits, and potential risks, and written informed consent was obtained from all participants.

The inclusion criteria were: (1) elderly individuals who were able to communicate effectively, (2) individuals with compos mentis level of consciousness, (3) elderly individuals who were not routinely consuming antihypertensive medication, and (4) those who were willing to participate in the study. The exclusion criteria included: (1) elderly individuals with a history of allergy to red ginger or lemongrass, and (2) participants who were unable to complete the intervention period.

Data collection was carried out using several instruments, including a calibrated digital sphygmomanometer, a blood pressure measurement observation sheet, and an intervention administration checklist. Blood pressure measurements were conducted before and after the administration of the combined red ginger and lemongrass decoction intervention. The combined red ginger and lemongrass decoction intervention was administered in a dose of 200 mL for 7 consecutive days, both in the morning and afternoon. The ingredients used consisted of 7 grams of red ginger, 6 grams of lemongrass, and 300 mL of clean water, which were boiled until the remaining decoction reached 200 mL.

The administration of the combined red ginger and lemongrass decoction intervention was carried out directly by the research team and had received ethical approval from the Research Ethics Committee of Universitas Muhammadiyah Purwokerto with ethical clearance number: KEPK/UMP/130/VI/2025.

RESULTS

Descriptive Statistics

Table 1 presents the demographic characteristics of the participants in the study. A total of 36 elderly respondents with hypertension were included in the intervention group. Based on gender, the majority of participants were female, accounting for 67% (n = 24), while male participants constituted 33% (n = 12). In terms of age distribution, most respondents were in the 60–69 years age group, representing 64% (n = 23), whereas 36% (n = 13) were aged between 70–90 years. These findings indicate that the study population was predominantly composed of female elderly participants and individuals aged 60–69 years, reflecting the common demographic profile of hypertension prevalence in older adults.

Table 1. Characteristics Of Participants

Characteristic	Frequency (n)	Percentage (%)
Gender		
Male	12	33
Female	24	67
Age		
60-69	23	64
70-90	13	36

Primary Outcome Measures

Table 2 presents the comparison of blood pressure before and after the intervention among elderly hypertensive patients. The findings show a decrease in both systolic and diastolic blood pressure following the administration of the combination of boiled red ginger and lemongrass water. The mean systolic blood pressure decreased from 170.53 mmHg before the intervention to 155.50 mmHg after the intervention. Meanwhile, the mean diastolic blood pressure decreased from 85.72 mmHg to 80.86 mmHg.

Table 2. The Mean Blood Pressure Before and After the Administration of the Combined Red Ginger and Lemongrass Decoction Intervention

Blood Pressure	Pre-Intervention	Post-Intervention
	Mean (mmHg)	Mean (mmHg)
Sistolic	170,53	155,50
Diastolic	85,72	80,86

Subgroup Analysis

Table 3 presents the results of the analysis of the effect of a combination of boiled red ginger and lemongrass water on blood pressure among elderly hypertensive patients. The analysis shows a decrease in both systolic and diastolic blood pressure after the intervention. The mean systolic blood pressure decreased from 170.53 mmHg (SD = 11.330) before the intervention to 155.50 mmHg (SD = 7.370) after the intervention. Similarly, the mean diastolic blood pressure decreased from 85.72 mmHg (SD = 1.542) to 80.86 mmHg (SD = 1.313). Statistical analysis using the paired t-test showed that the reduction in both systolic and diastolic blood pressure was statistically significant, with p-values of 0.001 ($p < 0.05$). These findings indicate that the combination of boiled red ginger and lemongrass water has a significant effect in reducing blood pressure among elderly patients with hypertension.

