



## **Reducing Blood Pressure with Slow Stroke Back Massage and Warm Water Foot Soak on Isolated Systolic Hypertension Patients**

**Joko Sapto Pramono<sup>1\*</sup>, Arsyawina<sup>2</sup>, Isti Khomatul Masita<sup>3</sup>**

<sup>1,2,3</sup> Poltekkes Kemenkes Kalimantan Timur, Samarinda, Indonesia

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**Corresponding author:**

Joko Sapto Pramono

e-mail:

[jokosp2005@yahoo.com](mailto:jokosp2005@yahoo.com)

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**Abstract.** Hypertension is a non-communicable disease that caused 64% of deaths globally and in Indonesia ranks fourth of death. Management of hypertension aims to keep blood pressure within normal limits, improve the health and quality of life and reduce the risk of serious complications, including heart disease and stroke. This study aimed to determine the effectiveness of slow stroke back massage techniques and warm water foot soak in reducing systolic blood pressure. The design in this study was a quasi-experiment with a non-equivalent pre-test and post-test design without a control group. The research sample was 30 respondents taken by purposive sampling divided into two intervention groups, each of 15 respondents. Data analysis used an Independent t-test and paired t-test. The results showed an effect of slow stroke back massage and warm water foot soak intervention on reducing systolic blood pressure with p-value = 0.001 ( $<\alpha = 0.05$ ). While the independent t-test obtained a p-value = 0.057 ( $>\alpha = 0.05$ ), which means there was no difference in effectiveness between the two interventions. It was concluded that the intervention of slow stroke back massage techniques and warm water foot soak affected reducing systolic blood pressure, and both had the same effectiveness in reducing systolic blood pressure. It is recommended that community health practitioners implement slow stroke back massage and warm water foot soak as an alternative to non-pharmacological therapies for hypertensive sufferers.

**Keywords:** Back massage; foot soak; hypertension.



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## Introduction

Hypertension is a condition in which blood pressure is  $\geq 140$  mmHg (systolic pressure) and or  $\geq 90$  mmHg (diastolic pressure) (1) (2). Systolic pressure is the highest pressure when the heart contracts. An increase in systolic blood pressure without diastolic pressure is called isolated systolic hypertension, which is usually associated with high pressure in the arteries (3). Isolated systolic hypertension most commonly occurs in the elderly as a form of hemodynamic hypertension, and its prevalence continues to increase, causing increased morbidity and mortality in the cardiovascular system (4).

Hypertension is a syndrome or collection of symptoms of various conditions interconnected like the aging process because hypertension is the interaction of various genetic and environmental factors that affect the progression of a cardiovascular problem (5). Two types of hypertension are primary hypertension and secondary hypertension. Primary hypertension is also called essential hypertension. The exact causes are unknown (idiopathic) by genetic and environmental factors, which can be triggered by age, obesity, stress, gender, smoking behavior, alcohol consumption, and hyperlipidemia. The cause of secondary hypertension is known to be a complication of certain underlying diseases such as chronic renal failure and diabetes mellitus (6,7).

The prevalence of hypertension in the world shows a very high number of around 1.13 billion. It is estimated that by 2025 there will be 1.5 billion people affected by hypertension. Every year, 9.4 million people die from hypertension and its complications (3). Hypertension is the first rank of Non-Communicable Diseases as the cause of death globally from 63% of all deaths each year and is the fourth cause of death in Indonesia (8).

East Kalimantan is in third place, with a prevalence reaching 39.0% (9). At the same time, Samarinda City is the second-highest throughout 2018, where hypertension is a disease suffered by people with an average of 2,420 people every month. The Temindung Public Health Center recorded the highest prevalence of hypertension, with an average of 450 people per month (10).

Hypertension often has no known signs and symptoms, and even complications occur as if suddenly, which are fatal. Therefore it is called the silent killer (11). Uncontrolled hypertension will cause several complications, including stroke, kidney failure, and coronary heart disease (2) (5). With regular blood pressure checks and effective management, early detection must be carried out to prevent various complications (12). Management of hypertension aims to keep blood pressure within normal limits, up to 120/80 mmHg ideally, improve the health and quality of life, and reduce the risk of serious complications, including heart disease and stroke (13). In general, the management of hypertension is divided into pharmacological and non-pharmacological therapies (14). Anti-hypertensive drugs are given for pharmacological treatment. The use of anti-hypertensive medications for a relatively long time often leads to boredom and non-compliance in hypertensive patients or drug dependence and side effects (14,15).

