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IMPLEMENTATION OF ISOMETRIC HANDGRIP EXERCISE TO LOWER BLOOD PRESSURE IN HYPERTENSION PATIENTS IN THE TAMILOUW HEALTH CENTER WORK AREA

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ABSTRACT

Introduction
Hypertension is a disorder of the blood vessels that block the supply of oxygen and nutrients in the blood so that they do not reach the tissues that need it, triggering an increase in blood pressure. Which aims to describe the application of Isometric Handgrip Exercise to lower blood pressure in hypertension patients in the Tamilouw Health Center work area.

Method(s)
This study uses a quantitative descriptive method, which aims to describe the application of isometric handgrip exercise to lower blood pressure in hypertensive patients in the Tamilouw Health Center work area. The subjects of this study were two people, female with the criteria of being diagnosed with grade I hypertension, aged 49 and 50 years, cooperative clients, and had no complications.

Result(s)
After 5 consecutive days of treatment, the results found were that in subject 1 there was a decrease in systolic blood pressure of 15 mmHg and diastolic blood pressure of 12 mmHg, while in subject 2 there was a decrease in systolic blood pressure of 5 mmHg and diastolic blood pressure of 5 mmHg.

Conclusion(s)
The application of isometric handgrip exercise can reduce systolic blood pressure and diastolic blood pressure in patients with hypertension, and after this study, it is expected that patients can do isometric handgrip exercise independently to lower blood pressure without using drugs and still maintain a diet, try to get enough sleep, and continue to do daily physical activities diligently.

INTRODUCTION

Hypertension is a disorder of the blood vessels that causes the supply of oxygen and nutrients in the blood to be blocked so that it does not reach the tissues that need it. Blocked blood vessels will increase blood pressure, and high and low blood pressure will affect homeostasis (balanced conditions) in the human body. Normally, young adults have blood pressure ranging from 120/70 mmHg at rest. According to *the World Health Organization* (WHO), a person is said to have hypertension if the systolic pressure exceeds 140 mmHg and the diastolic pressure exceeds 90 mmHg after being measured three times at different times (Pratiwi, 2020; Zainuddin and Labdullah, 2020). Hypertension can be caused by increased blood pressure through 3 mechanisms. First, the heart flows more fluid by pumping harder. Second, large arteries become stiff due to loss of flexibility caused by thickening of the artery walls or blockage of the arteries by cholesterol buildup. Third, there is an increase in fluid in the circulation which occurs when the kidneys experience an abnormality in excretory function, so that they are unable to remove excess salt and minerals in the body (Trisnawan, 2019; Ridwan, 2020).

According to data quoted directly from the official WHO article, an estimated 1.28 billion adults aged 30-79 years worldwide suffer from hypertension, most of whom (two-thirds) live in low- and middle-income countries including Indonesia. An estimated 46% of adults with hypertension are unaware that they have the disease, and less than half of adults (42%) with hypertension are diagnosed and treated. WHO states that hypertension is the leading cause of premature death worldwide. So one of the global targets for non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030 (Pratt *et al.*, 2023).

Based on data from the 2023 Indonesian Health Survey (SKI), hypertension occurs in the age group 35-44 years (27.2%), 45-54 years (39.1%), and 55-64 years (49.5%). In Maluku Province, the prevalence of hypertension sufferers was 3,994 people or around 27.3% where there was an increase of 78 sufferers from the previous 5 years. When compared to other provinces, Maluku Province has a low prevalence, this is certainly related to the low population in Maluku Province when compared to the population in Indonesia, which is around 1,945,648 people or equivalent to 0.7% of the 279,368,824 people of the total population of Indonesia. This statement supports the low prevalence of hypertension sufferers in Maluku Province in proportion to the population, so even though it is low, the problem of hypertension in Maluku Province must remain a government concern and receive more serious treatment (Ministry of Health of the Republic of Indonesia, 2023).

