JOSING: Journal of Nursing and Health
Volume 1, Nomor 2, Juni 2021
e-ISSN: 2745-7877
p-ISSN: 2746-0851
DOI: https://doi.org/10.31539/josing.v1i2.2326

CHANGES OF BLOOD PRESSURE IN HYPERTENSION PATIENTS THROUGH ISOMETRIC HANDGRIP EXERCISE

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ABSTRACT

This study aims to identify the effect of isometric handgrip exercise on changes in blood pressure in people with hypertension. Quasi experimental research design with two group pretest postest research design on 16 respondents. The results showed that there were changes in systolic and diastolic blood pressure after the isometric handgrip exercise intervention (t = 8,279, p = 0,000), (t = 6,154, p = 0,000). In conclusion, there was a difference between the decrease in systolic and diastolic blood pressure in the isometric handgrip exercise intervention group.

Keywords: Blood Pressure, Hypertension, Isometric Handgrip Exercise

INTRODUCTION

Hypertension is a non-communicable disease with a high prevalence and an increasing trend (Suiraoka, 2012). Blood pressure is one of the factors that have a significant influence on the circulatory system. High blood pressure or low blood pressure affects the body's homeostasis (Zainuddin et al., 2018; Andari et al., 2020). In young people, the resting blood pressure ranges from 120/70 mmHg. However, physiologically, blood pressure will vary due to many influencing factors. Blood pressure higher than 140/90 mmHg measured on three different occasions is called hypertension or hypertension (Stefani et al., 2019).

Hypertension is already a significant medical burden worldwide (Jørgensen et al., 2018). Hypertension is the third leading cause of death worldwide (Ogbutor et al., 2019). Hypertension affects more than 1 billion adults and 13% of total deaths worldwide (Farah et al., 2017; Lam, 2018). Cardiovascular disease statistics show that hypertension in the European Society of Cardiology countries is between 15.2% and 31.7% (Lopes et al., 2018; Timmis et al., 2020). It is estimated that by 2025, this prevalence will continue to increase by 29%. One billion people worldwide suffer from hypertension with systolic blood pressure ≥140 mmHg and diastolic blood pressure ≥90 mmHg, of which 2/3 are in developing low- and middle-income countries (WHO, 2015). Rapid urbanization, lifestyle, junk food, and stress are risk factors leading to an increase in the prevalence of hypertension (Garg et al., 2013).

According to the WHO region, Indonesia is the second-highest hypertensive patient in Southeast Asia after Myanmar (WHO, 2015). In Southeast Asia, including Indonesia, it was reported that 49.7% of the causes of death were due to non-communicable diseases, one of which was hypertension (Sartika et al., 2018, 2020)

The prevalence of hypertension in Indonesia is one of the health problems, with 25.8%. There are five areas with the highest incidence of hypertension in Indonesia, namely Bangka Belitung (30.9), followed by South Kalimantan (30.8%), East Kalimantan (29.6), West Java (29.4%), and Colombia. Lundalo (29.4%). At the same time, the prevalence of hypertension in Bengkulu Province has reached 21.6% (Riskesdas, 2018). The data from the health profile of Bengkulu Province has gained 54.66% of hypertension cases (Dinkes Provinsi bengkulu, 2016).

High blood pressure can lead to long-term and possibly fatal complications such as coronary artery disease, heart failure, stroke. In addition, people with hypertension also experience cognitive decline and poor quality of life (Hanfy et al., 2019). The incidence of hypertension in Indonesia remains high, but the control of hypertension is not enough. It requires various efforts to control the high incidence of hypertension to reduce the incidence of hypertension (Andri et al., 2018; Harsismanto et al., 2020).

The global action plan recommended by WHO in 2014 to control the prevalence of non-communicable diseases includes the control of risk factors such as smoking, high-salt diet, lack of physical activity, and stress or psychological control. Therefore, it is strongly recommended to increase physical exercise and stress management as prevention and promotion strategies. Physical exercise is one of the alternatives developed to lower blood pressure (Carlson et al., 2014). Previous studies have also shown that physical activity can reduce the blood pressure of hypertensive patients, which has excellent benefits for people of all ages and has. It is positively correlated with a 50% reduction in cardiovascular disease cases in hypertensive patients (James et al., 2014; Parlindungan et al., 2016).

