

# Soak Feet with Warm Water and Progressive Muscle Relaxation Therapy on Blood Pressure in Hypertension Elderly

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## ABSTRACT

**Background:** Hypertension is a silent killer. Each year hypertension contributes to the deaths of nearly 9.4 million people. Non-pharmacological management may use a combination of the therapy of foot soaks in warm water and progressive muscle relaxation.

**Aim:** The purpose of this study was to find out the effectiveness of the combination of the treatment of foot soaks in warm water and progressive muscle relaxation in blood pressure for the elderly with hypertension.

**Methods:** This study used a quasi-experimental design with the pretest and posttest control group design. The sample is consisting of 2 groups, 20 respondents in each group. Examples were selected by simple random sampling technique. The instruments were observation sheet, standard operating procedure, and sphygmomanometer digital. The data were analyzed using the paired t-test.

**Results:** The mean blood pressures pretest and posttest among control group were 160.70/88.37 mmHg and 160.25/88.67 mmHg. The mean blood pressure pretest and posttest among intervention group were 159.81/85.75 mmHg and 150.31/84.25 mmHg. The decrease in mean pre-posttest systolic and diastolic pressures in the intervention group were -9.50 mmHg and -1.50 mmHg. This study found that the treatment useful to reduce systolic ( $p < 0.030$ ) and diastolic ( $p < 0.041$ ). The comparison of systolic and diastolic blood pressure of intervention with the control group obtained  $p < 0.018$  and  $0.023$ .

**Conclusion:** The combination of the therapy of foot soaks in warm water, and progressive muscle relaxation is useful for lowering blood pressure. Respondents are expected to apply this treatment as a complementary therapy of hypertension.

**Keywords:** Blood pressure, elderly, hypertension, progressive muscle relaxation, water therapy

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## INTRODUCTION

Elderly has decreased function due to the ageing process. The effects of ageing and diseases related to ageing in humans include biological, physiological, psychosocial, and spiritual aspects (Stanley, M. Blair, KA. & Beare, 2006). Structural and functional changes in the elderly in the cardiovascular system, namely changes in thickened left ventricular, decreased number of heart cells, stiffness of blood vessels and valves become incompetent. Increased aortic strength can cause an increase in systolic blood pressure and can produce elevated blood pressure. A decrease in elasticity in the aortic vessel wall shows a little hardening of the arteries and higher blood pressure, causing the elderly to experience hypertension (Stanley, M. Blair, KA. & Beare, 2006) (Stockslager, 2007) (Paneni, Diaz Cañestro, Libby, Lüscher, & Camici, 2017).

Hypertension is an increase in systolic blood pressure above 130 mmHg and diastolic pressure above 80 mmHg (AHA, 2017). Hypertension is a silent killer where symptoms can vary between individuals and are almost the same as symptoms of other diseases. Hypertension is an independent risk factor for cardiovascular disease, including coronary arteries, ischemic stroke, peripheral arterial disease and congestive heart failure (Miller, 2012) (Strait & Lakatta, 2012). According to WHO 2013, it is estimated that in 2025 the prevalence of hypertension will increase to 1.5 billion people.

Untreated hypertension, in the long run, will cause damage to the arteries. Complications of hypertension can occur in organs such as; heart, brain, kidney and eyes (Zanchetti, 2017)(Trtica Majnarić et al., 2019). The occurrence of complications in hypertension can be prevented by pharmacological and non-pharmacological management. Pharmacological management can be given diuretics and ACE inhibitors. Pharmacological treatment can cause side effects such as dry mouth, thirst, weakness, dizziness, lethargy, muscle aches, muscle weakness, tachycardia, gastrointestinal disorders and depression (Smeltzer, S. C., Bare, B. G., Hinkle, J.L., and Cheever, 2013). Side effects in the elderly such as postural hypotension, depression, mental and behavioral changes, risk of poisoning with decreased liver and kidney function (Benetos, Petrovic, & Strandberg, 2019). Pharmacological treatment has many effects, so currently, non-pharmacological therapy is chosen for hypertension. Non-pharmacological management can be done with consumption of vegetables and fruits, weight loss, alcohol, sodium and tobacco restrictions, relaxation exercises, and complementary alternative therapies (Filho, 2019)(Fadlilah, Sucipto, & Judha, 2020).

