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**AUTHOR'S AFFILIATIONS**

Abdi Nusantara Health College<sup>1</sup>  
 Sulianti Saroso Infectious Disease  
 Hospital<sup>2</sup>

**CORRESPONDING AUTHOR**

Farida Murtiani, Sulianti Saroso  
 Infectious Disease Hospital

**E-mail:**

[idoel\\_fh@yahoo.com](mailto:idoel_fh@yahoo.com)

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**Effect of Ginger Extract to Decrease Blood Pressure in the Elderly with Hypertension**

Ulkomah<sup>1,2</sup>, Desridius Chalid<sup>1</sup>, Aninda Dinar Widiyanti<sup>2</sup>,  
 Farida Murtiani<sup>2\*</sup>

**Abstract**

**Background:** Hypertension is a cardiovascular disease that is common in the elderly. Pharmacological treatment of hypertension involves a lifetime commitment to drug adherence. Ginger extract as complementary therapy has been widely common in Indonesia to boost the immune system, improving the cardiovascular system by reducing the level of low-density lipoproteins and cholesterol. The study aimed to analyze red ginger extract as the main therapy for hypertension in the elderly. **Methods:** This study was quasi-experimental with one group pretest-posttest without a control group. Participants were 45-65-year-old hypertension patients in Semper Barat II Primary Health Care. The intervention was a beverage consisting of 4 grams of minced ginger then added by 2 spoons of honey in 100 ml of water. The drink was consumed in 5 days. We compare blood pressure before and after the intervention using T-Test. **Results:** The average age of participants was 62,9 (60-65) years old. Before intervention, mean blood pressure was 156,8 (140-180) / 98,03 (85-115) mmHg and lowered to 148,6 (125-170) / 92,57 (80-110) mmHg after 5 days of intervention (p=0,0001). **Conclusion:** We suggest ginger extract as an alternative to reduce blood pressure in elderly with hypertension. We hope the results will become a new approach to treat hypertension.

**Keywords:** hypertension; elderly; ginger extract

**Original Research Article**

**INTRODUCTION**

Hypertension is a common disorder found in the elderly. Hypertension is included in cardiovascular system impairment. It is persistent elevation of systolic more than 140 mmHg and/or diastolic pressure more than 90 mmHg. Globally, its prevalence was more than 22% around the world in 2020, with the highest number occurring in Africa, at 27%, and the lowest in America (18%). In Southeast Asia itself, the prevalence was 25%, the third highest in the world (Cheng et al., 2020). World Health Organization (WHO) predicted that 1.13 billion people throughout the world experienced hypertension in 2015-2020 or a comparison of 1:3 people. It is estimated that there will be 1.5 billion people diagnosed with this chronic disease in 2025 and 9.4 million mortality cases as a result of hypertension and its complications (Siagian et al., 2021).

The estimated number of hypertension cases in Indonesia is 63,309,620 people, while the number of deaths in Indonesia caused by hypertension is 427,218 deaths. It is estimated that only 1/3 of hypertension cases in Indonesia are diagnosed, and the rest go undiagnosed ((Kemenkes RI, 2019).

Jakarta was included in the fifth highest prevalence of hypertension (33,4%). According to the Jakarta Health Secretariat, it was estimated 2.671.915 people, more than 15 years old, had experienced hypertension, and 452.099 of them lived in North Jakarta (Dinkes Provinsi Jakarta, 2021). Hypertension has been the most found disease at Semper Barat II Primary Health Care (PHC), North Jakarta, since 2020. Based on their annual report, the incidence of the silent killer disease accounted for 1.248 people and decreased to 847 people.

The management of hypertension in the elderly, in principle, is not different from hypertension in general. It consists of both pharmacological and non-pharmacological therapies. The pharmacological approach involves the use of medications, including various types of antihypertensive drugs such as diuretics, beta-adrenergic blockers or beta-blockers, vasodilators, calcium channel blockers, and angiotensin-converting enzyme (ACE) inhibitors. Hypertension treatment should be lifelong. Many commonly used antihypertensive medications are synthetic drugs with active ingredients derived from chemical compounds, which may pose a risk of long-term side effects (Ainurrafiq et al., 2019).

