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The Effect of Combining Hydrotherapy and Sunbathing Therapy on Blood Pressure in Elderly Patients with Hypertension

Muhammad Sodik Hidayatullah[1)], Rudi Hamarno[2)], Nurul Hidayah[3)], Nurul Pujiastuti[4)]

[1-4)] Politeknik Kesehatan Kemenkes Malang, Nursing Department

E - mail: nurul_pujiastuti@poltekkes-malang.ac.id

Abstract: *High blood pressure cannot be ignored as it can lead to complications, particularly hypertension in the elderly. If left uncontrolled, hypertension can result in complications. One non-pharmacological prevention method that is rarely known and applied by the community is complementary therapy, such as hydrotherapy and sunbathing therapy. The purpose of this study is to determine the effect of hydrotherapy techniques (warm water soaking) and sunbathing therapy on managing hypertension in the elderly. The research method used is a quasi-experimental approach with pre-test and post-test in two groups: the treatment group and the control group. Data analysis utilized paired t-test comparison, with a p-value of 0.000, indicating that there is an effect of the combination of hydrotherapy and sunbathing therapy on the blood pressure of elderly patients with hypertension. It is hoped that healthcare professionals will provide education to help prevent increased blood pressure using non-pharmacological therapies, such as the combination of hydrotherapy and sunbathing therapy.*

Keywords: complementary, elderly, hydrotherapy, hypertension, sunbathing therapy

INTRODUCTION

Aging, particularly entering the elderly phase, is a period that can lead to many health issues due to a decline in bodily functions, including physical, psychological, social, and spiritual changes. One common health problem among the elderly is cardiovascular system disorders, which significantly increase the risk of degenerative diseases such as hypertension. High blood pressure cannot be ignored as it can lead to complications. The higher the pressure in the blood vessels, the harder the heart has to work to pump blood. If left uncontrolled, hypertension can cause heart attacks, heart enlargement, and heart failure. Hypertension can also lead to kidney failure, blindness, ruptured blood vessels, and cognitive impairment (WHO 2022).

Therefore, to prevent complications arising from hypertension, proper management must be carried out through both pharmacological and non-pharmacological approaches. One non-pharmacological prevention method that is still very rarely known and applied by the public is complementary therapy, specifically hydrotherapy and sunbathing therapy. Due to the rarity of using complementary therapies, especially hydrotherapy and sunbathing, and based on personal experience, the combination of these two therapies is interrelated. Hydrotherapy (warm water foot soaking) provides a stimulus to the lower extremities of the respondent, while sunbathing therapy affects the upper extremities of the respondent.

The elderly population in Indonesia is increasing each year. Over nearly five decades, the percentage of elderly people in Indonesia has approximately doubled (1971-2020), reaching 9.92 percent (about 26 million), with elderly women being about one percent more than elderly men (10.43 percent versus 9.42 percent). Among all elderly people in Indonesia, the younger elderly (60-69 years) dominate significantly, making up 64.29 percent, followed by the middle-aged elderly (70-79 years) and the older elderly (80+

years) at 27.23 percent and 8.49 percent, respectively. This year, there are already six provinces with an elderly population structure where the elderly make up 10 percent or more of the population: DI Yogyakarta (14.71 percent), Central Java (13.81 percent), East Java (13.38 percent), Bali (11.58 percent), North Sulawesi (11.51 percent), and West Sumatra (10.07 percent). In Malang City, the elderly population stands at 14.20% (Sari et al. 2020).

According to Riskesdas data from 2018, hypertension issues are more prevalent among the elderly, with a prevalence of 45.3% for those aged 45-54 years and 55.2% for those aged 55-64 years (Nurarif and Kusuma 2016). Additionally, based on a preliminary study conducted by the researcher at Puskesmas Arjuno in 2021, the prevalence of elderly hypertension in Malang City, specifically in the working area of Puskesmas Arjuno, revealed 1,400 hypertension patients, with an average of 130 active patients seeking treatment at the health center.

The low number of hypertension patients seeking treatment is due to the fact that hypertension or high blood pressure does not show specific symptoms or signs that can serve as early warnings (Pangribowo, 2019). Therefore, the researcher is interested in studying complementary therapies that are easy to implement and efficient, utilizing readily available natural resources. The therapies in question are hydrotherapy (warm water foot soaking) combined with sunbathing therapy.