One alternative therapy for non-pharmacological management to reduce blood pressure is to do a combination of warm water foot bath therapy and progressive muscle relaxation. Scientifically warm water has a physiological impact on the body which is smooth blood circulation, stabilizing blood flow and heart work as

well as loading factors in the water which will strengthen the muscles and ligaments that affect the joints of the body. Soaking warm water is beneficial for vasodilation in blood flow so that it can reduce blood pressure (Moovenhan & Nivethitha, 2014). In contrast, progressive muscle relaxation is stretching and releasing muscle groups that will produce different sensations. The benefits of progressive muscle relaxation are to reduce physical stress, decrease pulse, blood pressure and breathing without any side effects (Ain & Hidayah, 2018). The reason for choosing a combination of a warm foot soak and progressive muscle relaxation is because this procedure is more practical, easy, inexpensive, affordable. This therapy can be applied to hypertensive patients and has no side effects. Research on the combination of a combination of warm foot baths and progressive muscle relaxation with blood pressure has also never been done.

## METHODS

**Study Design:** This type of research is an experiment with a pretest and posttest control group design. Data were collected at Home for the Elderly in Yogyakarta, Indonesia, on January 24<sup>th</sup> to February 6<sup>th</sup>, 2018.

**Samples:** The research sample was elderly who suffer from hypertension at the Elderly Home Unit Budi Luhur Yogyakarta Indonesia. The samples were calculated using the Federer formula obtained a total of 40 respondents. The sample consisted of 2 groups, intervention groups and control groups. Each group with 20 samples. Examples were selected using random sampling according to inclusion and exclusion criteria. Inclusion criteria were willing to be a respondent and sign an informed consent, age 60-90 years old, resident, healthy BMI, Javanese ethnicity, and participate in all research processes. Exclusion criteria were trauma or acute inflammation, smoking, consuming alcohol, taking antihypertensive drugs, elderly who have limited mobility, and elderly who undergo bed rest treatment.

**Instruments:** Research tools are composed of tools for measuring blood pressure, means for soaking feet, and tools for progressive muscle relaxation. Blood pressure is measured with a digital sphygmomanometer, performed according to standard operating procedures, and recorded on an observation sheet. The tools and materials used to soak the foot of warm water are Waskom, water thermometer, towels, warm water, carried out according to standard operating procedures, and recorded on an observation sheet. Research instruments for progressive muscle relaxation are standard operational procedures and observation sheets. The result of the digital Sphygmomanometer validity test value was 0.753 ( $> r$  0.632), while the reliability test value was 0.865 ( $> r$  0.80).

**Data Collection:** The control group did not get any therapy for blood pressure. The intervention group received treatment in the form of a combination of warm foot baths and progressive muscle relaxation. Combination therapy of warm foot baths and progressive muscle relaxation is an action given to the respondent by immersing the feet in warm water together with progressive muscle relaxation. Treatment is carried out in a seated position, quiet environment without interruption, adequate lighting, and

comfortable ambient temperature. Therapy is given every day for two weeks. Be applied one time a day, i.e. in the afternoon within 15 minutes. Soak warm water is done by placing the foot in the Waskom which has been filled with warm water with 35-40°C (add warm water if the water temperature  $<35-40^{\circ}\text{C}$ ). During the process of soaking the feet in warm water, respondents made progressive muscle relaxation, namely exercising the muscles of the neck, face, hands and feet. The steps for progressive muscle relaxation are:

1. Bend your neck and head back slowly for 5-10 seconds, relax and straighten your neck and head.
2. Bend your neck and head forward for 5-10 seconds, relax and straighten your neck and head.
3. Wrinkle your forehead up for 5-10 seconds, relax the forehead muscles.
4. Close your eyes as hard as possible 5-10 seconds relax the eye muscles
5. Close the jaw and teeth as hard as possible for 5-10 seconds, relax the jaw muscles and bite
6. Punch the lips to the front as hard as possible for 5-10 seconds, relax the lip muscles.
7. Arch your back for 5-10 seconds straightens and relax your back.
8. Push your chest forward for 5-10 seconds, relax your chest muscles.
9. Raise both shoulders as if to touch the ears for 5-10 seconds relax your shoulders.
10. Clench your hands and bend your elbows up so that the muscles of the upper arms feel tight and tense for 5-10 seconds relax and straighten the elbows and fingers, feel your upper arms go limp.
11. Clench and tighten both wrists and as healthy as possible for 5-10 seconds, release the fist and feel the fingers and palms become weak.
12. Bend your palms up with your fingers open as hard as possible for 5-10 seconds, relax and straighten your palms, feel your forearms and palms become limp.
13. Bend your ankles up towards your knees, feel the tension in your calves and thighs for 5-10 minutes. Feel relaxed at the ankles, explore all the pressure in the calves and thighs disappear.
14. Bend your ankles down to the floor, feel the tension in your calves and thighs for 5-10 seconds, relax your ankles, and feel all the pressure in the calves and thighs disappear

