

ORIGINAL ARTICLE

Effect of Red Ginger Warm Compress on Blood Pressure Reduction in Patients' Hypertension

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ABSTRACT

Introduction: Hypertension is the third leading cause of death in Indonesia and accounted for 6.8% of the total death in the country. Complementary therapy is needed to reduce drug dependence caused by the disease. The purpose of this research is to analyze the effect of red ginger warm compresses on the blood pressure of patients with hypertension, Central Sulawesi Province, Indonesia. **Method:** This is a quasi-experimental research with One-group pretest-posttest design. The number of samples were 35 respondents and the tools used were the calibrated sphygmomanometer, a stethoscope, a mixture of warm water and red ginger, Standard Operating Procedures (SOP) for warm red ginger compresses, and pre and post-intervention observation sheets. Blood pressure measurements were carried out before the administration of the warm red ginger compress (pre-intervention). Furthermore, the respondent was given the compress for 20 minutes with 10 repetitions (intervention). After the intervention was completed, blood pressure was measured again while the patients were in a sitting position (post-intervention). The analysis technique used was paired t-test. **Results:** The results showed that the average systolic blood pressure decreased by 9.14, therefore, there was a significant difference (p-value <0.05) before and after the application of the red ginger compress. Additionally, the average diastolic blood pressure decreased by 7.57, therefore, there was also a significant difference (p-value <0.05) before and after the intervention. **Conclusion:** Warm red ginger compresses have a significant effect on reducing the systole and diastolic blood pressure of patients with hypertension.

Keywords: Hypertension, Red Ginger, Warm Compress

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INTRODUCTION

Hypertension or high blood pressure is an abnormal increase in blood pressure in the arteries that occurs continuously over a certain period of time (1), and it is a major public health problem in Indonesia (2). A review of current trends showed that the number of adults with the disease increased from 594 million in 1975 to 1.13 billion in 2015, with the increase mostly seen in low and middle-income countries (3). In fact, in Indonesia, it ranks as the 3rd leading cause of death and accounted for 6.8% of the total death in the country. In 2017, its prevalence was 32.1% and increased to 34.1% in 2018 (4). Additionally in Central Sulawesi alone, in 2017, the prevalence was 30.5% and increased to 31.5% in 2018. In Sigi Regency, the number of sufferers was 5,311 people in 2017 and significantly increased to 20,762 in 2018 (5).

Based on observations and data from the Non-Communicable Disease Prevention (NCD) program

at the Biromaru District Health Center in the last 2 years, the percentage of patients with hypertension was 8.85%, in 2017 and it increased by 10.5% in 2018. Furthermore, the data includes all age groups, gender, and a combination of new and old sufferers (6).

The results of the hypertension screening in young adults that was conducted in the village of Bora, Sigi Biromaru District in June 2019 showed that of 200 people aged 18-45 years, 47 suffered from hypertension. Additionally, based on the data, there was an increase in cases, both in Central Sulawesi Province and Sigi Biromaru Regency, including in the work area of the Biromaru Public Health Center (7).

The increase in hypertension cases is closely related to several behavioral risk factors, namely the consumption of foods that contain too much salt and fat, the habit of eating less fruit and vegetables, alcohol consumption, lack of physical activity and exercise, poor stress management, and smoking (8). In addition, socioeconomic factors such as income, education, and housing have a negative impact on behavioral risk factors, which influence the development of the disease (9). Unemployment or fear of unemployment may also have an impact on stress levels, which then

induces high blood pressure (10). Finally, psychosocial factors may also contribute to the increased incidence of hypertension in the younger population (11).

The high incidence of hypertension would increase the risk of complications, especially in organs that have blood vessels that could be damaged by the disease, such as the brain. The most common brain damage is stroke (12), and it could lead to an inability to walk and move. Additionally, it could cause impaired concentration and speech disorders, therefore, affecting the quality of life of the patient and family (13). Consequently, it is necessary to control the incidence of hypertension by changing one's lifestyle (lifestyle modification) and through the use of antihypertensive pharmacological therapy as a combination or single therapy. However, the use of more than one type of drug for a long time would increase the risk of drug-related problems, which could actually or potentially affect the patient's condition through non-compliance, drug interactions, and allergy to prescribed medication (14). In addition, long-term (long) treatment could cause complications that could lead to organ damages (15).

Due to the above facts, pharmacological therapy is not the only alternative therapy that could be used to treat hypertension (16). Complementary therapy is also needed to reduce drug dependence in order that the quality of life of sufferers could be maintained (17). A type of complementary therapy that is well known in the community is herbal therapy. This therapy uses natural ingredients for treatment, either by drinking, soaking, or compressing (18). One of the herbal therapies that is often used is ginger (*Zingiber Officinale*) (19). The results of research showed that consuming ginger could reduce the risk of hypertension and coronary heart disease by about 8%. (20). However, as with other herbal medicines, ginger herbal therapy is also not recommended for consumption by people that experience stomach and intestinal irritation, because there have been reports of intestinal blockage due to poorly chewed ginger (21). To avoid complications due to ginger consumption therapy, and also to provide various alternative methods of its herbal treatment, this research was conducted on the use of ginger through the compressing method.

