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The effect of elderly gymnastics on mean arterial pressure (MAP) in the elderly with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency

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ABSTRACT

Introduction: Hypertension is a disease characterized by increased blood pressure. This disease is common in the elderly due to decreased physical strength and function as they age. Basic health research in 2018 found that hypertension is the number one cause of death in Indonesia. Yogyakarta has a prevalence of 32.86% while the >65-year-old age group dominates at 64.78%. Data from the Public Health Office for the district with the highest incidence of hypertension is Sleman, with a total of 138,702 cases. Therefore, prevention and ways to control hypertension in the elderly need to be done, one of which is by changing behavior to be healthier, such as simple sports activities, such as elderly gymnastics. Elderly gymnastics can help widen blood vessels to maintain blood pressure stability.

Methods: The research method used a quantitative pre-experimental design with a one-group pretest-posttest design approach. Measurement of mean arterial pressure (MAP) was carried out before elderly gymnastics on the first day of gymnastics and measured again on the last day after gymnastics was completed. The sample used was total sampling, a total of 36 patients who met the inclusion criteria. Statistical tests used the Wilcoxon test because the data distribution was not normal.

Results: The results showed that the average Mean Arterial Pressure (MAP) score before elderly gymnastics was 116.15 mmHg, and after elderly gymnastics was found to decrease to 104.68 mmHg. Based on the results of the Wilcoxon test, the p-value is 0.000 (<0.05).

Conclusion: There is a significant effect of elderly gymnastics on the mean arterial pressure (MAP) of elderly people with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency.

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INTRODUCTION

Data from the Prambanan Health Center, the results of the last preliminary study data in 2024, showed that the number of people with hypertension was 4,392 people. Reinforced by the results obtained, Gayamharjo Village has never held Elderly Gymnastics. Researchers conducted a preliminary study by interviewing *posbindu* (integrated post for NCD screening) cadres in Gayam Hamlet on February 29, 2024. The findings revealed that Gayam Hamlet has an active *posyandu* (integrated health service post), and a high number of elderly residents in the area suffer from hypertension. Based on the data obtained, the number of elderly is 102 elderly and 52 people (53.04%) of them suffer from hypertension, with an age range of 60 - 93 years. In addition, it is also said that there has never been research and elderly exercise programs until now. Reinforced by the statement of one of the elderly in Gayam Hamlet who said that they had never participated in the elderly gymnastics program in their hamlet, and did not routinely take anti-hypertensive drugs, only when there were symptoms. Based on the results of the interview, it is known that the elderly lack physical activity because their daily activities only take care to household chores and sometimes farming. Therefore, high blood pressure disease is a global health problem that needs special attention because it can cause death, especially in developed and developing countries.[1]

If left untreated, hypertension can lead to complications from various diseases and may result in death.[2] One form of simple physical activity that can be done by the elderly to reduce hypertension rates is an exercise by the Indonesian Ministry of Health program in the 2017 Healthy Community Movement.[3] Exercise can be an additional therapy for people with hypertension in controlling blood pressure

because it can increase the elasticity of blood vessels.[4] One of the easiest forms of exercise that can be performed by the elderly is elderly gymnastics. Elderly gymnastics is an exercise that has benefits for the elderly because it can help maintain stable blood pressure.[5]

Based on the results of previous studies, there is a significant effect of giving elderly gymnastics on lowering blood pressure in the elderly with hypertension.[4,6,7] The difference between this study and previous studies is that it was conducted on the elderly population aged >60 years old with hypertension in a different location in Gayam Hamlet, Prambanan District, Sleman Regency, who had never received elderly gymnastics. This study aims to determine the effect of elderly gymnastics on the mean arterial pressure (MAP) of elderly hypertension in Gayam Hamlet, Prambanan District, Sleman Regency.

METHOD

Research design

This study uses quantitative methods with a pre-experimental design approach and a one-group pre-test post-test design approach. In this study, pre-test data will be collected by measuring the sample's blood pressure before being given elderly gymnastics on the first day of gymnastics to determine the initial condition and after the third intervention on the last day of gymnastics given a fifteen-minute break after gymnastics followed by a post-test by measuring blood pressure again to find out if there is a significant difference.

Population and sample

The population in this study was elderly people with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency, as many as 50 people, because two people died in May 2024. The sampling technique used was non-probability using total sampling. The final sample used in the study amounted to 36 respondents who had been adjusted to the inclusion and exclusion criteria. There were two respondents with asthma, two respondents with heart disease, one respondent with a leg fracture, and five respondents with dementia and old age. A total of 10 respondents were not included in the criteria as research respondents. In the implementation, one respondent found blood pressure >200 before the elderly gymnastics, and one respondent was sick, so he could not attend the second day of gymnastics activities. At the same time, two respondents refused to be respondents because there was an activity.

