

# The Effect of Hydrotherapy on Blood Pressure of the Hypertensive Patients in Public Hospital of RA Kartini Jepara

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**Abstract— Background:** Hypertension as a cardiovascular disease with a worldwide cases estimate of 1.39 billion in 2016. RA Kartini Jepara General Hospital in 2015 recorded a total of cases of essential hypertension and other hypertension, as many as 464 among 24,674 cases of non-contagious diseases in the community health centers and hospitals throughout jepara distric. There are some complementary therapies to control and reduce high blood pressure, I.e Warm hydrotherapy is the use of warm water at a temperature of around 40.50 – 43.0 °C. The objective of this research is to know the effect of hydrotherapy on the blood pressure of hypertension patients in the public hospital of RA Kartini Jepara. The research is a quasi experiment with pre-test and post-test administered to non-equivalent control group. There were 20 hypertension patients involved in the research chosen using purposive sampling technique. The respondents in the intervention group were given ±15 minutes hydrotherapy 1 time a day in 5 days, while the respondents in the control group were not given any therapy for 5 days. The instruments of the research were spigmomanometer of mercury and observation sheets. The data was analyzed using parametric statistic of Paired-Samples T Test and Independent-Samples T Test. The results of the research reveal that there is the effect of hydrotherapy on blood pressure, with a difference in the average decrease of systolic blood pressure of 19,000 mmHg and diastolic 4,000 mmHg, with *p*-value of 0.000 for systolic and *p*-value of 0.0443 for diastolic. The researchers conclude that hydrotherapy affects the blood pressure of hyppertensive patients in the public hospital of RA Kartini Jepara.

**Keywords—** blood pressure, hydrotherapy, hypertension.

## I. INTRODUCTION

The total number of deaths caused by cardiovascular diseases worldwide is around 17 million deaths per year. Among them, a complication of hypertension causes 9.4 million deaths every year. Hypertension is rising in some countries with the estimated worldwide prevalence of 1.39 billion cases. [6] In 2013 Basic Health Research Report (Riskesdas), the national prevalence rate of hypertension was 25.8%. If at the

present moment the population of Indonesia is 262,124,458 people, there are 65,048,110 suffering from hypertension. [8] hypertension include in non contagious disease. the prevalence hypertension in jepara regency still occupies the largest proportion of all as reported, which amounts to 57.7%. The second one is occupied by DM by 14.97%. The proportion is almost the same as the proportion in the Central Java Province. In RA Kartini Public Hospital, Jepara Regency, there are 464 among 24,674 cases in the community health centers and hospitals throughout Jepara District. [2]

There are several weaknesses of drug use among patients with hypertension, i.e. adherence as it requires a relatively long time to reduce blood pressure and boredom to consume drugs in long period. However, along with the rapid development of science, several changes in lifestyle help reduce blood pressure through the emergence of various complementary therapies. In fact, for some people, lifestyle changes can eliminate dependence on drugs. [7]

There are some complementary therapies to control and reduce high blood pressure and stress, and improve health, i.e. hydrotherapy, meditation, deep breathing relaxation exercises, and music therapy. [11] Warm soaking hydrotherapy is very easy for everyone, not expensive, and has no harmful side effects. [10]

A preliminary survey conducted on June 2, 2017 collected the data of 404 hypertensive patients in RA Kartini Hospital in Jepara Regency in 2016. Blood pressure measurements were carried out among hypertensive patients in the hospital in which out of 16 patients, there were 7 hypertensive patients with a systolic blood pressure of more than 140 mmHg and a diastolic blood pressure of more than 90 mmHg, with an average blood pressure of 160/90 mmHg. The seven respondents stated that they had pharmacological treatment for hypertension drugs but there were not any significant changes. Those respondents also had no knowledge about hydrotherapy. Based on the survey and background, the researchers were interested to conduct a study entitled "The Effect of Hydrotherapy on the Blood

Pressure of Hypertensive Patients in RA Kartini Public Hospital in Jepara Regency."

**II. METHODS**

This research implemented a quasi-experimental design with a pre-test and post-test to non-equivalent control group. The populations in this study were 38 hypertensive patients hospitalized in the Lotus Room of RA Kartini Public Hospital in Jepara Regency in December 2017. The sample formula is paired with the two-tailed direction, as follows:

$$n = \frac{4a^2 (Z_{crit} + Z_{pwr})^2}{D^2}$$

$$n = \frac{4 \times 0,5^2 (1,960 + 1,645)^2}{0,82}$$

= 20.306 rounded off to 20 respondents.