Several studies showed that there was a significant effect of giving warm compresses with a mixture of ginger on reducing blood pressure in patients with hypertension, with p -value = 0.004 for systolic blood pressure and p -value = 0.002 for diastolic blood pressure (22). Additionally, another research also showed that warm ginger foot soak therapy had an effect on reducing systolic blood pressure (p -value = 0.001) and diastolic blood pressure (p -value = 0.001) in elderly patients (23).

Due to the success of research on compresses and soaks with a mixture of warm ginger on the reduction of blood pressure in patients with hypertension, this

research was conducted to ascertain the effect of warm red ginger compresses on blood pressure in patients with hypertension in Bora Village, Central Sulawesi Province, Indonesia. Red ginger (*Zingiber officinale* Rosc) was chosen because it has a higher essential oil content compared to other gingers such as common ginger (*Zingiber officinale* var. *rubrum*) and elephant ginger (*Zingiber officinale* var. *officinde*) (24).

MATERIALS AND METHODS

Research design

This is a quasi-experimental research with One-group pretest-posttest design. It was conducted to analyze the effect of red ginger warm compresses on reducing blood pressure in a group of patients with hypertension, without a comparison group. Blood pressure measurements were carried out before the intervention was administered (pre-intervention). Meanwhile, during the intervention, the respondents were given a red ginger warm compress for 20 minutes with 10 repetitions (intervention). After the intervention, blood pressures were measured again, while the patients were in a sitting position (post-intervention). Finally, the research location was in Bora Village, Sigi Biromaru Regency, Central Sulawesi, Indonesia, and was conducted in July 2019.

Population and sample

The population in this research was 47 patients with hypertension that were selected based on the screening of young adults aged 18-45 years. Moreover, the sample was obtained using the sample size determination software in health studies from Lemenshow (25) that could obtain only a minimum sample size of 32 people. Before someone was determined as a respondent, interviews and blood pressure measurements were first conducted, and when they met the inclusion criteria, an informed consent was then signed. The number of samples according to the inclusion criteria was 35 respondents. Furthermore, 12 respondents were not included in the inclusion criteria because they had taken antihypertensive drugs which could alter the results of the research. Hence, severe hypertension respondents were not included in the research.

Inclusion criteria: 1. Aged 18-45 years, both male and female, 2. Suffering from mild-moderate hypertension, (mild hypertension, when blood pressure 140-159/90-99 mmHg, and moderate hypertension, when blood pressure 160-179/100-109 mmHg, 3. Not taking antihypertensive drugs, 4. Not having diabetes, stroke, heart, and kidney disease diagnosed by a doctor, 5. Not having abnormalities around the neck and back.

Exclusion criteria: 1. Age less than 18 years and more than 45 years, 2. Normal/severe hypertension, when blood pressure is 140/90 / 159/99 mmHg, 3. Have taken antihypertensive drugs, 4. having a disease other than hypertension diagnosed by a doctor, 5. Experiencing

abnormalities around the neck and back (such as skin disorders, fractures, etc.). Finally, the respondents were recruited using the purposive sampling technique.

Data collection

The data collection tools used were sphygmomanometer, stethoscope, red ginger hot water mixture, water thermometer, Standard Operating Procedure (SOP) red ginger warm compress, and pre and post-intervention observation sheets.

The data was taken by measuring the blood pressure of respondents when in a sitting position, before the warm red ginger compress was given (pre-intervention), then a red ginger warm compress was made using 200 grams of red ginger through the following procedure. The ginger was washed thoroughly then grated and mixed with 1 liter of water. Furthermore, they were boiled until 100°C in a basin and left to cool to 40.5°C. While waiting for the red ginger to cool, the respondents were adjusted to a pronation sleeping position, where they laid on their stomachs. Furthermore, their clothes were loosened in the neck and back regions. When the water was 40.5 °C, a towel was dipped in and then squeezed to reduce the wetness. Additionally, it was placed on the neck and back of the respondents and then back into the basin when it was no longer warm. The procedure was carried out for 20 minutes with 10 repetitions. When finished, the respondents were cleaned using a clean and dry towel and advised to sit back on a chair that had back support in order that they were relaxed. Then, the blood pressure measurement was carried out (post-intervention).

Data analysis

The pre and posttest blood pressure data were analyzed using the Paired Sample t-test with a significance level of $p = 0.05$, in order to ascertain the blood pressure in pre and post-intervention hypertension patients.