Warm water foot soaking is a non-pharmacological therapy that can lower blood pressure. The mechanism by which blood pressure changes after soaking the feet in warm water involves dilating blood vessels, improving blood circulation, and stimulating the nerves in the soles of the feet to function (Astutik and Mariyam 2021).

Sunbathing therapy involves exposing oneself to sunlight in the morning or late afternoon by lying down, sitting, or sleeping under the sun. The benefits of sunlight include maintaining blood circulation and strengthening the cardiovascular system. Sunlight can also stabilize pulse rates, blood pressure, and arteries, and widen open capillaries around the skin. This allows for optimal flow of nutrients and oxygen to the body's cells, which is beneficial in preventing vein thrombosis or blood clots (Pebrisiana, Tambunan, and Baringbing 2022).

Therefore, the researcher is very interested in addressing hypertension in the elderly using the combination of therapies. Nurses, who play the role of educators, are required to frequently remind patients to monitor their hypertension at least once a month to track health developments and prevent complications, especially to minimize the incidence of hypertension each year.

METHODS

The experimental research design used is a quasi-experimental design with a pre-test and post-test approach in two groups. In this study, the researcher divides the subjects into two groups: the treatment group and the control group. In the treatment group, the researcher will administer hydrotherapy and sunbathing therapy, starting with a pre-test by observing blood pressure. After the intervention, a follow-up measurement (post-test) will be conducted. In the control group, a pre-test will involve observing blood pressure. The blood pressure will then be measured again after 15 minutes (post-test), while the elderly participants will be motivated to regularly check their blood pressure.

The population in this study consists of elderly patients in the working area of Puskesmas Arjuno, Malang City. The average number of hypertension patients actively seeking treatment at the health center is 130. The sample size for this study, calculated using Federer's (1963) formula, will include 16 respondents from each group, making a total of 32 respondents.

The sampling technique used in this study is non-probability, specifically purposive sampling. This technique involves selecting samples from the population based on specific criteria determined by the researcher (research objectives/issues), so that the samples can represent the characteristics of the population that are already known (Nursalam 2015).

In this study, the independent variables are warm water foot soaking and sunbathing

therapy, while the dependent variable is blood pressure in the elderly. The research is conducted in the working area of Puskesmas Arjuno, Malang City, with data collection taking place from February to April 2022. The interventions hydrotherapy and sunbathing therapy are carried out according to Standard Operating Procedures (SOP), once every morning for 4 days, with each session lasting 15 minutes. The therapy is performed independently at home. After a week of therapy, nurses will observe the blood pressure and the client's condition and feelings at the end of the treatment period. The instrument used for data collection is an observation sheet for measuring blood pressure before and after therapy.

RESULTS AND DISCUSSION

Based on Table 1, the characteristics of the respondents are as follows: the majority are female, with 20 respondents (62.5%); aged 65-70 years, with 14 people (43.8%); unemployed, with 17 people (53.1%); and have an education level of junior high school, with 11 people (34.3%).

The average systolic blood pressure in the elderly before and after undergoing hydrotherapy and sunbathing therapy

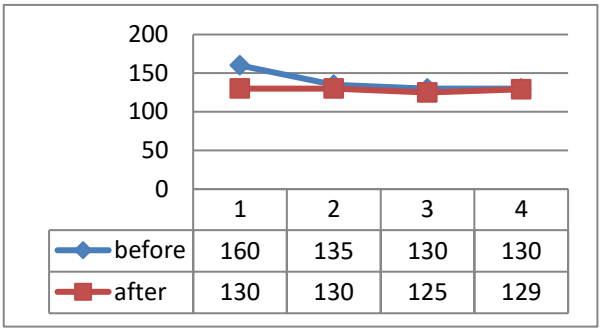

Figure 1. Changes in systolic blood pressure

Based on Figure 1, the average systolic blood pressure in elderly patients with hypertension before undergoing hydrotherapy and sunbathing therapy on day 1 was 160 mmHg. After performing hydrotherapy and sunbathing therapy, the average systolic blood pressure on day 4 was 129 mmHg. This indicates a mean difference of 31 mmHg.