Non-pharmacological prevention efforts to lower blood pressure can be made, such as reducing fatty foods, reducing salt, not smoking, drinking alcohol, managing stress well, having a hot bath, and more. Non-pharmacological treatment is also an independent nursing intervention for nurses to reduce blood pressure in hypertensive patients (6). It includes muscle relaxation therapy, breath relaxation, and hydrotherapy soaking feet with warm water (16–18). Scientists and health practitioners are currently developing complementary treatment as an alternative to helping patients treat hypertension cheaply and quickly. As a complementary therapy, there are many options that patients and families can do or ask for

help from a health practitioner, including hydrotherapy, deep breathing relaxation exercises, muscle relaxation massage, and music therapy (15).

Slow stroke back massage is a muscular relaxation technique by doing a gentle and quiet rubbing massage on the back and shoulder, starting from the lumbar region to the scapula. This action can reduce tension and relaxes muscles allowing more effortless blood flow to provide nutrients and oxygen (19). Various research on slow stroke back massage, in general, can help lower blood pressure (20,21). A warm water foot soak is a therapeutic foot soak. Using warm water for  $\pm$  10 minutes with temperatures ranging from 38°-40° C will help vasodilation and increase blood circulation to relax the body (22) and lower blood pressure (14). Three essential factors determining blood flow resistance are vessel diameter, artery length, and blood viscosity. The most important in this case is the diameter of the blood vessels because it can change rapidly due to contraction and expansion of the smooth muscle of the blood vessels (23). The advantages of these two therapies are that they are easy to do anywhere without cost, but it is not yet known how effective they are (6).

From the description above, the researcher would like to prove the effectiveness of the slow back massage technique, and warm water foot soaks on systolic blood pressure changes (isolated systolic hypertension) among patients with hypertension at the Temindung Public Health Center in Samarinda City.

## **Objective**

This study aimed to examine the effectiveness of slow stroke back massage techniques and warm water foot soak on reducing systolic blood pressure.

## **Method**

A quasi-experiment, pre-test, and post-test with a non-equivalent design without a control group were applied in this study. This research was conducted in the working area of the Temindung Public Health Center in Samarinda City in March 2020. The population in this study were people with hypertension. The samples were selected based on inclusion criteria, including 1) patients with stage I systolic hypertension (systolic blood pressure 140–159 mmHg), 2) taking routine anti-hypertensive drugs (amlodipine 5 mg per day), and 3) cooperative with the intervention. In contrast, the exclusion criteria were people with hypertension who had comorbidities (diabetes mellitus, heart failure, kidney failure, fractures) with open wounds or injuries to the skin and muscles around the intervention area, and sufferers who had spinal disorders. The sample selection used a non-probability sampling technique using purposive sampling consisting of two groups of 15 respondents, group 1 with slow stroke back massage intervention and group 2 with warm water foot soak intervention.

Blood pressure measurements were taken before and after the intervention, for 10 minutes 3 times per week for two weeks. The research data were statistically tested with univariate analysis in frequency distribution and bivariate Independent t-test and paired t-test.

## **Results**

Table 1 described the characteristic of respondents. The distribution of respondents based on gender, most of whom were men in groups 1 and 2 (86.7% and 80.0%), the ages of all respondents were over 40 years old, evenly distributed in group 2 but in group 1 some large age between 51 - 60 years (60.0%). Most of the patients had hypertension between 1-5 years (73.3% and 53.3%).

**Table 1 Respondents Frequency Distribution Based on Respondent Characteristics**

Characteristics	Group 1		Group 2	
	N	%	N	%
<b>Gender</b>				
Man	2	13.3	3	20.0
Women	13	86.7	12	80.0
<b>Age</b>				
41-50 years	5	33.3	5	33.3
51-60 years	9	60.0	5	33.3
> 60 years	1	6.7	5	33.3
<b>Long Suffering</b>				
<1 year	1	6.7	2	13.3
1-5 years	11	73.3	8	53.3
> 5 years	3	20.0	5	33.3
Total	15	100	15	100

Table 2 described that before the intervention of muscular relaxation was carried out, the systolic pressure in the range 150-159 mmHg was 53.3%. There was a decrease after the intervention of slow stroke back massage therapy, the systolic pressure in the range 150-159 mmHg to 0%. The mean and standard deviation difference between pre and post muscular relaxation therapy intervention at systolic pressure was  $9.13 \pm 0.990$ .