Despite being the most controllable factor in cardiovascular disease, hypertension is the world's burden (Salem et al., 2018). Nonpharmacological treatment involves consuming ginger extract, which includes potassium, which inhibits the release of renin-angiotensin, increasing sodium and water excretion, lowering blood pressure, and reducing salt and water retention in the blood (Santos Braga, 2019). One alternative for herbal therapy in reducing high blood pressure is ginger, which is a substitute method offering several health benefits. It acts as a therapeutic agent that enhances the immune system and improves the cardiovascular system by reducing low-density lipoprotein levels and cholesterol, which can have harmful effects on the heart. Ginger also acts as a vasodilator, which can lower blood pressure and enhance blood circulation (Farida et al., 2020).

In Indonesia, non-pharmacological treatment still existed as the elderly continued to apply traditional methods to reduce common flu symptoms and indigestion. It contains flavonoid which has an inhibition effect on angiotensin-converting enzyme (ACE), which can initiate vasoconstrictor mechanism and raise blood pressure (BP) as a result. Several studies mentioned its benefit as complement therapy to hypertension. A study by (Shaban et al., 2017) proved a significant difference in BP before and after having ginger extract for one month. While other research didn't specify about the participants, we would like to analyze the effect of red ginger (*Zingiber Officinale var rubrum*) extract in the elderly as the aging process include arterial stiffness which raises risk factor of hypertension in this group. A study by Wijayanti et al mentioned decreasing BP both systolic and diastolic in the intervention group after two weeks of consuming ginger extract (Wijayanti et al, 2018). In a study by (Ojulari et al., 2014) about ginger extract (*Zingiber officinale*) effect on BP and heart rate in 60 healthy participants in Kwara State, Nigeria, it was mentioned that it reduced BP after 2 hours. The study aimed to analyze ginger extract as the main therapy for hypertension in the elderly in Jakarta.

## **MATERIALS AND METHODS**

### **Study Design**

The study was quasi-experimental with one group pretest-posttest without a control group. The observation was done twice, before and after the intervention.

### **Setting**

The study was held at Semper Barat II PHC from November 2022 to January 2023.

### **Participants**

The target population was all elderly who had themselves examined in Semper Barat II PHC, approximately 100 people. We gathered 30 participants. Inclusion criteria were adults, 45-55 years old (early elderly) or 56-65 years old (late elderly), who had history of hypertension, willing to stop the hypertension drug during the study period, and agreed to study's regulation. Exclusion criteria were having comorbid disease i.e.: *chronic kidney disease* (CKD), kidney parenchymal disease, kidney

vascular disease, and acute gastritis. We also excluded ginger allergic and uncooperative people. To reduce data bias, participants stop their hypertension treatment temporarily during the research process. Any symptoms related to urgency hypertension had been informed to participants and in case that happened, participants would receive medical treatment.

**Instruments**

Study’s instruments included informed consent, questionnaire, observation paper, calibrated sphygmomanometer and stethoscope. Questionnaire contained participants’ identity and characteristics. Participants would be simply circling their answer or marking their suitable options. Observation paper was filled by researcher. The paper was used to note measurement result of BP, both before and after intervention. We used sphygmomanometer by oneMed Depkes RI AKL 20501906481.

**Intervention**

Intervention was made from 4 grams of diced ginger (*Zingiber Officinale var rubrum*). It was then boiled in 200 ml water for 10 minutes. After that, it was filtered to 100ml and added 2 spoons of honey. Intervention was done once a day for 5 days. After-intervention BP was measured after one week since the first day of intervention. The drink was made freshly every day by the researcher. First day intervention was done at Semper II Barat PHC. Participants and their family were explained about instruction on proper ginger extract use by the researcher. We sent the drink off to the participants' house on Day 2-5 and requested that they consume it in our presence to ensure compliance. We asked them to go back to the PHC at Day 7 to measure BP.