		Treatment Group		Control Group		Total	
		%	Number	%	Number	%	Number
Gender	Male	15,6 %	5	21,9 %	7	37,5%	12
	Female	34,4%	11	28,1 %	9	62,5%	20
					Total	100%	32
Age	65-65 years	21,9 %	7	18,8 %	6	40,7%	13
	65-70 years	21,9 %	7	21,9 %	7	43,8%	14
	70-75 years	6,2 %	2	9,3 %	3	15,5%	5
					Total	100%	32
Job	Work	21,9 %	7	25%	8	46,9%	15
	Not work	28,1%	9	25%	8	53,1%	17
					Total	100%	32
Education	No schooling	6,3 %	2	3,1%	1	9,4%	4
	Elementary school	9,4%	3	15,6%	5	25%	8
	Junior high school	15,6%	5	18,7%	6	34,3%	11
	Senior high school	15,6%	5	9,5%	3	25,1%	8
	Bachelor’s degree	3.1%	1	3,1	1	6,2%	2
					Total	100%	32

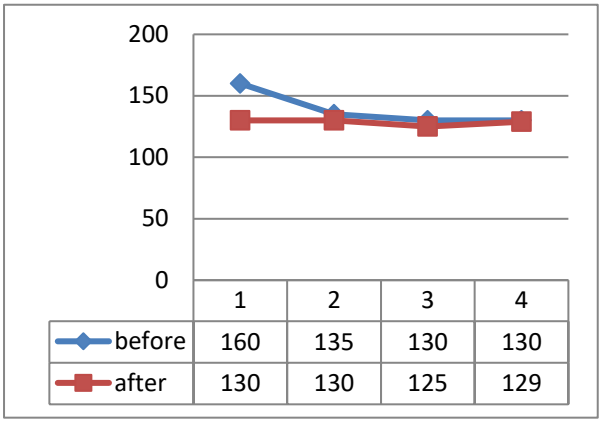

Figure 2. Changes in diastolic blood pressure

Based on Figure 2, the average diastolic blood pressure in elderly patients with hypertension before undergoing hydrotherapy and sunbathing therapy on day 1 was 100 mmHg. After performing hydrotherapy and sunbathing therapy, the average diastolic blood pressure on day 4 was 80 mmHg. This results in a mean difference of 20 mmHg.

Average systolic and diastolic blood pressure in the elderly control group

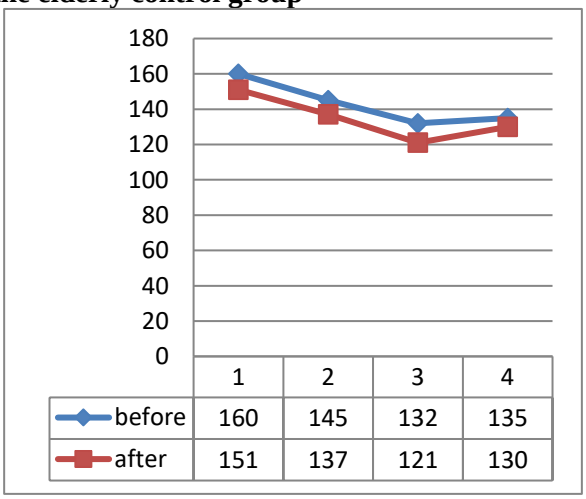

Figure 3. Changes in systolic blood pressure

Based on Figure 3, the average systolic blood pressure in elderly patients with hypertension in the control group on day 1 was 160 mmHg. On day 4, the average systolic blood pressure was 130 mmHg. This results in a mean difference of 30 mmHg.

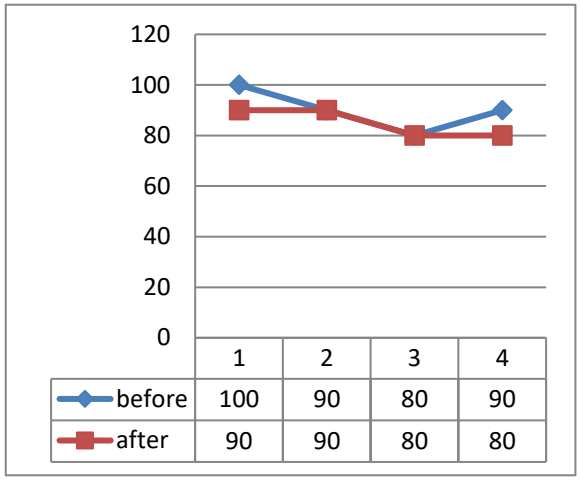

Figure 4. Changes in diastolic blood pressure

Based on Figure 4, the average diastolic blood pressure in elderly patients with hypertension in the control group on day 1 was 100 mmHg. On day 4, the average diastolic blood pressure was 80 mmHg. This results in a mean difference of 20 mmHg.