Isometric training is a form of static training that occurs when there is no significant change in muscle length or connection with muscle length or joint movement. This exercise can be performed anywhere. The intensity ranges from mild to moderate, the use of tools is relatively cheap, and the time required is relatively small, making it possible for the client to persist (Carlson et al., 2014). Isometric exercises were developed as exercise therapy to lower blood pressure using grips. The handle is a commonly used tool for measuring grip muscle strength, which is very important for daily activities and sports. According to scientific statements about alternative methods of lowering blood pressure, the American Heart Association (AHA) With the support of isometric handle training, it is explained that the isometric handle is an effective auxiliary therapy for lowering blood pressure, and it is agreed to be used clinically (McGowan et al., 2017).

European and American medical guidelines also recommend lifestyle changes as a non-drug therapy to increase physical activity through isometric grip exercise therapy (Okamoto et al., 2020). The American Heart Association (AHA) classifies Isometric Handgrip Exercise therapy as a potential therapy to lower blood pressure in hypertensive patients (Silva et al., 2018).

Isometric hand grip exercises can reduce cardiovascular reactivity to psychophysiological stressors in people with a history of hypertension (Badrov et al., 2013). Previous research also explained that patients who were given isometric handgrip training for five consecutive days showed a significant decrease in systolic and diastolic blood pressure (Sabar, 2015). One of the non-pharmacological therapies that can be done to reduce blood pressure in patients with hypertension is to increase the patient's physical activity and breathing exercises. In this study, the physical activity given to patients with hypertension is isometric handgrip exercise.

RESEARCH METHODS

Research Design

This study used a quasi-experimental research design with a one group pretest postest design. This research was conducted in the working area of the Pasar Kepahiang Community Health Center, Bengkulu Province.

Participant

The population in this study were patients with hypertension. Patients were recruited from the Pasar Kepahiang health center, patients who were included in the study were patients who had the criteria for systolic blood pressure ≥ 130 mmHg and diastolic blood pressure ≥ 90 mmHg, respondents were able to hold handgrip, aged ≥ 18-60 years, intervened when with the researcher and respondents were cooperative and were able to follow instructions, while patients who had arthritis, musculoskeletal injuries to the extremities and respondents who had carpal tunnel syndrome or pain in the hands were not included in this study. The number of samples in this study amounted to 16 respondents. The sampling technique used purposive sampling technique.

Intervention Group

The intervention was carried out individually and the intervention was carried out by the patient after being taught by the researcher and implemented in the isometric handgrip. In the intervention group, the isometric handgrip exercise was given for 5 consecutive days with a frequency of 1 time a day with the help of a handgrip. The total duration during the exercise was 180 seconds or 3 minutes and blood pressure measurements after the intervention were carried out after a 5 minute break.

Statistical Analysis

This data analysis will be processed using the SPSS 19 application. Descriptive statistics are carried out to describe the characteristics of the sample and a picture of blood pressure at the beginning of the measurement before it is carried out. Parametric paired sample t test was used to see whether there was an effect or change in blood pressure before and after the intervention was given.

RESULTS

Respondent characteristics

Table. 1
Distribution of Respondents by Age, Gender,
Family History of Hypertension and Medication (n = 16)

Characteristics	*Isometric Handgrip Exercise* (n=16)				Total		p *value*[a]
	(f)	(%)	Mean	SD	(f)	(%)	
Age	-	-	49,25	2,91	-	-	0,330
Gender							
Male	10	31,3	-	-	19	59,4	0,510
Female	6	18,7	-	-	13	40,6	
Family History							
There is	5	15,6	-	-	11	34,4	0,481
Nothing	11	34,4	-	-	21	65,6	

Based on table 1 in this study the average age of the respondents was 49.25 years with a standard deviation of 2.91, the majority of respondents were male (n = 10; 3.4%), had a family history of hypertension (n = 21; 65.6%).