Blood pressure is the result of systolic and diastolic blood pressure measurements. Blood pressure consists of pretest and posttest blood pressure. Systolic blood pressure measurements are measured by researchers in the left arm in a sitting position after resting for 5 minutes before the intervention. Posttest blood pressure was measured by researchers in the left arm in a sitting place after a 15-minute break of therapy. Blood pressure measurements were carried out on posttest 14 days after the last intervention.

**Data Analysis:** The data normality test used the Shapiro Wilk test with average results, so the statistical analysis uses the *Paired T-Test*.

**Ethical Consideration:** The ethical approval was obtained from the Health Ethics Committee of Faculty Health Science of Universitas Respati Yogyakarta with an

approval number of 537.2/UNRIYO/PL/X/2017. The study permission was also obtained from the Head of Home Elderly Unit Budi Luhur Yogyakarta Indonesia with an approval number 074/0725/Kesbangpol/I/2018.

## RESULTS

Table 1 is known in all groups; the majority of samples are male and elderly. Table 2 shows the mean pre-posttest systolic and diastolic blood pressure control group higher than the intervention group. The mean pre-posttest systolic and diastolic blood pressure control groups were 160.70-160.25 mmHg and 88.37-88.67 mmHg. In contrast, The mean pre-posttest systolic and diastolic blood pressure intervention groups were 159.81-150.31 mmHg and 85.75-84.25 mmHg. Table 3 known there was a significant relationship between gender and age to systolic and diastolic blood pressure among the intervention group (p 0.020 and 0.036). In the control group, among all gender and age group were increasing difference mean blood pressure. In the intervention group, among all gender and age group were decreasing difference mean blood pressure.

Table 4 shows that there was a decreasing mean systolic blood pressure and increased diastolic blood pressure in the control group (-0.45 mmHg and 0.3 mmHg).

In the intervention group, the mean difference systolic and diastolic blood pressured were decreased (-9.50 mmHg and -1.50 mmHg). There were no significant difference pretest and posttest in systolic and diastolic blood pressure in the control group (p 0.735 and 0.480). There was a significant difference between pretest and posttest in systolic and diastolic blood pressure in the intervention group (p 0.030 and 0.041). Combination of the therapy of foot soaks in warm water and progressive muscle relaxation active to reduce systolic and diastolic blood pressure for the elderly with hypertension (0.018 and 0.023)

Table 1: Distribution of Sample Frequencies based on gender and age

Variable	Control Group		Intervention Group	
	f	%	f	%
<b>Gender</b>				
Male	11	55.0	12	60.0
Female	9	45.0	8	40.0
Total	20	100.0	20	100.0
<b>Age</b>				
Elderly	13	65.0	14	70.0
Old	7	35.0	6	30.0
Total	20	100.0	20	100.0

Table 2: Pretest dan Posttest of Systolic and Diastolic Blood Pressure

Variable	Pre-posttest Systolic Blood Pressure (mmHg)		Pre-posttest Diastolic Blood Pressure (mmHg)	
	Control Group	Intervention Group	Control Group	Intervention Group
Min	145.00-147.00	148.00-122.00	72.00-74.00	65.00-69.00
Max	192.00-190.00	181.00-172.00	110.00-127.00	106.00-103.00
Mean	160.70-160.25	159.81-150.31	88.37-88.67	85.75-84.25
SD	9.78-9.82	9.91-16.33	9.15-9.21	9.25-9.55

