Decreasing Mean Arterial Pressure through Physical Activity in Obese Hypertensive Patients

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Abstract. This study aims to determine the decrease in Mean Arterial Pressure (MAP) for obese hypertensive patients through physical activity of elderly gymnastics. This research method is an experimental method with a Pretest-posttest control group design. A sample of 40 patients with hypertension at Anur Sinjai clinic was obtained using a purposive sampling technique with criteria for older adults aged 50-70 years. The sample was divided into two groups that were obese and non-obese, each consisting of 20 people. Obesity is known through the calculation of Body Mass Index (BMI), and MAP is obtained using the Motzer & Bridges formula (MAP = (S+2D)/3). MAP measurements were carried out before (pretest) and after (posttest) given physical activity for each group in the form of elderly exercise for 12 meetings. The data analysis technique used the t-test to determine the difference in the mean of the two samples. The results showed that elderly gymnastics had a significant effect on decreasing MAP both in the obese group (t-count = 7.080; sig = 0.000) and in the non-obese group (t-count = 4.087; sig = 0.000). In addition, there was a significant difference in the effect of MAP on the obese group and the non-obese group (t-count = 4.34; sig = 0.000) with a mean difference of 6.15 mmHg. This study concludes that there is a decrease in MAP in hypertensive patients after being given elderly exercise, both obese and non-obese. The decrease in MAP was faster in the non-obese group.

Keywords: MAP; physical activity; hypertensive

1 Introduction

Hypertension is a common condition associated with an unhealthy lifestyle and is a significant risk factor for cardiovascular disease [1]. This is one of the most common diseases in the community. Hypertension is a circulatory system disorder that increases blood pressure above the average rate, which is 140/90 mmHg. This is caused by the increased work intensity of the heart in pumping blood throughout the body to meet the needs for oxygen and nutrients throughout the body. If this is left unchecked, it can interfere with the performance of other organs, especially vital organs such as the kidneys and heart [2]. Although hypertension is not an infectious disease, we are always vigilant. Other diseases usually accompany hypertension, so it requires intensive and continuous treatment. Therefore, more intensive care is needed to reduce complications between hypertension and other diseases [3].

Anur Clinic is one of the clinics that serve patients in the Sinjai Regency. This clinic collaborates with BPJS and has been accredited by the Ministry of Health. The number of participants so far has reached 8500 patients spread throughout the Sinjai Regency. Based on the survey results conducted, it was found that there were 257 patients suffering from

BIC 2021, October 11-12, Batusangkar, Indonesia

DOI 10.4108/eai.11-10-2021.2319610

hypertension. They have been diligently checking their condition at the Anur Clinic until now. Most patients suffering from hypertension are aged 45 years and over. In addition, variations in body weight were also found in these patients. Although obesity impacts increasing blood pressure, not all obese people experience high blood pressure/hypertension [1].

Physical activity can lower blood pressure with resistance to hypertension [4]. Physical activity that is carried out continuously in the elderly will impact body composition and muscle strength, minimize risk factors due to disease, and improve cardiorespiratory performance [2], [4]. Moderate-intensity physical activity in the elderly can decrease systolic, diastolic and mean arterial pressure (MAP) blood pressure[5].

Based on factors that are strongly related to high blood pressure, physical activity and stress management can be influenced through exercises such as gymnastics and morning walks and mental/spiritual development [6]. Gymnastics for the elderly is a light physical activity that is easy to do and suitable for the elderly. This exercise is a program of the Ministry of Youth and Sports to improve the physical condition of the elderly so that they can live a healthy, happy, useful and prosperous life in old age[7] .

Based on the problems described above, the solution that will be given to hypertension is to provide physical activity in the form of elderly exercise to reduce the value of blood pressure, be it systole, diastolic or mean arterial pressure. However, in this study, the focus is on the mean arterial pressure, commonly referred to as the Mean arterial Pressure (MAP).

2 Method

The type of research used in this study was a pre-experimental design [17] with a pretest and posttest control group design. The population in this study were all hypertensive patients who were registered as BPJS participants at the Anur Clinic, Sinjai Regency. The sample size in this study was 40 people, which included details of 20 obese hypertensive patients and 20 non-obese hypertensive patients, using a purposive sampling method with women aged 50-70 years. All groups received physical activity in low-intensity exercise for three months (12 treatments). Each session takes 18 minutes, initial action 04:56 minutes, core action 06:22 minutes, transition action 02:58 minutes, and cooldown 03:39 minutes. There is a pretest before treatment and a posttest after treatment. The research location is Anur Clinic, Sinjai Regency.

The blood pressure of hypertensive patients was measured with a Riester brand tensiometer and auscultated with a stethoscope, and the unit is mmHg. These measurements were taken before and after physical activity. After finding the results of both blood pressure measurements (systolic and diastolic), then the formula can be used to measure the mean arterial pressure (Motzer & Bridges: 2009):

$$MAP = (S+2D)/3$$

MAP = Mean Arterial Pressure
S = Systolic blood pressure
D = Diastolic blood pressure

Obesity is known through the calculation of body mass index (BMI) by dividing body weight (kg) by the square of height (m). Furthermore, BMI data will be divided into two groups, namely those who are not obese (BMI < 23 kg/m2) and obese (BMI > 23 kg/m2). The collected

data were analyzed using descriptive statistics and inferential statistics with the help of SPSS 23.00 software. The analytical model used is the t-test, preceded by a test of requirements in the form of normality and homogeneity tests.