Hypertension treatment can be done in two ways, namely non-pharmacological therapy and pharmacological therapy. Pharmacological treatment is in the form of administering antihypertensive drugs that are given to control or lower blood pressure. Some types of hypertension drugs that are often used are diuretics, vasodilators, beta-blockers, calcium antagonists, inhibitors, Angiotensin Receptor Blockers (ARBs), and Angiotension Converting Enzyme (ACE). However, no matter how good the pharmacological therapy is, it certainly still has disadvantages in the form of side effects. Some side effects of antihypertensive drugs that often appear include drug dependence, nausea, weakness, abdominal pain, dry cough, dizziness, headaches, disturbed sleep quality, and the risk of cardiovascular disorders. While non-pharmacological therapy is in the form of losing weight for obese people, consuming lots of vegetables and fruits to meet the body's potassium needs, reducing salt and saturated fat intake, avoiding alcoholic beverages, quitting smoking, and doing physical activity (Putri and Melizza, 2022)

One of the easy physical activities that can lower blood pressure is an isometric exercise. Isometric exercise is a static exercise that does not change the length of the muscle and does not involve heavy joint movements when the muscle is contracted. This exercise can be done anytime, anywhere, with light to moderate intensity. Isometric exercise that has been proven in research to lower blood pressure is

isometric exercise using *a handgrip*, or what is called *isometric handgrip exercise*.

Studies have been conducted on the application of *isometric handgrip exercises*, including research conducted by Choirillaily & Ratnawati (2020), on "Handgrip Exercises Lower Blood Pressure in Hypertension Patients" on 16 respondents which showed that doing grip exercises with handgrip tools for 5 consecutive days, there was a decrease in systolic blood pressure of up to 10 mmHg and a decrease in diastolic blood pressure of 5 mmHg. In addition, research conducted by Marsela & Samiasih (2023), on "Case Study of the Application of *Handgrip Exercise Techniques* to Reduce Blood Pressure" on 2 respondents also showed the average results of changes in pressure after 5 days of treatment, showed a decrease in systolic blood pressure in both patients by 6 mmHg and diastolic blood pressure by 8 mmHg. There is also research conducted by Rosapdi (2022), on "Case Study: Application of *Isometric Handgrip Exercise* to Lower Blood Pressure in the Elderly with Hypertension" on 2 respondents also showed a decrease in diastolic and systolic blood pressure.

To provide a blood pressure lowering effect, *Isometric Handgrip Exercise* should be done routinely once a day for 5 consecutive days with a training duration of 45 minutes of contraction and 15 minutes of rest (2 repetitions) on both hands alternately, according to Choirillaily & Ratnawati (2020). In addition, Marsela & Samiasih (2023) also agree with the above study, namely that this exercise is carried out 1x/day for 5 consecutive days with the same duration (4 minutes/session), after previously resting for 5 minutes and measuring blood pressure. Meanwhile, according to Rosadi (2022), this exercise can be done with a duration of 45 seconds for each contraction and 15 seconds of rest, where the contraction is repeated up to 6 times on each hand (12 minutes/session).

METHODS

This research design uses a case study approach, which is a study conducted in-depth, in detail, and structured on individuals. The research method uses a quantitative descriptive method, which aims to describe the application of isometric handgrip exercise to lower blood pressure in hypertensive patients in the Tamilouw Health Center work area.

This study was conducted for two weeks in the working area of the Tamilouw Health Center, with a sample of two patients with hypertension selected based on predetermined inclusion and exclusion criteria. The selection of this study sample began with data collection at the Tamilouw Health Center, then from the data, hypertension patients were selected according to the criteria, namely subjects with a doctor's diagnosis of grade I or grade II hypertension, aged 15-50 years, willing to become clients by signing an informed consent, cooperative, hypertensive subjects without complications and no functional hand disorders, from these criteria, two patients were found who were suitable for treatment.

The treatment given to both research subjects was in the form of isometric handgrip exercise using spring handgrip once a day for 5 consecutive days, with a duration of 4 minutes/session (45 seconds of contraction, 15 seconds of rest, repeated 2 times on both arms). The results and findings were then presented in the form of tables and narratives that specifically describe the patient's condition before and after the application of isometric handgrip exercise and show its effect on lowering blood pressure

RESULTS

This study was conducted in the working area of Tamilow Health Center, namely in Tamilow Hamlet RT 11 and RT 19, Amahai District, Central Maluku Regency. The subjects in this case study consisted of 2 respondents who were given the same treatment. The assessment was conducted on both respondents and the following results were obtained:

Table 1 Characteristics of case study subjects

No	Characteristics	Subject 1	Subject 2
1.	Name	Mrs. R	Mrs. S
2.	Age	50 years	49 years
3.	Gender	Woman	Woman
4.	Religi	Islam	Islam

