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THE EFFECT OF COMBINATION OF SHOULDER EXERCISE AND ISOMETRIC HANDGRIP EXERCISE ON UPPER EXTREMITY MUSCLE STRENGTH IN POST-STROKE PATIENTS IN THE WORKING AREA OF PUSKEMAS SAWAH LEBAR IN BENGKULU CITY

Jelita Antasari, Hendri Heriyanto*, Erni Buston

Department of Nursing, Poltekkes Kemenkes Bengkulu, Bengkulu, Indonesia

**hendri_heriyanto@poltekkesbengkulu.ac.id*

Abstract

Indonesia ranks first with the most stroke sufferers in Asia. It is predicted that it will continue to increase to show the number of 23.3 million deaths in 2030. The data show that in 2021 In general, the prevalence of signs and symptoms of stroke in Indonesia is 12.1 per 1000. This means that more than 12 Indonesian individuals are recorded as suffering from stroke per year. 1000 residents throughout Indonesia. Most stroke patients experience muscle weakness in the lower extremities. This condition will result in disruption of fulfilling the needs of daily activities of stroke patients associated with impaired physical mobility. This study aims to determine the effect of a combination of shoulder exercise and isometric handgrip exercise on upper extremity muscle strength in post-stroke patients. Methods: This type of research is a quasi-experimental design with a pretest and posttest design with a control group. The sample of this study were 40 post-stroke patients who had muscle strength 3. The sampling technique was purposive sampling, one of the non-probability sampling techniques. Collecting data using data collection sheets. Data analysis used the Man Whitney test. The study was conducted in February - April 2023. A combination of shoulder exercise and isometric handgrip exercise was obtained on upper extremity muscle strength in post-stroke patients ($p=0.037 < 0.05$). It is hoped that health workers and researchers can develop research with other techniques that can used in post-stroke patients with the aim of enriching research results on types of exercises to increase upper extremity muscle strength.

Keywords: Muscle strength, Post-stroke, Upper Extremity, Shoulder Exercise, Isometric Handgrip Exercise

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INTRODUCTION

Cerebro Vascular Accident (CVA) or what is commonly referred to as a stroke is a disease that occurs when the blood supply to a part of the brain is suddenly disrupted because some brain cells die as a

result of blood flow disruption caused by a blockage or rupture of a vessel. blood on the brain. Stroke is still a major health problem, not only in Indonesia but also in the world (Sumyati et al., 2023). The World Health Organization (WHO) defines stroke as a condition in which rapidly developing clinical signs are found in the form of focal and global neurologic deficits, which can be severe and last for 24 hours or more and can cause death, without any other obvious cause. other than vascular problems (Rachman, 2018)

Stroke is included in a disease that leaves an impact in the form of disability or paralysis. The cause of stroke occurs when blood vessels to the brain fail to supply oxygen to brain cells. The impact on post-stroke patients is usually in the form of loss of muscle strength, slurred speech, impaired vision, difficulty walking, and loss of balance (Andriani et al., 2022). Stroke sufferers will also experience loss of motor and sensory function which can result in hemiparesis, hemiplegia, and ataxia. As a result of motor disturbances in the brain, the muscles will be rested causing muscle atrophy. Muscle atrophy can cause muscle stiffness, so that the stiff muscles can experience the limitations of movement that are commonly experienced in stroke patients. Furthermore, stroke can also result in various levels of disturbance, such as decreased muscle tone, loss of sensibility in some limbs, decreased ability to move diseased limbs and inability to perform certain activities. Stroke patients who experience weakness on one side of the body are caused by decreased muscle tone, so they are unable to move their bodies or immobilize (Andriani et al., 2022).

The World Stroke Organization (WSO) predicts that there will be 7.6 million deaths from stroke by 2022 and shows that each year there are 13.7 million new cases of stroke. Approximately 70% of strokes and 87% of deaths and disabilities due to strokes occur in low and middle income countries. The prevalence of stroke in the United States is around 7 million (3.0%), whereas in China the prevalence of stroke ranges between 1.8% rural and 9.4% urban. In Indonesia, based on the results of the 2018 Basic Health Research, the prevalence of stroke increased compared to 2013, namely from (7%) to (10.9%).