Analysis of blood pressure changes before and after therapy administration in the treatment group

Table 2. Results of the analysis of blood pressure before and after therapy administration in the treatment group in the working area of Puskesmas Arjuno, Malang City, from April 21 to May 4, 2022.

Treatment	N	Mean	Diff	t	Sig.(2-Tailed)
Systolic before	16	151,69	28,25	90.420	
Systoli after	16	123,44		119,532	0,000
Diastolic before	16	93,13	11,19	82,238	0,000
Diastolic after	16	81,94		168,224	

Based on Table 2, the paired t-test analysis data for systolic and diastolic blood pressure shows a sig-(2-tailed) value of 0.000, indicating that there is an effect of the treatment on systolic blood pressure before and after the intervention in the respondents. This shows that the intervention significantly affected systolic blood pressure by 28.25 mmHg in 16 respondents, and diastolic blood pressure significantly by 11.19 mmHg.

Analysis of blood pressure changes before and after in the control group

Table 3. Results of the blood pressure analysis in the control group in the working area of Puskesmas Arjuno, Malang City, from April 21 to May 4, 2022.

Group	**N**	Mean	Sig.(2-Tailed) sig.	Uji Statistik
Treatment	16	123,44	0,000	Independent sample t-test
Control	16	144,31	0,000	

Based on the data in Table 3, the simple paired t-test analysis for systolic and diastolic blood pressure shows a sig-(2-tailed) value of 0.000, indicating that there is an effect on systolic blood pressure before and after without any treatment in the respondents. This shows that, even without treatment or intervention, there was a significant effect on systolic blood pressure by 6.13 mmHg in 16 respondents, and on diastolic blood pressure by 4.56 mmHg in the working area of Puskesmas Arjuno.

Comparison analysis of systolic and diastolic blood pressure between the treatment group and the control group

Table 4. Results of the comparison analysis of systolic blood pressure between the treatment group and the control group in the working area of Puskesmas Arjuno, Malang City, from April 21 to May 4, 2022.

Group	**N**	Mean	Sig.(2-Tailed) sig.	Uji Statistik
Treatment	16	81,94	0,000	Independent sample t-test
Control	16	86,88	0,000	

Based on Table 4, it can be concluded that the average systolic blood pressure for the treatment group is 123.44 mmHg, and for the control group, it is 103.3 mmHg. After comparing the average systolic blood pressure between the treatment and control groups, the sig-(2-Tailed) result was 0.000 < 0.05, indicating a significant difference in the average systolic blood pressure between the treatment and control groups.

Table 5. Results of the comparison analysis of diastolic blood pressure between the treatment group and the control group in the working area of Puskesmas Arjuno, Malang City, from April 21 to May 4, 2022.

Treatment	N	Mean	Diff	t	Sig.(2-Tailed)
Systolic before	16	150,44	6,13	83,882	
Systoli after	16	144,31		92,085	0,000
Diastolic before	16	91,44	4,56	73,649	0,000
Diastolic after	16	86,88		103,299	

Based on Table 5, it can be concluded that the average diastolic blood pressure for the treatment group is 81.94 mmHg, and for the control group, it is 86.88 mmHg. After comparing the average diastolic blood pressure between the treatment and control groups, the sig-(2-Tailed) result was 0.000 < 0.05, indicating a significant difference in the average diastolic blood pressure between the treatment and control groups.

Identification of changes in systolic and diastolic blood pressure in the treatment group

Based on the research results for the treatment group, the average systolic blood pressure before treatment was 160 mmHg, and after treatment, it decreased by 31 mmHg, resulting in a systolic blood pressure of 129 mmHg. Meanwhile, the average diastolic blood pressure before treatment was 100 mmHg, and after treatment, it decreased by 20 mmHg, resulting in a diastolic blood pressure of 80 mmHg.

The results of this study are consistent with the research conducted by (Yati et al. 2021). Based on the blood pressure measurements carried out by the researchers on 31 respondents with hypertension, 28 respondents experienced a reduction in blood pressure after undergoing warm foot bath therapy, while 3 respondents did not experience any reduction. Another opinion, according to Price (2009), suggests that one factor affecting blood pressure reduction is gender; however, clinically, there is no significant difference. Besides gender, another factor influencing blood pressure is age.