There were as many as 20 respondents selected using the sampling technique of purposive sampling. The inclusion criteria were that the patients with hypertension were hospitalized at RA Kartini Public Hospital in Jepara Regency, had never received hydrotherapy, had systolic blood pressure of 140-180 mmHg and diastolic blood pressure of 90 -110 mmHg, around the age 34-75 years old, and willing to fill in the informed consent. Meanwhile, the exclusion criteria were that the respondents refused to become respondents, experienced chronic physical and mental disorders such as stroke, hypertension with AMI, heart failure or other complications, and dropped out.

The instruments used in this study included sphygmomanometer of mercury, observation sheet/checklist in the administration of hydrotherapy. The data analysis used the parametric T-Test Test and the Independent-Samples T Test.

This research was conducted in Teratai II and Terati III patient rooms on November 22 to December 12, 2017.

In this study, each individual in the intervention group was given hydrotherapy for ± 15 minutes, 1 time a day for 5 consecutive days, while in the control group the respondents were not given hydrotherapy from the initial observation range (pre-test) to final observation (post-test) for 5 days

**III. RESULT**

**Univariate Analysis**

**a. Blood Pressure before Hydrotherapy in the Intervention and Control Group**

**Table 1. Blood Pressure before Hydrotherapy in the Intervention and Control Group**

Blood Pressure	Mean	SD	Min	Max	(95% CI)	
					Lower	Upper
<b>Intervention Group</b>						
Systolic	165.00	15.811	140	190	153.69	176.31
Diastolic	101.00	9.944	90	120	93.89	108.11
<b>Control Group</b>						
Systolic	158.00	14.757	140	190	147.44	168.56
Diastolic	100.00	10.541	90	120	92.46	107.54

As shown in Table 1, the blood pressure in the intervention group before hydrotherapy was given is an average systolic blood pressure of 165.00 mmHg while the average diastolic blood pressure is 101.00 mmHg. Meanwhile, the result of blood pressure measurement in the control group before initial observation is in average 158.00 mmHg systolic blood pressure while the average diastolic blood pressure is 100.00 mmHg.

**b. Blood Pressure after Hydrotherapy in the Intervention and Control Group**

**Table 2. Blood Pressure after Hydrotherapy in the Intervention and Control Group**

Blood Pressure	Mean	SD	Min	Max	(95% CI)	
					Lower	Upper
<b>Intervention Group</b>						
Systolic	151.00	13.703	130	170	141.20	160.80
Diastolic	92.00	9.189	80	110	85.43	98.57
<b>Control Group</b>						
Systolic	163.00	10.593	150	180	155.42	170.58
Diastolic	95.00	8.498	80	110	88.92	101.08

As depicted in Table 2, the blood pressure in the intervention group after hydrotherapy is 151.00 mmHg systolic blood pressure while the average diastolic blood pressure is 92.00 mmHg.

Meanwhile, the result of blood pressure measurement in the control group after final observation is the systolic blood pressure of 163.00 mmHg while the average diastolic blood pressure is 95.00 mmHg.

**c. Differences in Blood Pressure (Systolic-Diastolic) Before (Pre-Test) and After (Post-Test) in the Intervention Group and Control Group**

**Table 3. Differences in Blood Pressure Before and After in the Intervention Group and Control Group**

N	Average difference s.b.	±	CI 95%		p
			Lower	Up	
TDS Pre-Test : TDS Post-Test Intervention Group	0	14,000 ± 5,164	10,306	17,69	0,000
TDD Pre-Test : TDD Post-Test Intervention Group	0	9,000 ± 11,972	0,436	17,56	0,041
TDS Pre-Test : TDS Post-Test Control Group	0	-5,000 ± 8,498	- 11,079	1,079	0,096
TDD Pre-Test : TDD Post-Test Control Group	0	5,000 ± 10,801	-2,727	12,72	0,177

The systole of the intervention group is p value of 0.000, and the diastole is p values of 0.041.

The control group's systole is  $p$  value of 0.096, and the diastole is  $p$  value of 0.177.

d. Differences in Blood Pressure (Systolic-Diastolic) in the Intervention Group with Hydrotherapy and the Control Group Without Hydrotherapy

Table 4. Differences in Blood Pressure (Systolic-Diastolic) in the Intervention Group with Hydrotherapy and the Control Group without Hydrotherapy

		n	Average difference	CI 95%		$p$
				Lower	Upper	
Systolic Blood Pressure	Without hydrotherapy	10				
	With hydrotherapy	10	19,000	12,393	25,607	0,000*
Diastolic Blood Pressure	Without hydrotherapy	10				
	With hydrotherapy	10	4,000	-6,713	14,713	0,0443*

In Table 5, it is clear that the results of the mean difference in systolic blood pressure is 19,000 with a value of 95% confidence level and the average systolic blood pressure is 12,393 to 25,607, with  $p$  value of 0,000. Meanwhile, the diastolic blood pressure is 4,000 with a value of 95% confidence level, and the average diastolic blood pressure is -6,713 to 14,713, with  $p$  value of 0,0443. Both have  $p$  values  $< \alpha$  (0.05), so  $H_0$  is rejected which means that there is a meaningful difference between the average blood pressure of respondents in the Intervention Group (Systolic-Diastolic) with hydrotherapy and the ones in the Control Group without hydrotherapy

IV. DISCUSSION

There was a mean difference in the systolic blood pressure of 19,000 with  $p$  0.00 and diastolic blood pressure of 4,000 with  $p$  0.0443 in the intervention and control group. There was a clear difference in the blood pressure average difference (systolic-diastolic) after hydrotherapy was given in the intervention group compared to those without hydrotherapy in the control group.