SD=Standard Deviation

Table 3. Relationship of Gender and Age with Pre-posttest Blood Pressure

Variable	Pre-posttest Systolic Blood Pressure (mmHg)		Pre-posttest Diastolic Blood Pressure (mmHg)	
	Control Group	Intervention Group	Control Group	Intervention Group
<b>Gender</b>				
Mean Male	161.5-167.1	164-150.2	82.8-87.4	87.7-86.3
Mean Female	160.9-168.3	152.8-150.5	83.4-85.05	82.5-80.83
Difference Mean Male	5.60	-13.80	4.60	-1.4
Difference Mean Female	7.40	-2.3	1.65	1.67
p Value*	0.561	0.020	0.782	0.036
<b>Age</b>				
Mean Elderly	163.4-166.55	162.6-157.7	87.6-89.25	88.7-85.6
Mean Old	148.3-150.98	155.16-138	85.7-86.05	82-80,83
Difference Mean Elderly	3.15	-4.9	1.65	-3.1
Difference Mean Old	2.68	-17.16	0.35	-1.17
p Value*	0.740	0.030	0.552	0.007

\* Spearman Rank

SD=Standard Deviation

Table 4. Effect of the combination of the therapy of foot soaks in warm water and progressive muscle relaxation in blood pressure for the elderly with hypertension

Group	Mean Systole/Diastole(mmHg)	The Mean Difference Systole/Diastole	P-value
<b>Control</b>			
Pretest	160.70/88.37	-0.45/0.3	0.735/0.480*
Posttest	160.25/88.67		
<b>Intervention</b>			
Pretest	159.81/85.75	-9.50/-1.50	0.030/0.041*
Posttest	150.31/84.25		
<b>Blood Pressure</b>			
Systolic PrePosttest Control-Intervention			0.018**
Diastolic PrePosttest Control-Intervention			0.023**

\*tested using Wilcoxon

\*\* tested using Independent T-test

## DISCUSSION

Age of respondents divided according to the Law of the Republic of Indonesia number 13 of 1998 into the age of 60-74 years (elderly) and 75-90 years (old). As we age, the elderly experience a decline in function due to the ageing process. Increased age is often accompanied by a variety of chronic diseases such as arthritis, hearing loss, dementia, and the cardiovascular system (Amigo, 2012). In this study, the average systolic and diastolic elderly blood pressure was higher than old age. Pre-posttest in the control group increased either systolic or diastolic. A greater increase was found in the elderly age control group (3.15 mmHg > 2.68 mmHg for systolic; 1.65 mmHg > 0.35 mmHg for diastolic. average blood pressure both at pretest and posttest shows higher rates than old age. The mean pre-posttest blood pressure in the intervention group decreased. The greatest decrease in systolic blood pressure in old age (-17.16 mmHg), while systolic blood pressure in elderly age (-3.1 mmHg).

It is known that as age increases, blood pressure gets higher. Age affects the occurrence of hypertension due to structural and functional changes in the elderly on the cardiovascular system. Increased age is accompanied by structural and functional changes in the cardiovascular system, including thickened left ventricle, decreased pacemaker cell count, arteries become stiff, dilated veins, valves become incompetent, increased aortic strength which causes an increase in systolic blood pressure that is disproportionate with diastolic, which results in widening of the arteries (Stanley, M. Blair, KA. & Beare, 2006)(Stockslager, 2007)(Buford, 2016).

There is no clinically significant difference in blood pressure in men or women. After puberty, men tend to have higher blood pressure. After menopause, women tend to have a higher blood pressure than men due to hormonal factors because women who have not experienced menopause are protected by the hormone estrogen which plays a role in increasing HDL levels (Potter, Perry, Stockert, & Hall, 2017). This is different from the opinions of experts. Overall, in Korea, the prevalence of hypertension was higher in men (34.6%) than in women (30.8%). However, after the age of 60 years, hypertension is more common in women than men. After the age of 60 years, women are more likely to have hypertension and maintain less control of hypertension than men of the same age range (Choi HM, Kim HC, 2017). In other research found the prevalence of hypertension was 3.9% for women and 5.2% for men. It was influenced by several things, such as the effect of modernization, lifestyle, and diet (Gurven, Blackwell, Rodríguez, Stieglitz, & Kaplan, 2012).