Table. 2
Respondents Prior Systolic Blood Pressure
and After Given Intervention (n = 16)

Variable	Group	N	Mean	SD	95% CI	
					Min	Maks
Systolic Blood Pressure Before the Intervention	Handgrip	16	156,06	8,64	151,88	160,25
Systolic Blood Pressure After the Intervention	Handgrip	16	153,69	8,56	149,63	157,75

Based on table 2 it can be seen that the isometric handgrip exercise intervention group obtained a systolic blood pressure value above 140 mmHg, which is 156.06 mmHg. After the intervention, the systolic blood pressure decreased to 98.76 mmHg.

Table. 3
Respondents Prior to Diastolic Blood Pressure
and After Given Intervention (n = 16)

Variable	Group	n	Mean	SD	95% CI	
					Min	Mak
Diastolic Blood Pressure Before the Intervention	Handgrip	16	99,34	3,11	98,06	101,13
Diastolic Blood Pressure After the Intervention	Handgrip	16	98,76	2,77	96.00	98,63

Based on table 3 it can be seen that the isometric handgrip exercise intervention group obtained a diastolic blood pressure value above 90 mmHg, which is 99.34 mmHg before the intervention was given. After the intervention, the diastolic blood pressure decreased to 98.76 mmHg.

The blood pressure of the isometric handgrip exercise intervention is included in the category of hypertension grade II, which is in the range of 140 mmHg systolic blood pressure and 90 mmHg diastolic blood pressure.

Table. 4
Distribution of Mean Systolic and Diastolic Blood Pressure
Before and After Intervention (n = 16)

Variable	Group		Mean	SD	t *value*	p *value*
Sistolic	*Isometric Handgrip*	Before	156,06	8,64	8,279	0,000
		After	153,69	8,56		
Diastolic	*Isometric Handgrip*	Before	99,63	3,28	6,154	0,000
		After	97,25	2,72		

Participants in the isometric handgrip exercise intervention group experienced a decrease in systolic blood pressure by 2.37 mmHg and diastolic blood pressure by 2.38 mmHg. Further analysis showed a decrease in systolic blood pressure before and after the intervention in the isometric handgrip exercise group with (t value = 8,279, p value = 0,000). There was also a decrease in diastolic blood pressure before and after the

intervention was given in the isometric handgrip exercise group (t value = 6.154, p value = 0.000).

DISCUSSION

Characteristics of Respondents

Characteristics of interviewees The results showed that the average age of the respondents was 49.25 years old. The results of this study are the same as those of previous studies, and both explain the influence of age group on the occurrence of hypertension (the older a person is, the higher his blood pressure is due to various factors such as decreased blood vessel elasticity and decreased renal function). Play the role of a blood pressure balancer (Sundari et al., 2013). Age is one of the factors that affect a person's health. With age, the risk of high blood pressure will increase. One of the risk factors that affect high blood pressure is age, because the older If you get bigger, you have a higher risk of high blood pressure. As you age, your risk of high blood pressure increases. This is because the blood vessels, hormones, and heart are affected by the body's natural changes (Triyanto, 2014).

The majority of the gender of the interviewees in this study was male. The meta-analysis by Danaei et al. also found that men's global average systolic blood pressure is higher than women's. This may be due to the existence of risk factors such as smoking and coffee consumption. Men tend to be higher than women (Widiana & Ani, 2017). According to Suiraoka (2012) his is also because men have many risk factors that affect high blood pressure, such as smoking, work discomfort and uncontrolled diet. Usually women are After menopause, there will be an increase in high blood pressure.