A study conducted by Santoso (2015).revealed that there was a therapeutic effect of warm water foot soak in decreasing blood pressure. The results of the study also showed that warm water foot soak therapy was very significant in decreasing the blood pressure of hypertensive patients with  $p = 0.000$ . [9]

Among patients with hypertension, capillary resistance occurs in the lateral part of the lower limbs, especially the legs. In traditional Chinese medicine, the soles of the feet are the starting and ending points of the six meridians. There are more than 60 acupuncture points on the soles of the feet associated with bile, bladder, stomach, spleen, liver, and kidneys. Soaking the feet in warm water with the temperature of 40.5 - 43°C for 20-30 minutes, in which the

transfer of heat from warm water to the body will cause dilation of blood vessels, can help open clogged meridians, improve blood circulation throughout the body, reduce muscle tension, reduce edema, nourish the heart, eliminate stress, relieve pain, increase capillary permeability, and provide warmth to the body. Thus, it is very useful to reduce blood pressure in cases of hypertension [1]

The respondents were treated with warm water foot soak for 10-15 minutes with the temperature of 32-35°C. Warm water foot soak therapy was carried out with the frequency of once a day in the morning for 5 consecutive days. The therapy had a significant difference in the blood pressure. After the therapy, blood pressure measurement was done again (post-test), and the researchers could see a significant decrease in the blood pressure after the administration of warm water foot soak therapy. [3]

Scientifically, warm water with the temperature of 32-35°C is stated to have a physiological impact on the body. The warmth of the water makes blood circulation smooth. Therefore, hypertensive patients in their treatment not only use drugs but also use non-pharmacological alternatives through easier and cheaper method, i.e. warm water foot soak therapy that can be done at home. Warm water is known to have a physiological impact on the body. Thus, the water can be used in a therapy to restore stiff joint muscles and cure strokes done through awareness and discipline [1].

After soaking feet in warm water with the temperature of 32-35°C for 10-15 minutes, the temperature in the warm water decreases after 6 minutes 25 seconds. In the 5<sup>th</sup> minute, the researchers moved the legs of patients with hypertension to other washbasin containing new warm water at the temperature of 32-35°C to keep the warm water temperature within the standard range of 32-35°C. Thus, during the therapy, the temperature of warm water remained stable and was effective to reduce blood pressure in hypertensive patients [4]

Warmth transfer from the warm water into the body causes blood vessel dilation and decreases muscle tension. Therefore, blood circulation can be launched. It affects arterial pressure through baroreceptors in the sinus corticus and the aortic arch which convey impulses carried by fibers nerves carrying signals from all parts of the body to inform the brain about blood pressure, blood volume and special needs of all organs to the sympathetic nerve center to the medulla so that it stimulates systolic pressure and ventricular muscle strain stimulates the ventricles to immediately contract. [1]

The water level in warm water foot soak therapy is the ankle height of hypertensive patients. The therapy is done in the morning because it is the best time in which the body and nerves are in good condition and the nerves on the feet are more sensitive after resting at night. The warm water foot soak therapy is done for 5 consecutive days because the blood vessels of hypertensive patients experience stiffness, therefore, it takes 5 consecutive days to maintain the elasticity of the blood vessels so that the blood pressure does not increase again [5]

The researchers conclude that although there is an increase in the mean of systolic blood pressure and a decline in the diastolic pressure among the respondents in the control

group, it is not significant. This is because the control group respondents are unable to control the factors that help increase and decrease blood pressure; one of them is emotional stress that can increase peripheral vascular resistance and cardiac output. So, it will stimulate sympathetic nerve activity and the blood pressure will increase.

Although the results of the study show a significant decrease in blood pressure, the respondents still experience other symptoms of hypertension such as dizziness, palpitation, and difficulty in sleeping. Therefore, there needs to be the administration of hydrotherapy for hypertension along with other therapies such as pharmacological therapy, low salt diets, low cholesterol diets, and stress management techniques.

#### ACKNOWLEDGMENT

The researchers do not specifically categorize the types of hypertension into hypertension 1, 2 and 3. The time constraints and observation of patient interventions are not completely controlled; one of the examples is that the family provides food obtained outside of the hospital

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