Similarly, for sunbathing therapy, the findings are consistent with the research by (Wahyuni, Harun, and Nurhidayat 2019) on the effects of sunbathing therapy, where before the treatment, the average systolic blood pressure was 153.00 mmHg and diastolic blood pressure was 95.50 mmHg. After the treatment, the average systolic blood pressure was 147.50 mmHg and diastolic blood pressure was 91.00 mmHg. The results showed that among the systolic measurements, 14 respondents (70%) experienced a reduction in blood pressure, while 6 respondents (30%) had no change. There was no increase in blood pressure. For diastolic blood pressure, 12 respondents (60%) experienced a reduction, 8 respondents (40%) had no change, and no respondents experienced an increase.

Abnormal blood pressure observed in respondents before therapy is due to factors that contribute to hypertension, such as physical weakness, decreased elasticity of the aortic wall, thickening and stiffening of valves, reduced heart pumping strength, and loss of blood vessel elasticity. If blood pressure issues are left unaddressed, they can lead to complications. Therefore, hydrotherapy and sunbathing therapy, provided by the researchers, serve as preventive measures against complications arising from abnormal blood pressure. The combination of hydrotherapy and sunbathing therapy has a significant positive impact on blood pressure.

The combination of these therapies is interrelated, where sunbathing therapy affects the upper extremities of the respondents, while hydrotherapy impacts the lower extremities. Thus, this combined therapy is a good non-pharmacological approach for respondents to prevent hypertension, especially considering that the average age of respondents is 65-70 years, a period where organ function declines and additional health support is needed for the elderly. The combined therapy was applied for 15 minutes once a day, tailored to elderly respondents, as per the researchers' implementation.

Identification of changes in systolic and diastolic blood pressure in the control group

Based on the research results for the control group, the average systolic blood pressure before the test (pretest) was 160 mmHg, and it decreased by 30 mmHg after the test (posttest), resulting in a systolic blood pressure of 130 mmHg. Meanwhile, the average diastolic blood pressure before the test (pretest) was 100 mmHg, and it decreased by 20 mmHg after the test (posttest), resulting in a diastolic blood pressure of 80 mmHg.

In health care training research, factors influencing hypertension are categorized into two main groups: immutable factors such as gender, age, and genetics, and modifiable factors such as diet, exercise habits, and others (Yati et al. 2021).

The difference between the control group and the treatment group is that the control group only received health education about the combination therapy of hydrotherapy and sunbathing. The purpose of this education was to increase the respondents' understanding of managing blood pressure issues. However, based on the research results, blood pressure changes in the control group were observed due to lifestyle changes following the education. Since the researchers did not directly supervise the interventions, it is likely that if the therapy was carried out independently, there would still be differences in both quality and quantity compared to the interventions supervised by the researchers.

Additionally, the implementation of this combined therapy is influenced by educational factors. According to Notoadmojo, higher education levels can affect respondents' knowledge and behavior. This was evident in the control group, where 18.3% had a junior high school education. Thus, when given education on the combined therapy of hydrotherapy and sunbathing as hypertension prevention, the respondents could easily understand and perform the therapy independently, even without researcher supervision. The results showed that the independently performed therapy had only slight differences compared to the treatment group. Another factor influencing blood pressure changes in the control group is lifestyle habits, specifically the use of antihypertensive

medication. The habit of taking antihypertensive medication is one factor affecting blood pressure changes and is a lifestyle aspect that researchers could not control during the study.

Analysis of changes in systolic and diastolic blood pressure in the treatment group

Based on the paired t-test analysis data for systolic and diastolic blood pressure in the treatment group, the sig-(2-tailed) value was 0.000, indicating a significant effect on systolic blood pressure before and after the treatment in the respondents.

Warm foot soaking therapy is a non-pharmacological approach that can lower blood pressure. The benefits of warm foot soaking therapy include alleviating fever, relieving pain, improving fertility, reducing fatigue, enhancing the immune system, and also promoting better blood circulation (Astutik and Mariyam 2021).

According to the research conducted by (Yayuk Wijayanti, M. Fatkhul Mubin 2018), one of the benefits of sunbathing is that it helps maintain blood circulation and strengthens the cardiovascular system. Sunlight can stabilize pulse, blood pressure, and arteries, and it dilates capillaries in the skin, allowing nutrients and oxygen to flow efficiently to body cells.

The recommended combination therapy for the elderly is a non-pharmacological approach that is very easy and efficient for respondents to access, as both therapies involve readily available resources such as hot water and sunlight. The reason researchers recommend non-pharmacological therapies is not only due to their ease of use but also because these therapies have a lower risk of complications compared to pharmacological therapies.