5.	Ethnic group	Ambon	Ambon
6.	Education	Senior High School	Senior High School
7.	Status	Marry	Marry
8.	Work	Housewife	Kindergarten Teacher
9.	Address	Tamilouw Village RT 11	Tamilouw Village RT 19

The treatment given to both respondents was in the form of vital signs examination, then applying *isometric handgrip exercise* once a day for 5 consecutive days, with a duration of 4 minutes/session (45 seconds of contraction, 15 seconds of rest, repeated 2 times on both arms). After the client rested for ± 5 minutes, vital signs were checked again, with the following results:

Table 2 results of TTV observation of Respondent 1

Observation TTV		H1	
		Pre	Post
TD	Systole	166 mmHg	166 mmHg
	Diastole	110 MmHg	105 MmHg
N		63x/m	62x/m
P		20x/m	20x/m
S		35.1˚C	35.8˚C

H2		H3	
Pre	Post	Pre	Post
174 MmHg	179 MmHg	160 MmHg	148 MmHg
112 MmHg	117 MmHg	112 MmHg	111 MmHg
64x/m	64x/m	71x/m	65x/m
22x/m	22x/m	20x/m	20x/m
38.2˚C	38.7˚C	36.4˚C	36.8˚C

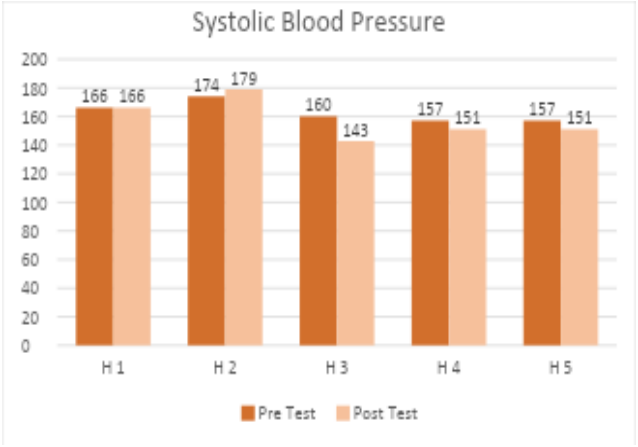
H		H5	
Pre	Post	Pre	Post
157 MmHg	151 MmHg	157 MmHg	151 MmHg
110 MmHg	101 MmHg	110 MmHg	98 MmHg
67x/m	70x/m	68x/m	67x/m
19x/m	20x/m	20x/m	20x/m
35.2˚C	35.6˚C	36˚C	36.5˚C

Table 3: Results of TTV observations for Resp 2

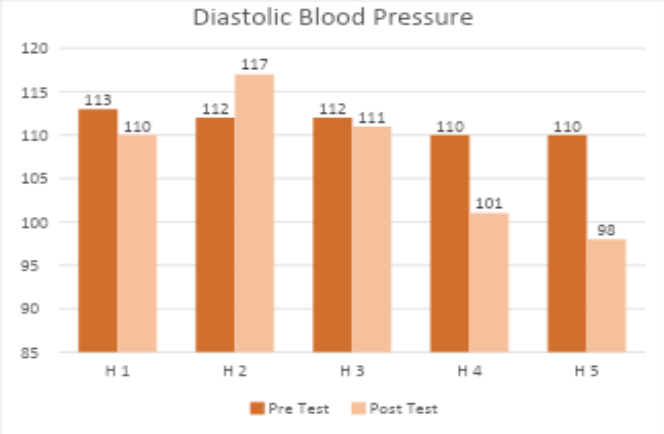
Observation TTV		H1	
		Pre	Post
	Systole	71 mmHg	74 mmHg
	Diastole	85 MmHg	87 MmHg
N		54x/m	58x/m
P		0x/m	0x/m
S		5.2˚C	5.8˚C

H2		H3	
Pre	Post	Pre	Post
78 MmHg	161 MmHg	176 MmHg	142 MmHg
97 MmHg	91 MmHg	89 MmHg	81 MmHg
51x/m	55x/m	59x/m	55x/m
18x/m	19x/m	20x/m	20x/m
36.1˚C	35.9˚C	36.3˚C	36.8˚C