3 Result and Discussion

This research was conducted at the Anur Sinjai Clinic for six weeks using a quasi-experimental design. The research subjects were 40 people divided into two groups, namely the treatment group (Obesity) and the treatment group (non-obese), each of which consisted of 20 people. After doing a descriptive analysis, the results of the mean arterial pressure (MAP) are obtained in the following table:

Table 1. Comparison of the results of the mean arterial pressure (MAP) of the obese group after being given physical activity treatment for elderly gymnastics

Group	Mean	SD	Mean Difference	t-count	Sig. (p)
Pretest	113.38	2.62	3.19	7.080	0.000
Posttest	110.19	3.06			

Based on the results of the data analysis test, the effect of physical activity on elderly exercise on MAP in hypertension patients using the t-test in table 4 above shows that the posttest average value (110.19) is lower than the pretest average (113.38) mean difference of 3.19 with a t-count value of 7.080 and a probability value (p) < α (0.05), it can be concluded that there is a significant effect of physical activity on elderly gymnastics to decrease MAP in obese hypertensive patients.

Table 2. Comparison of MAP results in the non-obese group after being given physical activity treatment for elderly gymnastics

Group	Mean	SD	Mean Difference	t-count	Sig. (p)
Pretest	116.34	3.06	4.20	4.087	0.001
Posttest	114.39	6.12			

Based on the results of the data analysis test, the effect of physical activity on elderly exercise on MAP in hypertension patients using the t-test in table 3 above shows that the posttest average value (110.19) is lower than the pretest average (114.39) mean a difference of 4.20 with a t-count value of 4.087 with a probability value (p) < α (0.05), it can be concluded that there is a significant effect of elderly exercise physical activity on reducing MAP in hypertension patients who are not obese.

Table 3. Comparison of the results of the mean arterial pressure in the obese and non-obese groups after being given physical activity treatment for elderly gymnastics

Group	Mean Difference	t-count	Sig. (p)
Obesity			
Not Obesity	6.15	4.34	0.000

Based on the results of the data analysis test, the comparison of the effect of physical activity on elderly exercise on MAP in the obese group and the non-obese group using the t-test in table 6 above shows that the mean difference between the obese group and the non-obese group is 6.15 with a t-count value of 1.467 and the probability value (p) < α (0.05), it can be concluded that there is a significant difference in MAP in patients with hypertension after being given physical activity in elderly gymnastics between the obese group and the non-obese group. When viewed from the average value of the posttest, the obesity group was more effective in reducing it than the non-obese group.

The findings in this study indicate that elderly exercise physical activity has a significant effect on reducing MAP both in the obese group and in the non-obese group. In addition, it was also found that there was a considerable difference in the effect of MAP on the obese group and the non-obese group. The decrease in the non-obese group was more significant than the obese group when viewed from the mean difference.

The findings in this study are in line with the results of research [9] that elderly exercise activities carried out regularly every week can reduce blood pressure in the elderly. Another study also found a significant relationship between physical activity and blood pressure in the elderly who were overweight [1]. Elsewhere [10], a study found moderate-intensity physical activity [11] performed regularly for 12 weeks can lower a person's blood pressure. Another study recommended moderate-intensity aerobic exercise for 2.5 hours a week to control blood pressure [12].

The results of other studies also found that lack of physical activity affects increasing blood pressure, thus triggering an increase in body weight which involves expanding a person's risk of increasing blood pressure [13]. Therefore, it is essential to continue doing physical activity regularly even though you are old to maintain the quality of life. Strong evidence also found that adults with hypertension who are active in physical activity can reduce their blood pressure [14]. Increasing physical activity is essential for controlling blood pressure in individuals with hypertension [15]. Old age and overweight are two risk factors for high blood pressure [16].

The significant decrease in MAP in the elderly who are given exercise is supported by the theory that during exercise, the elderly occur skeletal muscle contractions (skeleton) which will cause mechanical and chemical responses [17]. According to [18], the mechanical response when the muscle contracts and relaxes causes the venous valve to work optimally so that the blood returning to the right ventricle increases. The increased cardiac return causes an increase in the strain on the left ventricle of the heart so that cardiac output increases up to 4-5 times compared to resting cardiac output [19]. By regularly participating in gymnastic activities, people with hypertension can lower their blood pressure. This means doing exercise in the form of exercise periodically increasing oxygen intake and improving blood flow to the heart muscle, relaxing blood vessels so that hypertension levels can be controlled.

4 Conclusion

The conclusion drawn from this study is that elderly exercise physical activity has a significant effect on reducing MAP both in the obese and non-obese groups. In addition, there was a significant difference in the impact of MAP on the obese group and the non-obese group, and the non-obese group had a more significant decrease than the obese group. An increase in MAP will have an impact on hypertension. Non-pharmacological management of hypertension is through improving diet and increasing physical activity. One form of physical activity is

elderly gymnastics. Regular and structured exercise for the elderly can reduce systolic, diastolic, and MAP blood pressure so that hypertension levels can be controlled so that the elderly can live healthier, more active and productive lives.

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