The changes in blood pressure observed in the treatment group are attributed to the therapy provided, which involves a combination of hydrotherapy and sunbathing therapy, targeting blood pressure in the elderly in the working area of Puskesmas Arjuno, Malang City.

Analysis of changes in systolic and diastolic blood pressure in the control group

Based on the data in Table 4.6, the simple paired t-test analysis for systolic and diastolic blood pressure shows a sig-(2-tailed) value of 0.000, indicating a significant effect on systolic blood pressure before and after, even without any treatment for the respondents.

The changes in blood pressure are dependent on the individual's physical condition and lifestyle behavior. Hypertension is defined as abnormally high blood pressure, which should be measured at least on three different occasions. A person is considered to have hypertension if their blood pressure is higher than 140/90 mmHg (Nurarif and Kusuma 2016).

The causes of hypertension in elderly individuals include changes such as decreased elasticity of the aortic wall, thickening and stiffening of heart valves, reduced heart pumping ability leading to decreased contraction and volume, and loss of blood vessel elasticity. These issues arise from reduced effectiveness of peripheral blood vessels for oxygenation and increased resistance in peripheral blood vessels (Nurarif and Kusuma 2016).

The changes in blood pressure in the treatment group show a clear effect due to the intervention provided. In contrast, the changes in blood pressure in the control group result from changes in the respondents' behavior themselves. However, based on the respondent characteristics data in the control group, blood pressure changes are influenced by several supporting factors, such as education level (with most having junior high school education) and age (21.9% are between 65-70 years old). This age range aligns with the WHO definition of elderly, a period where organ function declines.

After providing the intervention and education by the researchers, blood pressure that was initially abnormal became normal due to lifestyle changes in the respondents aimed at preventing increased blood pressure, thanks to the applied education. The combination therapy works by providing external stimuli that positively influence the functioning of the body organs, thereby impacting changes in the respondents' blood pressure.

Analysis of the effects of hydrotherapy and sunbathing therapy in managing hypertension in the elderly

Based on the results of the independent test, it can be concluded that the average systolic blood pressure in the treatment group is 123.44 mmHg, while in the control group it is 103.3 mmHg. After comparing the average systolic blood pressure between the treatment and control groups, the significance test result (2-Tailed) was 0.000 < 0.05, indicating a significant difference in the average systolic blood pressure between the two groups.

Meanwhile, the average diastolic blood pressure in the treatment group is 81.94 mmHg and in the control group is 86.88 mmHg. After comparing the average diastolic blood pressure between the treatment and control groups, the result of the significance test (2-Tailed) was 0.000 < 0.05, indicating a significant difference in the average diastolic blood pressure between the two groups.

Soaking feet in warm water is part of hydrotherapy, formerly known as hydropathy, which is a method of treatment using water to alleviate or treat painful conditions. It is a low-tech therapeutic approach that relies on the body's responses to water (Pratiwi 2018). Research on sunbathing therapy also aligns with previous studies, as (Hardianti, Nisa, and Wahyudo 2018) found that blood pressure after sun exposure showed a decrease in 20 respondents.

The changes in blood pressure in the treatment group showed significant changes until the end of the study compared to the control group. The blood pressure changes observed in the treatment group were due to the intervention provided to the respondents, which included the combination therapy administered by the researcher, resulting in outcomes consistent with previous studies. In contrast, the control group received only educational intervention, but also experienced changes in blood pressure. These changes in the control group may have been due to lifestyle changes of the respondents, such as medication habits and the implementation of combination therapy without the researchers' knowledge. Therefore, the final results of the control group showed only a slight difference compared to the treatment group after receiving education on complementary therapy, specifically non-pharmacological therapy useful for managing hypertension in the elderly.

CONCLUSIONS

The average systolic and diastolic blood pressure in the elderly treatment group decreased after receiving a combination of hydrotherapy and sunbathing therapy. Meanwhile, the average systolic and diastolic blood pressure in the elderly control group also decreased, although without receiving the combination of hydrotherapy and sunbathing therapy.

The analysis of changes in systolic and diastolic blood pressure in the treatment group showed significant changes due to the combination of hydrotherapy and sunbathing therapy. On the other hand, the analysis of changes in systolic and diastolic blood pressure in the control group also showed significant changes, even without the combination of hydrotherapy and sunbathing therapy.

The analysis of the effect of the combination of hydrotherapy and sunbathing therapy on the treatment group showed a greater effect on systolic and diastolic blood pressure compared to the control group.

CONFLICT OF INTEREST STATEMENT

There is no conflict of interest.

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