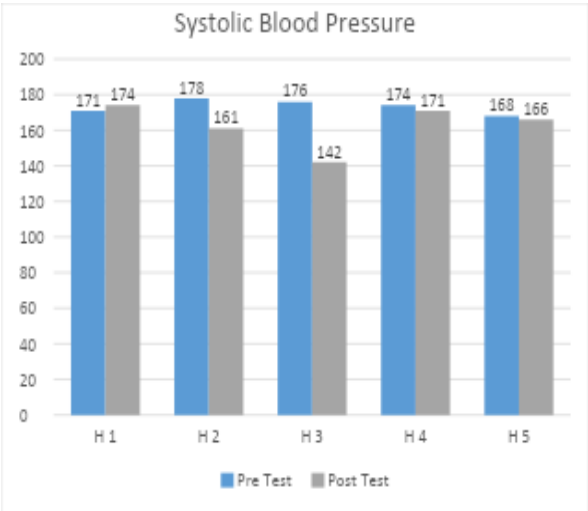
H4		H5	
Pre	Post	Pre	Post
174 MmHg	171 MmHg	168 MmHg	166 MmHg
82 MmHg	80 MmHg	83 MmHg	80 MmHg



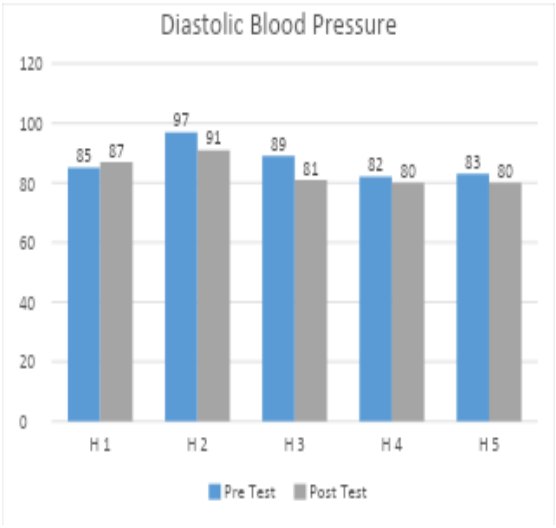
Graph 1 results of systolic blood pressure measurements of respondent 1



Graph 2 results of diastolic blood pressure measurements of respondent 1



Graph 3 results of systolic blood pressure measurements of respondent 2



Graph 4 results of diastolic blood pressure measurements of respondent 2

DISCUSSIONS

The isometric handgrip exercise was implemented, the observation results using the daily vital signs observation sheet showed differences before and after the action was carried out as shown in subjects 1 and 2.

Case study subject 1 showed a decrease in blood pressure from 166/110 mmHg to 151/98 mmHg, there was a difference in systolic blood pressure of 15 mmHg and diastolic blood pressure of 12 mmHg. Meanwhile, case study subject 2 also showed a decrease in blood pressure, from 171/85 mmHg to 166/80 mmHg, there was a difference in systolic blood pressure of 5 mmHg and diastolic blood pressure of 5 mmHg. From these results, it can be seen that the decrease in blood pressure in subject 1 was greater when compared to subject 2. This is because, during the treatment given, subject 2

experienced sleep disturbance so subject 2's sleep time was only about 4 hours per day. The insufficient sleep experienced by subject 2 also affected the decrease in blood pressure during the treatment.

The blood pressure of subject 1 and subject 2 after treatment at the first meeting decreased, but at the second meeting the blood pressure of both subjects before treatment increased compared to the previous meeting. This is because at the time of the second meeting, subject 1 was sick and his body temperature increased so blood pressure also increased. While in subject 2, at the second meeting, the subject said that last night he only slept 2 hours because he was preparing for the graduation ceremony of the kindergarten students he was coaching, subject 2 also complained of a headache since waking up.

The success shown in this study is in line with the success of previous studies. Such as the study conducted by Choirillaily and Ratnawati (2020), "Handgrip Exercise Lowers Blood Pressure in Hypertension Patients" on 16 respondents showed that by doing grip exercises with a handgrip for 5 consecutive days, there was a decrease in systolic blood pressure of up to 10 mmHg and a decrease in diastolic blood pressure of 5 mmHg. In addition, a study conducted by Marsela and Samiasih (2023), on "Case Study of the Application of Handgrip Exercise Techniques to Reduce Blood Pressure" on 2 respondents which also showed the average results of changes in pressure after 5 days of treatment, showed a decrease in systolic blood pressure in both patients by 6 mmHg and diastolic blood pressure by 8 mmHg.

