THE EFFECT OF ISOMETRIC HANDGRIP EXERCISE ON BLOOD PRESSURE IN ELDERLY WITH HYPERTENSION

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ABSTRACT

Hypertension is one of the most common non-communicable diseases in the elderly and can lead to serious complications if left uncontrolled. One of the non-pharmacological interventions proven to lower blood pressure is isometric handgrip exercise in elderly with hypertension. This study aimed to determine the effect of isometric handgrip exercise on blood pressure in elderly with hypertension. The research method was a quasi-experimental design with a non-equivalent control group approach. The total sample was 50 elderly with hypertension, divided into an intervention group and a control group. The intervention involved isometric handgrip exercise for 3 weeks. The study showed a decrease in mean systolic blood pressure of 7.84 mmHg and diastolic blood pressure of 3.84 mmHg in the intervention group. In contrast, in the control group, the mean systolic blood pressure decreased by only 1.24 mmHg, and the mean diastolic blood pressure increased by 2.36 mmHg. Isometric handgrip exercise has a significant effect on lowering blood pressure in elderly with hypertension, and thus it can be used as a nonpharmacological method, both in healthcare facilities and in the community.

Keywords*:Hypertension; Elderly; Isometric Handgrip Exercise;*

INTRODUCTION

Degenerative diseases are chronic diseases that last for years and can affect a person's quality of life and productivity, if the proportion of the elderly population increases, the incidence of degenerative or non-communicable diseases will also increase (Safitri et al., 2024). According to the WHO, the number of elderly people aged 65 and over will triple by 2023. Data shows that the number rose from 260 million in 1980 to 761 million or more in 2021. According to the Central Statistics Agency (BPS), the prevalence of elderly people in Indonesia was 10.82% in 2021, and will increase to 11.75% in 2023.

One of the most common non-communicable diseases in the elderly is hypertension (Mighra & Djaali, 2020). Hypertension is a disease that sometimes does not cause symptoms, but when blood pressure increases or is uncontrolled, it can lead to complications, such as stroke. This is why this disease is often referred to as a silent killer (Fitria & Prameswari, 2021). According to the WHO, hypertension is the leading cause of death worldwide in 2023, with an estimated 1.28 billion people aged 30-79 years old. Most cases occur in low- and middle-income countries, with Southeast Asia ranking third with a prevalence of approximately 25% of the total population (Hintari & Fibriana, 2023).

Hypertension management is carried out pharmacologically, using antihypertensive drugs, and non-pharmacologically. One non-pharmacological management method that can be used in hypertension patients is Isometric Handgrip Exercise, which is useful for lowering resting systolic and diastolic blood pressure in hypertensive patients (Hartini, 2022). This exercise involves gripping and contracting the forearm muscles without involving any joints (Prastiani et al., 2023). Research conducted by Veralia et al., (2023) found that the intervention group performed Isomeric Handgrip Exercise for 10 days and took antihypertensive medication, while the control group only took antihypertensive medication without exercising. The intervention group showed an average reduction in systolic blood pressure of 14 mmHg and diastolic blood pressure of 10 mmHg. In the control group, the reduction in systolic blood pressure was only 4 mmHg and diastolic blood pressure by 10 mmHg. Consistent with research conducted by Prastiani et al., 2023, an intervention involving isometric handgrip exercises performed for five consecutive days with a duration of three minutes per session demonstrated that isometric handgrip exercises were effective in reducing systolic and diastolic blood pressure in patients with stage 1 hypertension. Furthermore, research conducted by Hartini (2022) showed an average reduction in blood pressure among respondents who performed the exercises 12 times over four weeks, with an average of 12.5/9 mmHg. Based on preliminary

survey data obtained on January 14, 2024, in the Pancur Batu District, North Sumatera Province, there was 389 elderly people with hypertension were recorded in 2022. This number increased to 437 elderly people with hypertension in 2023, and increased again in 2024. There were 3,808 elderly people with hypertension, and the prevalence of hypertension was 15.94%. This means there were 608 elderly people with hypertension. Only 122 of them were regularly taking antihypertensive medication. Interviews with 10 elderly people with hypertension revealed that they had never performed isometric handgrip exercises to lower their blood pressure. With this therapy, it is hoped that the incidence of hypertension in the elderly will decrease by 2025. Based on the above background, the author needs to conduct research on "The Effect of Isometric Handgrip Exercise on Blood Pressure in Elderly with Hypertension in Pancur Batu District.