Ethical Clearance

The research was approved by the ethical review board of the Faculty of Medicine, Tadulako University, number 4217/UN.28.1.3/KL/2019.

RESULTS

Social Demographics

Bora village is a part of the Sigi Biromaru sub-district, and most of its area is plain. Additionally, the majority of its population belongs to the Kaili tribe and is dominated by males. (5). Prior to the earthquake, tsunami, and liquefaction, Sigi Biromaru was an agricultural area where most of its population were rice, plantations, or freshwater fish farmers. Additionally, it was a source of secondary crops and the main supplier of rice, vegetables, and freshwater fish for Palu City and its surroundings. However, after the earthquake, tsunami, and liquefaction (± 10 months), the situation in the area

changed, as many people lost their jobs because the land could not be cultivated due to damaged irrigation channels and lack of water sources. In this condition, there were still people that kept trying to grow their plants even though the results were not the same as before (less yields).

Characteristics of Respondents

Based on table I, it could be seen that the majority of hypertension sufferers were men (54.3%) and 82.9% of them were within the age group of <45 years. In general, 60.0% of respondents had long suffered from hypertension > 1 year, while 54.3% had a family history of the disease. The results of this respondents' characteristics contradict with the results of research by Atun et al.,(26) regarding the Effect of Hot Ginger Hydrotherapy on Blood Pressure in Hypertensive Patients, where the results obtained showed that of the 20 respondents, the majority of sufferers were females (around 80%), and 45% of them were within the age group of 61-70 years. Meanwhile, the research by Atun et al.,(26) is in accordance with the opinion of Kabo (27) which states that women would experience an increased risk of hypertension and cardiovascular disease after menopause (age 55 years), because in this period the hormone estrogen which could protect women from atherosclerosis in the blood vessels is no longer formed. According to the Indonesian Ministry of Health (4), Men have 2.3 times more risk of experiencing an increase in blood pressure than women. However, after entering menopause, the prevalence of hypertension in women is higher than in men because the hormone estrogen is not formed anymore.

Table I: Characteristics of respondents, duration of hypertension, and history of hereditary hypertension in respondents

Variable		n (35)	%
Sex	Male	19	54.3
	Female	16	45.7
Age	≥ 45 years	6	17.1
	< 45 years	29	82.9
History of suffering from hypertension	> 1 year	21	60.0
	< 1 year	4	11.4
	Unknown	10	28.6
Family History of Hypertension	Yes	19	54.3
	No	16	45.7

Systolic and Diastolic Blood Pressure Analysis before and after Red Ginger Warm Compress

Based on table II, it could be seen that there was a significant decrease in systolic blood pressure by an average of 9.143, after compression with red ginger (p -value <0.05). Additionally, there was a significant difference in diastolic blood pressure before and after the warm compresses with p -value <0.05, as there the blood pressure decreased by an average of 7.571.

The results of this research are in accordance with

Table II: The different tests of systolic and Diastolic blood pressure before and after warm ginger red compress

Blood Pressure		Mean	N	Std. Deviation	Std. Error Mean	Average Difference	p (Paired T Test)
Systolic	Before	144.29	35	10.651	1.800	9.143	0.000
	After	135.14	35	10.109	1.709		
Diastolic	Before	92.14	35	6.335	1.071	7.571	0.000
	After	84.57	35	5.054	0.854		

research by Nurahmandani et al., (23) which showed that there was an effect of soaking one’s foot in warm ginger water on decreasing the blood pressure in the elderly at the Pucang Gading Nursing Home in Semarang with $p = 0.001$ for systolic and $p = 0.001$ for diastolic blood pressure.

DISCUSSION

Characteristics of Respondents

Based on the analysis in this research, it was found that most of the respondents with hypertension (54.3%) were male, and 82.9% of them were within the age group <45 years. Generally, 60.0% of the respondents have long suffered from hypertension > 1 year, while 54.3% had a family history of hypertension.

Based on the characteristics of the respondents, most cases of high blood pressure were included in the category of primary hypertension. However, the cause of primary hypertension is not fully understood and could be influenced by heredity (genetic) and an unhealthy lifestyle (28). Factors that could increase the prevalence of the disease that could be changed include poor lifestyle, obesity, smoking, alcohol consumption, stress, and lack of physical activity (29.30).

From the results, the percentage of men that suffered from hypertension and those that have a family history of the disease was, the same (54.3%). Therefore, it could be assumed that all male sufferers had a family history of hypertension, and should be able and willing to change their lifestyle to prevent complications such as stroke, including heart and kidney failure. Based on the observations, in addition to heredity, most of the respondents had an unhealthy lifestyle, such as smoking, and the habit of consuming foods with high saturated fat content (from coconut milk), called “utakelo” cuisine, made from Moringa vegetables and cooked using coconut milk, and “duo” which is dried anchovies, usually cooked by sauteing.