The results of this study are consistent with previous studies, which showed that the prevalence of hypertension in men is higher than that in women. Gender affects a person's hormone levels. As we all know, the estrogen possessed by women is a protective factor/ Protect blood vessels, so that men with lower levels of estrogen than women are more common in heart and vascular (cardiovascular) diseases). Most of the respondents in this study had a family history of suffering from hypertension. Genes can interact with others and also the environment that can cause blood pressure to rise over time (hypertension is considered polygenic and multifactorial), this is associated with an increase in intracellular sodium levels and a decrease in the calcium-sodium ratio. This study is in line with previous research which states that a family history of hypertension with hypertension affects the incidence of hypertension (Heriziana, 2017).

In this study most of the respondents had a history of irregular treatment. Dr. Sandosh Padmanabhan, a researcher from the University of Glasgow reported by the Daily Mail said that blood pressure can naturally fluctuate due to the complex interaction of various factors, one of which is when a person does not take medication regularly. Pradmanabhan continued, patients who fail to comply with the dosage in taking medication will trigger an increase in their risk of heart attack or stroke by more than 40% (Hellosehat, 2018).

If a history of hypertension is obtained from parents, the presumption of primary hypertension in a person will be quite large. This can happen because of a trait that is passed on through genes. Heredity does have a big role in the emergence of hypertension. This is proven by the finding that out of 10 people with hypertension, 90% of them occur because they have genes that can cause hypertension. However, genes can make a person suffer from hypertension because there are other external trigger factors (Heriziana, 2017).

Effect of Isometric Handgrip Exercie on Blood Pressure

The results of this study indicate that hypertensive patients who were given isometric handgrip exercise for 5 consecutive days showed a significant decrease in systolic and diastolic blood pressure between before and after doing the isometric handgrip exercise. The results in this study are supported by previous research which states that isometric exercises using handgrip significantly reduce systolic blood pressure by 2.4 mmHg (p value = 0.036) and diastolic blood pressure by 2.5 mmHg (p value = 0.0079) (Mortimer & McKune, 2011).

Isometric Handgrip Exercise is a static exercise therapy using a handgrip that involves contraction of muscle resistance without changing muscle length, for example lifting or pushing heavy loads and contracting muscles against certain objects (Karthikkeyan et al., 2020; Parlindungan et al., 2016; Susiladewi et al., 2017). Low to moderate intensity exercise can be done anywhere, because it is very easy to do, relatively inexpensive equipment, does not cause cardiovascular stress and is of short duration (Hamza & Elden, 2019). Exercise is performed with 4×2 minute contractions at 20-50% MVC (Maximal Voluntary Contraction) with 1-5 minutes rest (Stefani et al., 2019). Isometric Handgrip Exercise therapy can reduce blood pressure in hypertension by about 7 mmHg for systolic and 5 mmHg for diastolic (Farah et al., 2017).

The results of research conducted by Zainuddin & Labdullah (2020) show that several literature review articles show that the Isometric Handgrip Exercise is proven to be effective in reducing blood pressure in hypertensive patients. Handgrip isometric exercise can reduce cardiovascular reactivity to psychophysiological stressors in people suffering from hypertension (Badrov et al., 2013).

Isometric handgrip therapy can also improve endothelial dysfunction by increasing tension mediated by the bioavailability of nitric oxide and increasing antioxidant activity. Isometric exercise results in a significant increase in blood pressure, which is very important in maintaining muscle perfusion during sustained contraction (Jeelani & Taklikar, 2018). Less muscle mass involvement during isometric exercise (unilateral vs. bilateral and upper and lower extremity) results in a higher reduction in blood pressure (Lopes et al., 2018). Blood pressure and heart rate response to isometric exercise are influenced by the strength of contractions, the size of the muscles contracting and the length of time used (Piikmann & Reisberg, 2019).

Isometric Handgrip Exercise activates mechanical receptors immediately, due to increased muscle tension. This occurs by maintaining muscle tension, increasing the excitatory state of the central nervous system and producing a possible increase in sympathetic outflow and decreased parasympathetic outflow, resulting in an increased blood pressure response. The pressure response to isometric exercise comes from a reflex that serves to increase perfusion pressure to active muscles, where blood flow is blocked by continuous muscle contraction (Garg et al., 2013). Less muscle mass involvement during isometric exercise (unilateral vs. bilateral and upper and lower extremity) results in a higher reduction in blood pressure (Lopes et al., 2018).