**Table 2 Respondents Frequency Distribution Based on Systolic Blood Pressure Value Group 1 (Slow Stroke Back Massage)**

Type of test	Systolic blood pressure range (mmHg)	f	%	Pre-Post Average Mean $\pm$ SD	Difference Mean $\pm$ SD
Pre test	130-139	0	0	150.06 $\pm$ 5,700	9.13 $\pm$ 0.990
	140-149	7	46.3		
	150-159	8	53.7		
Post test	130-139	5	33.3	140.93 $\pm$ 5,444	
	140-149	10	66.7		
	150-159	0	0		

Table 3 described that before the warm water foot soak intervention was carried out, the systolic pressure range 150-159 mmHg was 60.0%. There was a decrease after the foot soak intervention, where the systolic pressure of 150-159 mmHg became 26.7%. The difference between the mean and standard deviation between pre and post warm water foot soak intervention

**Table 3 Respondents Frequency Distribution Based on Systolic Blood Pressure Group 2 (Warm water foot soak)**

Type of test	Systolic blood pressure range (mmHg)	f	%	Pre-Post Average Mean $\pm$ SD	Difference Mean $\pm$ SD
Pre test	130-139	0	0	152.06 $\pm$	7.33 $\pm$ 1.234
	140-149	6	40.0	4,697	
	150-159	9	60.0		
Post test	130-139	3	20.0	144.73 $\pm$	
	140-149	8	53.3	5.049	
	150-159	4	26.7		

Table 4 described that the two groups obtained p-value = 0.001 (<0.05), it can be concluded that there was a difference in the mean systolic blood pressure between pre and post-intervention slow stroke back massage techniques and warm water foot soak.

**Table 4 Differences Test of Pre and Post Intervention Mean**

Blood pressure	N	Score	Pre test	Post test	p-value
Group 1	15	Mean + SD	150.06 $\pm$ 5,700	140.93 $\pm$ 5,444	0.001
Group 2	15	Mean + SD	152.06 $\pm$ 4,697	144.73 $\pm$ 5.049	0.001

To determine the effectiveness between the two types of intervention, a different test for the mean difference in systolic blood pressure was carried out in the two groups using the unpaired T-test or independent t-test.

Table 5 described the significance value of systolic blood pressure in group 1 and group 2, namely p-value > 0.05, which means that there is no significant difference between the two types of intervention.

**Table 5 Differences Test Mean Difference Change in systolic blood pressure before and after intervention**

Pressure Systolic Blood	Intervention Group	N	Mean $\pm$ SD	p-value
Pre Test	Group 1	15	150.06 $\pm$ 5,700	0.303
	Group 2		152.06 $\pm$ 4,697	
Post Test	Group 1	15	140.93 $\pm$ 5,444	0.057
	Group 2		144.73 $\pm$ 5.049	

## Discussion

### Characteristics of Respondents

Some of the distinguishing factors at risk for the prevalence of hypertension include age, sex (24), and history of the disease. With increasing age, physiological function decreases due to degenerative processes. A decrease in body resistance accompanies the risk of developing various non-communicable diseases in the elderly. Hypertension is also a risk

in the elderly with unhealthy lifestyles and diets such as sodium intake, saturated fat, smoking, lack of exercise, and obesity (25–27). Potter & Perry (2015) states that changes in blood pressure can occur quickly, even in optimal health conditions. Several characteristic factors identified as triggers for changes in blood pressure are age, stress, ethnicity, gender, daily variation, drugs, smoking, activity, and weight. Along with age, body organ physiology will decrease various diseases, including hypertension (28).

Basic Health Research in 2018 illustrates that the most common disease among the elderly is hypertension (63.5%)(9). This was in line with the data from the previous study. Their research showed that people with hypertension over the age of 51 are 46.3% (29). People with hypertension tend to be higher in young adults than in the elderly (30). It is estimated that this is due to the factors of improving health and lifestyle and supporting local cultural characteristics.