Table 3. The Effect of Combined Red Ginger and Lemongrass Decoction on Blood Pressure Among Elderly Patients with Hypertension

Variabel	Pre test		Post test		P Value	N
	Mean	SD	Mean	SD		
Systolic Blood Pressure	170,53	11,330	155,50	7,370	0,001	36
Diastolic Blood Pressure	85,72	1,542	80,86	1,313	0,001	36

DISCUSSION

Elderly individuals are defined as those aged 60 years and above, as stipulated in Law Number 13 of 1998 concerning Elderly Welfare. Elderly individuals experience various physiological and anatomical changes as part of the aging process, including changes in the cardiovascular and renal systems that play important roles in blood pressure regulation. As age increases, blood vessels gradually lose their elasticity and the arterial walls become thicker, resulting in increased resistance to blood flow, which ultimately leads to elevated blood pressure (Singh et al., 2023).

The elderly age group is known to have the highest risk of developing hypertension. This condition is thought to be associated with physiological changes resulting from the aging process, such as decreased vascular elasticity and declining renal function, which contribute to elevated blood pressure. In addition, increased activity of the sympathetic nervous system and the renin–angiotensin–aldosterone system (RAAS) in elderly individuals further exacerbates hypertension through mechanisms of vasoconstriction and fluid retention. Less active lifestyles, high-salt dietary patterns, and a tendency toward weight gain also contribute to worsening blood pressure in this age group (Miller & Arnold, 2022).

From a theoretical perspective, ginger contains several active compounds such as flavonoids, saponins, and non-flavonoid phenolic compounds that play an important role in lowering blood pressure. Flavonoids can inhibit the angiotensin-converting enzyme (ACE), thereby reducing the production of angiotensin II, promoting vasodilation, and ultimately lowering cardiac output and blood pressure. Phenolic compounds such as gingerol and shogaol also have antioxidant properties that help reduce free radicals and increase nitric oxide production, which acts as a natural vasodilator. In addition, saponins may inhibit the renin–angiotensin–aldosterone (RAA) system, thereby reducing angiotensin II formation and aldosterone secretion, both of which are associated with increased blood pressure (Sabbatini & Kararigas, 2020). According to the researchers' analysis, in elderly women, the decline in estrogen levels after menopause may affect blood pressure due to the loss of its protective effect on blood vessels. Therefore, the combination of physiological, hormonal, and lifestyle factors becomes the main cause of the high prevalence of hypertension.

High blood pressure (hypertension) is a condition characterized by an increase in pressure within the arteries. Hypertension is generally an asymptomatic disease, or if symptoms do occur, they are often nonspecific, causing elevated arterial pressure to frequently go unnoticed by patients. Blood pressure measurements are expressed using two values: the upper value represents the pressure when the heart contracts (systolic pressure), while the lower value represents the pressure when the heart relaxes (diastolic pressure) (Miller & Arnold, 2022).

Factors influencing the occurrence of hypertension include non-modifiable factors, such as sex, age, and genetic predisposition, as well as modifiable factors, including dietary patterns, exercise habits, and other lifestyle-related behaviors. The causes of hypertension may also be associated with emotional disturbances, obesity, excessive alcohol consumption, excessive coffee intake, tobacco use, and certain medications (Abeywickrama & Niranji, 2024). The findings of this study showed a reduction in both systolic and diastolic blood pressure following the administration of boiled red ginger and lemongrass water among elderly patients with

hypertension. The observed reduction may be associated with the pharmacological properties of the bioactive compounds contained in red ginger and lemongrass. However, because this study did not include a control group, the findings should be interpreted cautiously, as other factors such as placebo effects, dietary changes, increased health awareness during the intervention period, medication adherence, and lifestyle modifications may also have contributed to the observed reduction in blood pressure.

Hypertension can lead to various complications. Persistent elevation of blood pressure over a prolonged period may cause damage to the kidneys (renal failure), heart (coronary heart disease), and brain (resulting in stroke) if not detected early and treated appropriately. Hypertension also triggers the formation of atherosclerotic plaques in the cerebral arteries and arterioles, which may lead to arterial occlusion, ischemic injury, and stroke as long-term complications. Complications related to hypertension account for approximately 9.4% of deaths worldwide each year. Furthermore, hypertension contributes to at least 45% of deaths caused by heart disease and 51% of deaths caused by stroke (Nadar & Lip, 2021).