The results of the study Andri et al., (2018) show that isometric handgrip exercise and slow deep breathing exercise can affect changes in blood pressure in hypertension sufferers at the Pasar Kepahiang Health Center and the Bukit Sari Health Center in Bengkulu Province. The results showed that there was a change in systolic and diastolic blood pressure after the isometric handgrip exercise intervention (t=8,279, p=0.000), (t=6.154, p=0.000), and changes in systolic and diastolic blood pressure after the slow deep intervention was given. breathing exercise (t=3.632, p=0.002), (t=4.226, p=0.001).

Recent research conducted by Ogbutor et al., (2019) shows that isometric handgrip exercise can reduce blood pressure in hypertensive patients. The average decrease in systolic blood pressure and diastolic blood pressure in the intervention group was 7.48 ± 0.06 mmHg and 6.41 ± 1.01 mmHg, respectively, and significantly increased systolic blood pressure, diastolic and pulse rate in 5 minutes after exercise at 30% MVC with mean values of 8.60 ± 0.20 mmHg, 7.33 ± 0.03 mmHg, and 8.24 ± 0.20 beats/min.

This is in line with the research of Zainuddin & Labdullah (2020) which showed that the Isometric Handgrip Exercise was proven to be effective in reducing blood pressure in hypertensive patients. In a study conducted by Sandhu et al., (2014) the results showed that the isometric handgrip exercise decreased resting heart rate and arterial pressure in normotensive individuals. Therefore, this form of exercise training can be used as a non-pharmacological intervention in lowering arterial pressure and heart rate and these findings are consistent with the results of this study.

Based on the results above, although the decrease in blood pressure obtained was not too large, according to a media release uploaded on the PD PERSI page, it was said that a decrease in blood pressure of up to 2 mmHg of blood pressure can reduce the risk of death from coronary heart disease by 7% and the risk of death. due to stroke by 10% (Hellosehat, 2018). So the average reduction in blood pressure in this study is expected to provide good benefits in reducing morbidity and mortality due to hypertension. Another thing that can cause the small frequency of decreasing blood pressure is that the level of treatment of respondents who are mostly irregular because regularly taking anti-hypertensive drugs can be one of the factors that affect the increase or decrease in blood pressure. The presence of other diseases can also hinder exercise in lowering blood pressure.

The results of this study have shown that by giving isometric handgrip exercise interventions for 5 consecutive days with a frequency of 1 time a day can effectively reduce blood pressure.

CONCLUSION

There was a difference between the decrease in systolic and diastolic blood pressure in the isometric handgrip exercise intervention group.

The researchers concluded that clinically the intervention group was effective in lowering blood pressure in hypertensive patients and in this case nurses had an important role so that this intervention could be used by the community, especially hypertensive patients. Researchers consider that this intervention has a good benefit in efforts to lower blood pressure. Although the decrease in systolic and diastolic blood pressure was not too high, the intervention of these two groups is expected to be used as a non-pharmacological therapy that helps patients control or lower blood pressure in addition to controlling their daily lifestyle.

SUGGESTION

It is hoped that Pasar Kepahiang puskesmas can develop a policy to implement isometric handgrip exercise as a non-pharmacological therapy for patients with hypertension and apply it to the community as an alternative in helping to lower blood pressure apart from lifestyle modification.

Nursing services are expected to include isometric handgrip exercises as a study material for nursing education as a non-pharmacological therapy in an effort to reduce blood pressure in hypertensive patients.

For further research, it is necessary to develop further research by increasing the duration of the study, whether it is doing the intervention isometric handgrip exercise so that it can obtain a more specific pattern and description regarding the effective time of reducing blood pressure in the two intervention groups. It is necessary to develop further research on the isometric handgrip exercise by linking confounding variables and analyzing it up to the multivariate test.

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