The prevalence of hypertension in women was higher than in men, physiologically hormonal changes affect the reproductive system (31) and various other body systems, including cardiovascular (32). This theory is in accordance with the results obtained in this study and other studies mentioning women as much as 56.6% (29). However, according to the effects of research by Suharto et al. (2020) found that there were more men (68.75%) than women (27). Characteristics of respondents describe changes in body physiology, lifestyle, knowledge of prevention and treatment. On average, hypertension is a chronic disease suffered by patients such as this research data. This was also related to preventing hypertension through a behavior or lifestyle change approach, which is still difficult and requires an extended period (32,33). Health workers will consider family history and local culture to educate on the prevention and treatment of hypertension.

### **Differences in Systolic Blood Pressure Pre Test and Post Test on Slow Stroke Back Massage and Warm Water Foot Soak**

Theoretically, slow stroke back massage stimulates the formation of a piezoelectric effect which helps stretch and lengthen muscle fibers, thereby increasing blood circulation and bringing oxygen and nutrients back to tense areas of the body (19). The effect of stretching smooth muscle also occurs in the vertebral arteries, which tend to be vasoconstriction, so that blood circulation to the spinal cord returns to normal, which results in a physiological decrease in systolic blood pressure (17). Similar research shows the effect of slow stroke back massage therapy on lowering blood pressure by Mohebbi et al. (2014) with  $p$ -value = 0.001(21).

*Warm water foot soaks* Physiologically stimulates the nerves in the soles of the feet, such as baroreceptors. Baroreceptors are the primary reflex to determine the regulatory control on heart rate and blood pressure. Baroreceptors receive stimulation from stretching or blood pressure located in the aortic arch and carotid sinuses of blood vessels (15,16). Stretching or dilating blood vessels resulting in increased blood circulation, decreased blood viscosity, reduced muscle tension, increased tissue metabolism, and increased capillary permeability, thereby lowering blood pressure. Warm water foot soak also affects the small arteries that will dilate to reduce peripheral resistance and cause a decrease in systolic and diastolic blood pressure (34). The results of this study indicate a reduction of systolic blood pressure and are similar to the effects of previous studies by Murwidi and Abdullah (2019) combined with Benson relaxation techniques effectively lowering blood pressure in people with hypertension (6).

In general, respondents felt that there was relaxation with the two interventions. The effect on reducing systolic blood pressure occurred, although there was no significant difference between the two. Actions like this can be done daily routinely by people with hypertension at rest and are generally favored by the Indonesian people because they can be

done at home. Even this action can be used as a development model of health services based on traditional medicine.

### **Differences in Systolic Blood Pressure Between Interventions Slow Stroke Back Massage Therapy and Warm Water Foot Soak Intervention**

Non-pharmacological measures can reduce systolic blood pressure by 5-6 mmHg, whereas a decrease in systolic blood pressure by 5 mmHg can reduce the risk of stroke by 34%. Non-pharmacological actions besides physical therapy will be more effective with healthy living behaviors through limiting salt consumption, weight loss, eating lots of fruit, limiting smoking and drinking alcohol, physical activity, and stress management (35). Warm water foot soak causes vasodilation of blood vessels that can physiologically balance the volume and diameter of the blood vessels so that it impacts lowering blood pressure (34). Different ways to slow stroke back massage is the effect of massage therapy that causes relaxation and is responded to by the parasympathetic nerves, thereby reducing heart rate, blood pressure, and anxiety (21). In theory, both therapies have a reasonably practical blood pressure-lowering effect.

The author assumes that slow stroke back massage therapy and warm water foot soak performed on hypertensive patients in the working area of the Temindung Public Health Center Samarinda City had the same effectiveness in reducing systolic blood pressure, possibly because of the association with homogeneous respondent characteristics carried out with strict procedures and observation. Thus, patients and their families can select the management based on preferences and convenience. It can also take turns as long as there is no contraindication of another disease to take action.

### **Conclusion**

There was a difference in the mean systolic blood pressure of the respondents before and after the slow stroke back massage intervention in group 1. There was also a difference in the mean systolic blood pressure of the respondents before and after the warm water foot soak intervention in group 2. However, there was no significant difference in systolic blood pressure between the two interventions. For community health practitioners, the authors suggest that it can be used as a model development of health services based on traditional medicine. It is hoped that further research can be carried out by including other variables that have not been studied related to hypertension, such as quality of life in hypertensive sufferers.

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