METHOD

This study was quantitative with a non-equivalent control group design. Respondents were elderly with grade I and II hypertension in the Tuntungan Community Health Center in Pancur Batu District. A purposive sample size of fifty individuals was selected. Respondents were divided into two groups: 25 in the intervention group and 25 in the control group.

Prior to the Isometric Handgrip Exercise (IHE) intervention, blood pressure measurements were taken in both groups. The intervention group then underwent IHE three times a week for four weeks. After three weeks, blood pressure measurements were repeated in both groups.

RESULTS AND DISCUSSION

This study was conducted on 50 elderly respondents with hypertension. This study aimed to examine the effect of isometric handgrip exercise on lowering blood pressure in elderly with hypertension. The results of the study and data processing are as follows:

Table 1. Respondent characteristic

Variables	Intervention Group		Control Group	
	f	%	f	%
Age (years):				
- 55-59	3	12,0	6	24,0
- 60-64	10	40,0	11	44,0
- 65-69	5	20,8	3	12,0
- ≥ 70	7	28,0	5	20,0
Sex :				

- Male	5	20,0	8	32,0
- Female	20	80,0	17	68,0
Education :				
- Junior High School	9	36,0	6	24,0
- Senior High School	16	64,0	19	76,0
Total	25	100,0	25	100,0

The majority of respondents in this study were in the 60–64 age group, 40% in the intervention group and 44% in the control group. These findings indicate that the elderly are the most prevalent group experiencing hypertension. With age, physiological changes occur, such as decreased blood vessel elasticity, increased arterial stiffness, and decreased vascular endothelial function, which contribute to increased blood pressure. These results align with research by Suryaman and Mahmud (2023), which found that the 60–69 age group was the most prevalent group experiencing hypertension. This is likely because at this age, cumulative risk factors such as lifestyle changes, decreased physical activity, and unhealthy dietary habits have been in place for a long time, increasing the risk of hypertension. Therefore, age is a significant determinant of hypertension in the elderly.

Based on gender, the results of this study indicate that the majority of respondents were women, 80% in the intervention group and 68% in the control group. This predominance of female respondents aligns with the research findings of Amalia and Sjarqiah (2022), which stated that hypertension among elderly patients at the Jakarta Islamic Hospital in Sukapura was predominantly female. This can be explained physiologically, as women, especially after menopause, experience a decrease in estrogen levels, which protect blood vessel elasticity. This decrease in hormones increases the risk of hypertension in elderly women compared to men. In addition to biological factors, the tendency of elderly women to more regularly undergo health check-ups at health care facilities is also a contributing factor to the higher hypertension detection rate in this group. Therefore, gender factors need to be taken into account in efforts to prevent and control hypertension in the elderly.

Based on education level, the majority of respondents had a high school education, namely 64% in the intervention group and 76% in the control group. Education level is closely related to their understanding of health information, including hypertension management. Elderly people with higher levels of education typically have a better understanding of the importance of blood pressure control and following medical advice.

Table 2. Classification of blood pressure before and after intervention

Classifivation of Blood Presure	Baseline		First Week		Second Week		Third Week	
	f	%	f	%	f	%	f	%
Intervention Group								
- Pre-Hypertension	0	0,0	0	0,0	2	8,0	10	40,0
- Grade-I -hypertension	12	48,0	18	72,0	18	72,0	14	56,0
- Grade-II hypertension	13	52,0	7	28,0	5	20,0	1	4,0
Control Group								
- Pre-Hypertension	0	0,0	0	0,0	0	0	0	0,0
- Grade-I -hypertension	11	44,0	15	60,0	9	36,0	18	72,0
- Grade-II hypertension	14	56,0	10	40,0	16	64,0	7	28,0
Total	25	100	25	100	25	100	25	100

Based on Table 2, it can be seen that there were differences in the pattern of changes between the intervention and control groups during the three-week observation period. In the intervention group, before the isometric handgrip exercise, all respondents were in the grade-I hypertension (11 (44.0%) respondents), and grade-II hypertension (14 (56.0%). However, after the intervention was implemented regularly, a positive shift occurred. In second week, pre-hypertension began to emerge, with 2 (8.0%) respondents, increasing significantly to 10 (40.0%) respondents in third week. Meanwhile, the proportion of respondents with grade-I hypertension remained high in first and second week at 18 (72.0%), but began to decrease in third week to 14 (56.0%). Then, the category of grade-II hypertension experienced a significant decrease, from 13 (52.0%) respondents to 1 (4.0%) respondent in third week.