Data collection techniques and instruments

Data collection was carried out by observing blood pressure before the first day of gymnastics and after the last day, by giving a fifteen-minute break before being measured again. Researchers contacted expert gymnastics instructors by showing proof of training certificates to help researchers provide gymnastics. The gymnastics used in this study are according to *Menpora* 2020 with the attached gymnastics procedure. The movement procedure in elderly gymnastics starts from warm-up movements, stretching, and core gymnastics to cooling down. The purpose of warming up is so that the elderly can prepare themselves physically to carry out gymnastics. Stretching is performed to improve blood circulation and prevent injuries. The core movement contains movements that are assembled according to the exercise program, consisting of movements starting from the head, upper extremities, and lower extremities, ending with a cooling movement so that the body condition returns as before the exercise. The data collection tools included a clinically validated Omron digital sphygmomanometer with two calibration tests, demographic data questionnaires, blood pressure measurement observation sheets, Standard Operating Procedures (SOPs) for blood pressure measurement, and SOPs for elderly gymnastics. The research was conducted on May 6, 8, and 10, 2024, from seven to half past nine in the morning at the Manggis Elderly *Posyandu* in Gayam Hamlet.

Data analysis

Univariate analysis to determine data on respondents' characteristics (age, gender, education level, occupation, duration of hypertension). A normality test was conducted before bivariate analysis between variables, with the results of abnormal distribution ($p<0.05$). Because the data was not normally distributed, a non-parametric test was conducted between variables using the Wilcoxon statistical test.

Ethical clearance

This study was conducted after obtaining research ethical approval. The ethical approval number is 035/KEPK/IV/2024 issued by KEPK STIKes Guna Bangsa.

RESULT

Characteristics of respondents

Table 1 shows the characteristics of respondents based on age in the elderly with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency, almost entirely in the elderly category (60-74 years), totaling 33 people (90.7%). Most of the respondents are female, with a total of 26 people (72.2%). Most respondents have had hypertension for 1-3 years, with a total of 18 people (50%).

Statistical test of the effect of elderly gymnastics on elderly MAP with hypertension

The results of the Wilcoxon signed-rank test, used to compare two related samples with numerical data that were not normally distributed, showed a p-value of 0.000 ($p < 0.05$). This indicates a significant difference in MAP scores before and after the elderly exercise intervention.

DISCUSSION

Characteristics of respondents

The findings indicate that the majority of respondents with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency were in the elderly age category (60–74 years), totaling 33 individuals (90.7%). Other research shows that the majority of elderly hypertension are aged 60-74 years.[8,9] Both physiological changes, such as decreased vascular elasticity, and unhealthy lifestyle factors, including high-fat diets, excessive sodium intake, and smoking influence hypertension in the elderly. Age remains an inevitable risk factor for elevated hypertension rates.

The results showed that most of the respondents' gender was female, with a total of 26 people (72.2%). Other research shows the results of hypertension

Table 1. Characteristics of respondents in Gayam Hamlet, Prambanan District, Sleman Regency, 2024

Characteristics Respondents	Category	frequency (n=36)	Percent (%)
Age	Elderly (60-74)	33	90.7
	Old (75-90)	3	8.3
Gender	Male	10	27.8
	Female	26	72.2
Duration of hypertension	<1 year	7	19.4
	1-3 years	18	50
	>3 years	11	30.6

Source: Primary Data May 2024

Table 2. Wilcoxon statistical test

Category	n	Mean ± SD	P value
MAP before elderly gymnastics	36	116.15 ± 12.94	0.000
MAP after elderly gymnastics	36	104.68 ± 13.46	

Source: Primary Data May 2024

experienced by many women, with a total of 83 people (64.8%).[10] Hormonal changes in women who experience menopause cause an increase in blood pressure. In addition to hormonal changes, there are other factors that women experiencing hypertension more often, namely due to poor behavior such as stress, unhealthy eating and drinking, and lighter physical activity than men. From a physiological perspective, many elderly women experience hypertension due to a decrease in estrogen levels following menopause. Estrogen plays a protective role in maintaining vascular health, and its decline increases the risk of blood vessel damage and hypertension.[11]