In the study known systolic blood pressure in the control and intervention groups decreased. The decrease in systolic blood pressure in the intervention group was more significant than in the control group (9.50 mmHg > 0.45 mmHg). The reduction in the control group even though no treatment was given is likely due to programs that are provided at elderly homes to control elderly blood pressure. The program includes the provision of low sodium nutrition, physical activity, group activity therapy that can relax the elderly and reduce stress. Diastolic

pressure in the control group increased (0.3 mmHg), while the intervention group decreased (1.50 mmHg).

The combination of warm water foot bath therapy and progressive muscle relaxation has a significant effect on reducing blood pressure ( $p < 0.05$ ). Systolic and diastolic blood pressure has decreased compared to the beginning of the research process. A combination of warm water foot bath therapy and progressive muscle relaxation is given for two weeks (14 days) to see the effects of continuous treatment. This therapy is offered every day in the afternoon, starting at 14: 00-16: 30. Determination of the time of treatment is based on Snayder & Lindquist (2014), which says that a good time to do the therapy is in the morning and evening.

Warm water which scientifically has a physiological impact on the body is affecting blood vessels. Warm water makes blood circulation smooth and stabilizes blood flow and heart work. Warm water will strengthen the muscles and ligaments that affect the joints of the body (Lalage, 2015). Soaking warm water has effects and benefits, one of which is a biological effect, which is that heat can cause blood vessel dilatation which can result in increased blood circulation. Physiologically progressive muscle relaxation can reduce oxygen consumption, metabolic rate, breathing rate, muscle tension, premature ventricular contractions, and systole and diastolic blood pressure, and increase brain alpha waves (Aji, 2016) (Hamarno, 2010).

The working principle of warm water foot bath therapy and progressive muscle relaxation that is conduction where heat or warm transfer occurs from the water into the body will cause blood vessel dilation and decreased muscle tension so that blood circulation can affect arterial pressure by baroreceptors in the aortic sinus. The aortic arch will convey impulses carried by nerve fibres that carry cues from all parts of the body to inform the brain about blood pressure, blood volume and the individual needs of all organs to the sympathetic nerve centre to the medulla so that it will stimulate systolic pressure, i.e. the ventricular muscle strain will stimulate the ventricles to contract immediately. At the beginning of the contraction, the aortic valve and the semilunar valve are not open yet. To open the aortic valve, the pressure inside the ventricle must exceed the weight of the aortic valve. Circumstances where ventricular contractions begin to occur so that with the dilation of blood vessels, blood flow will smoothly and efficiently push blood into the heart thereby reducing systolic blood pressure (Potter et al., 2017).

A combination of soak feet with warm water therapy and progressive muscle relaxation can be done because this therapy can maintain the elasticity of arteries. The therapeutic response of warm water foot baths and progressive muscle relaxation in lowering blood pressure is to widen blood vessels. In the process of vasodilation of the blood vessels of the sympathetic nervous system which will temporarily increase blood pressure during response increases the speed and strength of the heart rate and also narrows the majority of arterioles (Ferayanti, 2017); (Khasanah, 2017). Structural and functional changes in the peripheral vascular system of the elderly, one of which is the aorta and large arteries, can reduce the ability to accommodate the volume of blood pumped by the heart

(stroke volume, resulting in decreased cardiac output and increased peripheral resistance. The long-stroke amount will cause diastolic blood pressure to increase (Smeltzer, S. C., Bare, B. G., Hinkle, J.L., and Cheever, 2013).

A combination of soak feet with warm water therapy and progressive muscle relaxation is a natural, inexpensive, safe and comfortable therapy for the elderly. The tools and materials needed are simple and easy to get. Warm water is made sufficient by heating the water with fire and determining the temperature to be achieved by dipping the back of the palm or elbow. The progressive muscle relaxation movement is also easily remembered and performed by the elderly. In the elderly, there is a decline in all bodily functions, one of which is the ability to cleanse toxins and remove substances that are not useful for the body. In this therapy, there is no substance consumed by the elderly, so it is safe for the body. The elderly can carry out this therapy anywhere and anytime. The elderly can also combine therapy with other activities such as watching television or listening to music.

## CONCLUSION

The combination of warm water foot baths and progressive muscle relaxation is effective in reducing systolic and diastolic blood pressure in the elderly who suffer from hypertension. Furthermore, based on the results can be used as a basis for non-pharmacological therapy to reduce blood pressure in people with hypertension in the community.

**Conflict of Interest:** There was no conflict of interest in this study.

**Disclosure:** This study was not a Thesis or Dissertation

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