Conversely, in the control group, which did not receive the intervention, there was no significant improvement in blood pressure. Not a single respondent fell into the pre-hypertension category from the beginning to the end of the observation period. The proportion of grade-I hypertension increased from 11 (44.0%) to 15 (60.0%) in second week , then decreased in second week to 9 (36.0%) respondents, and increased in third week to 18 (72.0%). Meanwhile, grade-II hypertension experienced a change, from 14 (56.0%) to 10 (40.0%) respondents, then increased to 16 (64.0%) and finally decreased to 7 (28.0%) in the third week.

Research conducted by (Muli et al., 2020) in Germany also reported that the majority of elderly people aged 60-94 years had systolic blood pressure in the grade 1 hypertension range. This similarity reinforces the fact that grade 1 hypertension is a common condition in the elderly, making it important to monitor and manage it early to prevent progression to more severe hypertension.

This study found that high blood pressure, or hypertension, in the elderly is caused by several factors, including age, stress, lifestyle factors such as lack of physical activity, and a family history of the disease. Therefore, the implementation of isometric handgrip exercise interventions needs to be monitored and carried out regularly to help lower blood pressure towards normal values.

Table 3. Differences in systolic blood pressure before and after isometric handgrip exercise

Sytolic blood pressure	Mean	SD	p-value
Intervention Group			0,000
- Before	151,36	8,8	
- After	143,52	7,5	
- Mean Differences	7,84	4,1	
Intervention Group			0,000
- Before	154,64	8,9	
- After	153,40	7,1	
- Mean Differences	1,24	6,1	

The paired t-test showed that systolic blood pressure in the intervention group before isometric handgrip exercise was 151.36 mmHg, and after isometric handgrip exercise it was 143.52. Therefore, there was a mean difference of 7.84 with a standard deviation of 4.1. The paired t-test statistic yielded a p-value of 0.000, concluding that isometric handgrip exercise has an effect on sistolic blood pressure in elderly with hypertension. Meanwhile, systolic blood pressure in the control group before exercise was 154.64 mmHg, and after (without treatment) it was 153.40. Therefore, there is a mean difference of 1.240 with a standard deviation of 6.1 and the paired t-test yielded a p-value of 0.000. This showed that the reduction in systolic blood pressure was more significant in the intervention group.

This research aligns with a study by (Javidi et al., 2022) involving isometric handgrip exercise for 8 weeks. The results showed a reduction in systolic blood pressure of 15.5 mmHg and diastolic blood pressure of 5 mmHg. Furthermore, in line with research (Hartini, 2022), there was a difference in the average blood pressure of respondents before and after the intervention, with an average difference of 12.5/9 mmHg and a p-value of 0.005, indicating a significant decrease in blood pressure after the intervention.

Table 4. Differences in diastolic blood pressure before and after isometric handgrip exercise

Diastolic blood pressure	n	p-value
Intervention Group		0,000
- Negatif ranks	21	
- Positif ranks	1	
- Ties	3	
Intervention Group		0,081
- Negatif ranks	5	
- Positif ranks	13	
- Ties	7	

Based on Table 4, the results of the Wilcoxon signed-rank test showed that in the intervention group, the majority of respondents (84%) experienced a statistically significant decrease in diastolic blood pressure (p = 0.000), while in the control group, there was no difference in diastolic blood pressure before and after isometric handgrip exercise (p= 0.081). This study aligns with (Veralia et al., 2023)'s findings that isometric handgrip exercise can lower blood pressure and improve comfort in pre-elderly and early-elderly individuals. Using a 10-day intervention and control group design, the study demonstrated a 5.63% reduction in diastolic blood pressure.

Isometric handgrip exercise increases muscle contraction activity, which can affect the circulatory system. This activity increases muscle tone and controlled peripheral resistance, which can trigger changes in the cardiovascular system. This adaptation stimulates vasodilation, increasing blood return to the heart, and reducing sympathetic nervous system activity. This condition causes a gradual decrease in blood pressure, especially with regular exercise.

Therefore, the more consistently someone performs isometric handgrip exercise, the greater the likelihood of a decrease in systolic and diastolic blood pressure in elderly hypertensive patients.

CONCLUSION

The difference in mean systolic blood pressure rankings in the intervention group was higher (Mean Rank = 33.74; Sum of Ranks = 843.50) compared to the control group (Mean Rank = 17.26; Sum of Rank = 431.50). This indicates a statistically significant difference between the

groups. Therefore, it can be concluded that isometric handgrip exercise has an effect on blood pressure in elderly hypertensive patients.

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