Most respondents had been living with hypertension for 1–3 years, totaling 18 individuals (50%). Other studies have shown that the earlier hypertension is detected, the higher the level of treatment adherence.[12] Currently, the BPJS health service program has become more accessible and comprehensive within the community, allowing for better identification of potential disease risks and enabling earlier detection.[13]

Elderly gymnastics affects the MAP in the elderly population

Based on the results above, it showed that the average MAP of respondents before elderly gymnastics in the study was 116.15 mmHg or said to be in the category as grade 1 hypertension. Consistent with previous findings, the average MAP recorded before the elderly gymnastics intervention was classified as grade 1 hypertension.[14,15] Hypertension that arises due to physical changes in the elderly occurs due to increasing age. This affects reduced physical activity, causing atherosclerosis or the accumulation of fat and stiffness of blood vessels.

Based on the results above, it showed that the average MAP of respondents after elderly gymnastics in this study was 104.68 mmHg in the pre-hypertension category. Findings from other studies indicate that elderly gymnastics interventions can reduce blood pressure levels, with post-intervention measurements often shifting into the pre-hypertension range.[16] When someone continues to do gymnastics, vasodilation relaxes blood vessels, which causes blood pressure to decrease. Another thing that can lower blood pressure is due to reduced heart pump activity. The heart muscle will be stronger, so there will be fewer contractions.[4,17]

Statistical test of the effect of elderly gymnastics on elderly MAP with hypertension

The results of the paired sample mean difference test using the Wilcoxon signed-rank test (due to numerical data with non-normal distribution) showed a p-value of 0.000 ($p < 0.05$), indicating a significant difference in the average MAP score before and after the elderly exercise intervention. Therefore, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, meaning that elderly gymnastics had a significant effect on the MAP of elderly individuals with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency. There was an average decrease of 11.47 mmHg in MAP after performing the exercise three times a week for one week in the morning.

A systematic literature review of 20 journal articles published between 2013 and 2021 found that elderly gymnastics has a significant effect in reducing blood pressure among older adults with hypertension.[1,4,18] The benefits of each gymnastic movement in the hands aim to train the strength of the muscles in the arms, improve blood circulation, and make the shoulder muscles healthier.[19] The benefits of movement on the legs are increasing muscle and joint strength in the legs, improving coordination in movements related to agility, and burning fat.[20] Meanwhile, the purpose of head movements is to increase blood flow to the head so that the flow of blood to the brain is smooth, strengthen and relax the neck muscles, increase the agility of head movements, reduce stress and tension, and improve blood circulation.[2]

The movement procedure in elderly gymnastics, according to *Menpora* 2020, starts from warm-up movements, stretching, and core gymnastics to cooling down. The purpose of warming up is so that the elderly can prepare themselves. Stretching is performed to promote smooth blood circulation and prevent injury. The core movements are structured according to the exercise program, beginning with the upper extremities, followed by the lower extremities, and concluding with a cool-down phase. The purpose of the cool-down is to help the body gradually return to its pre-exercise state.

Elderly gymnastics can reduce

blood pressure because blood vessels will experience vasodilation, namely, dilation of blood vessels. When someone continues to do gymnastics, it will relax the blood vessels, which causes blood pressure to decrease.[4,17] The heart muscle will be stronger so there will be fewer contractions. Elderly gymnastics will also stimulate the release of endorphins produced by the brain and function as a natural tranquilizer so that it can provide a sense of comfort and reduce high blood pressure.

The limitations of this study that are expected to be further developed by researchers are adding a control group as a comparison and increasing the number of samples in the study, not just one hamlet location so that the number and characteristics do not represent the number of hypertension sufferers. In addition, research can be conducted with a longer frequency so that the results are more significant and increase the number of tensiometers used so that the difference in blood pressure measurement time is not too long from one to another to avoid bias.

CONCLUSION

There is a significant effect of elderly gymnastics on the mean arterial pressure (MAP) of elderly people with hypertension in Gayam Hamlet, Prambanan District, Sleman Regency.

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CONFLICT OF INTEREST

There were no potential conflicts of interest during the research, writing, and publication of this study.

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AUTHOR CONTRIBUTION

1. AAAS as study conception and design of research studies, data collection, analysis and interpretation of research data, preparation and drafting of articles, and critical revision of scientific articles.
2. TTM as study conception and design of research studies, analysis and interpretation of research data, preparation and drafting of articles, and critical revision of scientific articles.
3. RW as study conception and design of research studies, analysis and interpretation of research data, preparation and drafting of articles, and critical revision of scientific articles.

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