**Data Analysis**

Univariate analysis was done to describe participants’ characteristic. Bivariate analysis was done by T dependent or Wilcoxon test. IBM SPSS Statistic 24 was used to perform data analysis. Power statistical number was less 0,05.

**Ethical Consideration**

This study was approved by Sulianti Saroso Infectious Disease Hospital Ethical Committee. Ethical clearance number 08/XXXVIII.10/I/2023 was released then. We also managed to get permission from North Jakarta Health Secretariat to conduct the research. The participant was explained about the study and if they’re agreed to participate, we asked them to sign informed consent.

**RESULTS**

We gathered 30 elderlies with average age was 62.9±1,85 (60-65) years old. Most of them were 65 years old (n=8 people; 26.7%), women (n=21 people;70%) and had history of hypertension (n=20 people; 66.7%). Table 1 described participants’ characteristic (Table 1).

**Tabel 1.** Participants’ characteristic

Characteristic	Frequency	%
<b>Age (years)</b>		
60	6	20
61	2	6,7
62	3	10
63	5	16.7
64	6	20
65	8	26,7
<b>Gender</b>		
Male	9	30
Female	21	70
<b>Family history of Hypertension</b>		
Yes	20	66,7
No	10	33,3

Before intervention, average of BP was  $156.8 \pm 11.64$  (140-180) /  $98.03 \pm 7.85$  (85-115) mmHg. When intervention had been given for one week, BP was measured again. Mean BP after intervention was  $148.6 \pm 11.88$  (125-170) /  $92.57 \pm 7.38$  (80-110) mmHg (Table 2).

**Table 2.** Description of Blood Pressure Before and After Intervention with Ginger Extract (*Zingiber Officinale Var Rubrum*)

	Blood pressure	Mean	Standar Deviasi	Min-Max
<b>Pretest</b>	Sistolic	156,80	11,648	140-180
	Diastolic	98,03	7,854	85-115
<b>Posttest</b>	Sistolic	148,60	11,883	125-170
	Diastolic	92,57	7,380	80-110

The data follows a normal distribution. Bivariate analysis using the Dependent T-test was conducted. The significance test was performed with an alpha significance level of 0,05 and a Confidence Interval of 95%. The analysis results reveal that the average systolic blood pressure before the intervention of administering red ginger extract (*Zingiber Officinale Var Rubrum*) was 156.80 and after the intervention, it was 146,60. The average systolic decrease was 8,200. The average of diastolic BP before and after shows decreasing of 5,46 from 98,03 to 92,57. The dependent T-test, both in systolic and diastolic BP, showed a P value of 0.0001, leading to the rejection of the null hypothesis (Ho). This implies that there is a significant difference in systolic blood pressure before and after the administration of red ginger extract (*Zingiber Officinale Var Rubrum*). It indicates that the administration of red ginger extract (*Zingiber Officinale Var Rubrum*) has an impact on changes in systolic blood pressure in elderly individuals with hypertension (Table 3).

**Table 3.** Ginger Extract (*Zingiber Officinale Var Rubrum*) Effect to High Blood Pressure Improvement

	Blood pressure	Mean	Mean Decrease	P value
Sistolic	Before intervention	156,80	-8,200	0,0001
	After intervention	146,60		
Diastolic	Before intervention	98,03	-5,467	0,0001
	After intervention	92,57		

## DISCUSSION

Our study found most of the participants (6 people; 26.7%) was 65 years old. It was in line to (Lampitasari, 2017) which stated most of their participants (63.3%) were more than 48 years old. It was also the case in the study of (Tamrin et al., 2019) whose majority of the participants were more than 60 years old (58.3%). Potter and Perry stated BP is rising based on age (Potter & Perry, 2015). Systolic BP correlates to decrease vessel elasticity. Structural changing and decreasing functional usually happened in older people because of aging process. It also includes atherosclerosis forming, decreasing elasticity of loose connective tissue that affected to vessel elasticity so that aorta and other main artery lose their ability to accommodate stroke volume that will decrease cardiac output and increase peripheral resistance (Smeltzer & Bare, 2018).