Isometric handgrip exercise was applied to subjects 1 and 2 with the same type and technique. This exercise was given for 5 consecutive days, with a frequency of once a day, with a duration of ± 15 minutes (5 minutes of rest before exercise, 4 minutes of exercise, and 5 minutes of rest after exercise). The exercise given was in the form of arm muscle strength training by holding a Spring handgrip type handgrip tool by adjusting the spring tension according to the subject's strength (between 5-60 kg), and the handgrip gripping technique used was the hold handgrip technique. The application of the exercise was then focused on subject 1, including the spring tension adjusted to the grip strength of subject 1, which was around 5 kg, and in subject 2 the spring strength was also the same.

Although the treatment applied to both subjects was the same, the decrease in blood pressure in both subjects was different. The decrease in blood pressure in subject 2 was lower when compared to subject 1 because during the study subject 2 experienced a lack of time to rest and sleep. The causes of hypertension suffered by both were also different. Subject 1 had a hereditary history while subject 2 had experienced sleep disturbances for the past 4 months.

According to Nuraeni (2019), someone who has a family history of being a carrier of hypertension has a two times greater risk of developing hypertension. The process of hereditary hypertension begins with the symmetric gene that codes for the aldosterone synthase gene, resulting in ectopic production of aldosterone and mutation of the endothelial sodium channel gene which results in increased aldosterone activity, suppression of plasma renin activity and hypokalemia, leading to damage that causes excess mineralocorticoid syndrome. With increased aldosterone, there is increased water retention, so blood pressure also increases. In addition, Dismiantoni *et al.* (2020) stated that someone who has a family with a history of hypertension has a greater risk of developing hypertension compared to a family without a history of hypertension. If both parents are hypertensive, the incidence of hypertension in their offspring increases 4 to 15 times compared to if both parents are normotensive. If both parents suffer from essential hypertension, then 44.8% of their children will suffer from hypertension. If only one parent is hypertensive, then 12.8% of their offspring will experience hypertension.

This is in line with what was experienced by case study subject 1, who had a family history of hypertension (mother) so subject 1 was at risk of experiencing hypertension, and due to an unhealthy lifestyle, subject 1 finally suffered from hypertension for the past 4 years.

In addition to hereditary factors, something as simple as lack of sleep can also cause hypertension if allowed to continue. According to Musliana and Meutia (2022), poor sleep quality can be interpreted as a lack or excess of sleep. Short sleep duration is associated with a greater risk of hypercholesterolemia in adolescents. Sleep duration is associated with serum lipid and lipoprotein levels among adults. This is said to be a trigger between poor sleep quality and hypertension, where poor sleep quality can result in sleep disorders. Sleep disorders are a collection of conditions characterized by disturbances in the amount, quality, or time of sleep in an individual. Sleep disorders are also one of the factors that can affect blood pressure, due to short sleep duration.

Short sleep duration can not only increase average blood pressure and heart rate but also increase the activity of the sympathetic nervous system and stimulate stress, which can ultimately lead to hypertension. Emotional changes such as impatience, irritability, stress, fatigue, and pessimism caused by insufficient sleep duration can increase the risk of high blood pressure. People who have entered middle age, if they lack sleep, will be more susceptible to high blood pressure (Salman *et al.*, 2020).

This is in line with what was experienced by the subject of case study 2, who said that he often had sleep disturbances. Subject 2 said that at night he had difficulty sleeping soundly and often woke up in the middle of the night and was awake until morning. During the day, the subject rarely took a nap because of the many activities he did, so the client's daily sleep rest needs were not met.

CONCLUSIONS

Based on the results of the study on the Application of Isometric Handgrip Exercise to Lower Blood Pressure in Hypertension Patients in the Tamilouw Health Center Work Area, it can be concluded that the application of isometric handgrip exercise can lower systolic blood pressure and diastolic blood pressure in 2 subjects with hypertension. Factors that need to be considered when implementing *isometric handgrip exercises* on research subjects are ensuring that the health condition, food consumed, and sleep of the research subjects are in a stable condition, so as not to affect the decrease in blood pressure during the research.

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