One of the non-pharmacological approaches that may help lower blood pressure in patients with hypertension is the consumption of red ginger and lemongrass decoction. From a pharmacological perspective, red ginger contains several bioactive compounds, including gingerol, shogaol, flavonoids, phenolic compounds, and saponins, which are believed to contribute to cardiovascular protection through multiple mechanisms. Ginger has been reported to improve blood circulation by stimulating peripheral blood flow and promoting vascular relaxation. In addition, its antioxidant properties may help reduce oxidative stress and neutralize free radicals that contribute to endothelial dysfunction and hypertension. Several studies also suggest that ginger may lower blood pressure through the blockade of voltage-dependent calcium channels and inhibition of angiotensin-converting enzyme (ACE) activity, thereby reducing vasoconstriction and improving vascular function. These pharmacological effects are largely associated with the presence of flavonoids, saponins, and phenolic compounds in ginger (Nurhayati et al., 2022).

Flavonoids found in ginger are believed to contribute to blood pressure reduction by inhibiting the activity of angiotensin-converting enzyme (ACE), thereby reducing the conversion of angiotensin I into angiotensin II, a potent vasoconstrictor. This mechanism may promote vasodilation, improve blood vessel relaxation, and subsequently help lower blood pressure. In addition, inhibition of ACE activity may increase nitric oxide availability and reduce superoxide anion production, both of which play important roles in maintaining vascular function and regulating vascular resistance. Ginger also contains phenolic compounds such as gingerol and shogaol, which possess strong antioxidant properties. These antioxidants may help reduce oxidative stress by neutralizing free radicals and decreasing the activity of vasoconstrictive factors such as thromboxane A2, endothelins, and endoperoxides. Furthermore, antioxidants may help preserve nitric oxide levels, which are essential for maintaining endothelial function and promoting vasodilation. Through these combined mechanisms, ginger may contribute to improved cardiovascular function and blood pressure regulation (Amponsah-Offeh et al., 2023).

In addition to flavonoids and phenolic compounds, ginger also contains saponins, which may contribute to blood pressure regulation through their effects on the renin–angiotensin–aldosterone (RAA) system. Saponins are believed to inhibit renin activity in the kidneys, thereby reducing the formation of angiotensin II, a potent vasoconstrictor that can increase vascular resistance and blood pressure. Reduced angiotensin II levels may also decrease aldosterone secretion, leading to increased excretion of sodium and water by the kidneys. This mechanism may help reduce blood volume and cardiac output, which subsequently contributes to lower blood pressure. Therefore, the inhibition of the RAA system by saponins may play an important role in the antihypertensive effects of ginger (Nadia, 2020).

Lemongrass contains several bioactive compounds, including citral, flavonoids, and polyphenols, which are believed to have antihypertensive properties. These compounds exhibit vasodilatory, antioxidant, and mild diuretic effects that may help lower blood pressure through multiple physiological mechanisms. Citral and flavonoids may promote relaxation of vascular smooth muscles, resulting in vasodilation and reduced vascular resistance. In addition, the

antioxidant activity of polyphenols may help reduce oxidative stress and improve endothelial function, both of which are important in maintaining cardiovascular health. Lemongrass also demonstrates mild diuretic effects by increasing the excretion of sodium and water through urine, which may contribute to reduced blood volume and arterial pressure. Previous pharmacological studies and animal models have suggested that lemongrass possesses potential antihypertensive activity, particularly in individuals with mild to moderate hypertension (Silva & Bárbara, 2022).

CONCLUSION

The findings of this study showed a reduction in systolic and diastolic blood pressure among elderly patients with hypertension following the administration of red ginger and lemongrass decoction, with statistically significant results ($p < 0.05$). These findings suggest that red ginger and lemongrass decoction may have potential as a complementary non-pharmacological approach for blood pressure management in the elderly. However, given the absence of a control group and the limited sample size, further studies using more rigorous research designs are needed to confirm the effectiveness and generalizability of these findings.

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