Our study found that participants were mostly female, (n=21 people; 70%). In line to research of (Lampitasari, 2017) which stated that most hypertensive patients were female, reaching to 76.7%. (Tamrin et al., 2019) also described most of hypertension patients in elderly were female (52,8%). Estrogen hormone serves as a protective factor against hypertension. As estrogen levels decrease during menopause, elderly women become more susceptible to hypertension compared to men of the same age group (Tamrin et al., 2019).

The research results reveal that out of 30 elderly individuals with hypertension, the majority have a history of hypertension, specifically 20 individuals (66.7%). This aligns with a study by (Adam et al., 2018), which states that most hypertension patients at the Paceda Bitung City Health Center have a family history of hypertension, with 51 individuals (57.3%). Someone with a family history of hypertension is at a higher risk of experiencing hypertension. This occurs because individuals with a family history of hypertension may have certain genes that interact with the environment, leading to an increase in blood pressure (Black & Hawks, 2014).

Our study showed significant improvement after receiving intervention for five days. A systematic review and meta-analysis by (Hasani et al., 2019) mentioned ginger supplementation reduced systolic BP (MD: -6.36 mmHg, 95% CI [-11.27, -1.46]; P = .011) and diastolic BP (MD: -2.12 mmHg, 95% CI [-3.92, -0.31]; P = .002). They were significantly decreased in ≤50 years old people, follow up duration less than 8 weeks and ginger doses more than 3 grams per day. A study by (Shaban et al., 2017) found significant difference after intervention of ginger drink after one month while a research of (Wijayanti et al., 2018) found difference in two weeks period. Supriani et al also found decreasing of BP in hypertension participants who received ginger drink than control group (p=0.001) (Supriani et al., 2019).

One of herbal therapy in lowering high blood pressure is ginger. It acts as a therapeutic effect that boosts immune system, improving the cardiovascular system by reducing the level of low-density lipoproteins and cholesterol. It also acts as a vasodilator that can lower blood pressure and improve blood circulation (Farida et al., 2020). Ginger is beneficial for cardiovascular system. It stimulates blood circulation and improve cell metabolism. It also has antioxidant effects and reduces the formation of prostaglandin-E2 (PGE2) & thromboxane thus reducing the risk of blood clots. So, ginger should not be used in conjunction with anticoagulant drugs such as heparin, wafarin, and aspirin because it can prolong bleeding time (Muliani, 2021).

Ginger contains flavonoid, saponin, and non-flavonoid phenol compounds (Guerrero et al., 2012). Flavonoids have an inhibitory effect on angiotensin-converting enzyme (ACE) activity which blocks initiation of angiotensin II from angiotensin I so that vasodilation occurs, cardiac output decreasing and blood pressure reduction (Guyton & Hall, 2016). ACE inhibition can also increase nitric oxide and lower superoxide anions which also cause vasodilation (Kojsova et al., 2006 in Muliani, 2021). Potassium in ginger affects diuretic system, resulting vasodilation of blood vessel and lowering BP (Supriani et al., 2019).

In addition to flavonoid and phenol, ginger also contains Saponins that plays a role in inhibiting RAA system in the kidneys (Anh et al., 2020). Angiotensin II can also stimulate secretion of aldosterone which causes a decrease in the excretion of salt and water by the kidneys and resulting an increase of cardiac output. This leads to rising blood pressure. Thus, decreasing formation of angiotensin II will lower blood pressure (Guyton & Hall, 2016).

We had minimalized data bias by stopping hypertension treatment in participants. We didn't analyse other risk factor of hypertension that possibly present regarding participants' age. Also, there was no control group in our study as comparison.

## CONCLUSION

According to our study, ginger extract (*Zingiber Officinale Var Rubrum*) was effective to decrease blood pressure in elderly with hypertension in Semper Barat II PHC, North Jakarta. We believe these findings could offer a new approach to hypertension treatment. It is recommended to conduct further research with a larger and more diverse participant population for comprehensive insights. Also, better design study was needed.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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