It is necessary to consume coconut milk which contains fat as long as it is consumed as needed because fat serves as a protective and body-building substance. However, when consumed in excess, it increases the risk of plaques which narrows blood vessels and increases vascular pressure which could cause hypertension (31). Excessive fat consumption occurs when fat intake

exceeds 30% of the total daily energy requirement (32). Similarly, consuming foods that contain excessive salt (such as duo) could increase blood pressure because the high sodium content could bind fluids thereby increasing the amount of blood volume. Consequently, the heart has to work harder to pump blood, causing an increase in blood pressure (26).

In fulfilling the responsibilities married adult men have towards their families, they sometimes find obstacles and problems that could trigger stress. The stress could then increase peripheral vascular resistance, cardiac output, and stimulate sympathetic nervous system activity which could lead to hypertension. The causes of stressors range from biological, psychological, social, and chemical factors, including temperature. All of these factors could then trigger a stress response (33) which could trigger an increase in the production of the hormone adrenaline that would cause the heart to pump blood faster, leading to an increase in blood pressure (34). Therefore, stress management with relaxation is needed in order that the body and mind become relaxed (35). Finally, one of the ways to relax is to give a warm red ginger compress to hypertensive Patients (36).

Effect of Warm Red Ginger Compress on Systolic and Diastolic Blood Pressure in Hypertensive Patients

The results of the analysis showed that there was a significant difference in systolic blood pressure before and after red ginger compression with a value of $p < 0.05$ ($p = 0.000$), as the systolic blood pressure decreased by an average of 9.143. In addition, there was also a significant difference in diastolic blood pressure before and after warm red ginger compresses with a value of $p < 0.05$ ($p = 0.000$), as there was an average decrease in the diastolic blood pressure by 7.571.

According to the results of the analysis, giving warm red ginger compresses was very important in lowering blood pressure in hypertensive patients. This is because it causes the peripheral blood vessels to experience excessive vasodilation, which diverts large amounts of blood supply from internal organs, leading to a decrease in blood pressure. In addition to the warm temperature of the water, the aroma of ginger essential oil would also provide a sense of comfort and relaxation. This condition could stimulate the release of acetylcholine and histamine which would induce vasomotor activity that helps prolong vasodilation, leading to a decrease in

blood pressure.

When red ginger is squeezed, there would be the absorption of flavonoids and phenolic acids through peripheral blood vessels, and these substances are very important bioactive molecules that act as antioxidants and enzyme inhibitors (37). These antioxidant substances could clean free radicals in the circulatory system, in order to improve blood circulation, and could also stimulate metabolism in blood vessel cells which causes better elasticity.

Enzyme inhibitors are substances that inhibit the performance of the Angiotensin-Converting Enzyme (ACE) enzyme, which plays a role in the renin-angiotensin system. These substances would reduce the formation of angiotensin II from angiotensin I, leading to vasodilation, which then reduces cardiac output, and ultimately lowers blood pressure (38).

In addition to flavonoid and phenolic compounds, ginger also contains saponins, which play a role in inhibiting renin (RAA system) in the kidneys, thereby reducing the formation of the vasoconstrictor, angiotensin II. Meanwhile, angiotensin II could stimulate aldosterone secretion which causes a decrease in salt and water excretion by the kidneys, leading to an increase in blood heart output that causes an increase in blood pressure. Therefore, a decrease in the formation of angiotensin II could lower blood pressure (39).

Given that the main component of fresh ginger is a gingerol, when there is heat or at high temperatures, gingerol would turn into a shogaol which has a spicier taste. Therefore, red ginger warm compresses should not be used excessively because the heat affects tissues directly and would continuously damage epithelial cells, cause redness, and a stinging feeling, which could cause skin blister (40).

Red ginger is usually safe when taken properly, however, it could cause mild side effects, including heartburn, diarrhea, belching, and general stomach discomfort. Additionally, it could lower blood pressure in a similar way as some medications for blood pressure and heart disease. Consequently, taking ginger along with these medicines may cause blood pressure to drop too low or induce an irregular heartbeat (41).

A limitation of this research is that there was no control group for comparison, and pre and post-measurements were carried out on the same day. However, the strength of the research lies in the compress technique using red ginger, which needs to be considered with the specific administration procedure for optimal results.

CONCLUSION

There was a significant difference in systolic and

diastolic blood pressure before and after the red ginger warm compress intervention, as there was an average decrease in systolic blood pressure of 9,143 and diastolic blood pressure of 7,571. Therefore, the intervention has the potential to be used to lower the blood pressure of patients with hypertension, both systolic and diastolic. However, further research is needed on a larger number of respondents and requires a control group.

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