Nationally, the prevalence of stroke in Indonesia in 2018 based on a doctor's diagnosis in the population aged ≥ 15 years (10.9%) or an estimated 2,120,362 people. The prevalence of stroke living in urban areas is greater (63.9%) compared to those living in rural areas (36.1%). Provinces of East Kalimantan (14.7%), DI Yogyakarta (14.6%) and in Bengkulu province itself the prevalence of stroke is (9.5%) (Ministry of Health RI, 2018). Based on a survey with secondary data conducted by researchers at the Bengkulu Provincial Health Office in 2019 the number of incidents of people who had a stroke was 1,899 people. The highest stroke sufferers were in Bengkulu city as many as 1,296 people with muscle weakness as many as 879 people (46.28%), North Bengkulu district as many as 160 people with muscle

weakness as many as 20 people (12.5%) and Rejang Lebong district as many as 89 people with weakness muscle as many as 38 people (2.69%). Data from the Bengkulu City Health Office for stroke cases counted in 2021, namely 420 people with 329 patients experiencing muscle weakness. The results of a survey conducted by researchers obtained data from the Bengkulu City Health Office. The primary health center that had the most cases of stroke experienced a stroke, namely Puskesmas Sawah Lebar in Bengkulu City with data for 2021 totaling 157 people. Furthermore, namely the Jembatan Kecil Health Center, data obtained in 2021 totaled 35 people who were recorded. Then the third most stroke sufferer is at the Kandang Health Center with a total of 26 people recorded in 2021 (Bengkulu City Health Office, 2021)

Based on the results of measurements of upper extremity muscle strength conducted by researchers during the initial survey on September 21 2022 in the area that will be the research site, namely in the working area of Puskesmas Sawah Lebar in Bengkulu City, there were 9 patients who experienced muscle weakness in the upper extremities. Post-stroke patients will generally experience various health problems, one of which is muscle weakness. Stroke sufferers who experience muscle weakness and do not immediately get proper treatment can cause complications, one of which is contractures which can cause functional disorders, impaired mobility, disruption of daily activities and disabilities that cannot be cured (Listiana et al., 2020). One of the sequelae that becomes a problem in post-stroke patients is muscle weakness in the upper extremities. So far, the usual form of mobilization to restore muscle strength in post-stroke patients is ROM (Range of Motion) or range of motion exercises. Another therapy that can be done in post-stroke patients is a combination of Shoulder Exercise and Isometric Handgrip Exercise (Naldi et al., 2018).

Shoulder Exercise is a movement exercise that causes muscle contraction and stretching, in which the client moves each shoulder by flexing, extending, adducting, abducting and shrugging the shoulders both actively and passively. to increase muscle strength in the shoulders so they can move the upper extremities. Furthermore, Isometric Handgrip Exercise is a form of exercise to statically contract the hand muscles without being followed by excessive movement of the muscles and joints. Exercise can also be used as a therapy which can also be useful for improving muscle mass and upper extremity strength. This therapy is done by opening and closing the palms of the hands using a handgrip. The expected goal in implementing some of these methods is to increase muscle strength in the upper extremities (Naldi et al., 2018).

The advantages of shoulder exercises and isometric handgrip exercises are that they can help increase arm muscle strength and arm endurance are more practical and easy to do and can also strengthen upper extremity muscles that experience weakness in post-stroke patients. Strengthening muscles that

experience weakness can help restore body functions to their normal functions. Movements of flexion, extension, abduction, adduction and shrug coupled with handgrip strengthening can increase muscle strength thereby increasing the performance of these muscles compared to other exercises commonly performed in post-stroke patients (Kadek et al., 2019). Researchers are interested in conducting research on a combination of Shoulder Exercise and Isometric Handgrip as a benchmark for increasing muscle strength in post-stroke patients. Therapy performed on post-stroke patients is aimed at developing, maintaining and restoring motion and stimulating the hands to be able to perform a movement or muscle contraction, thus helping to restore upper extremity function lost due to stroke.

MATERIALS AND METHODS

The type of research used was a quantitative study using a quasy experimental design with a pretest-posttest design with control group. The population in this study were post-stroke patients with upper extremity muscle strength of 3 at Puskesmas Sawah Lebar in Bengkulu City with a total of 157 stroke patients. The sampling technique in this study used purposive sampling, the data collection used in this study was primary and secondary data. The instruments used in this study were handgrip, leaflets and standard operating procedures regarding the combination of shoulder exercise and isometric handgrip exercise, data collection sheets, and muscle strength measurement sheet informed consent sheet, and stopwatch, data processing in this study editing, coding and corting, data entry and processing, cleaning. Research analysis in this study used 1) Univariate Analysis (Descriptive Analysis) and Bivariate Analysis. This research was submitted for an ethical clearance protocol and received an ethical due test to the ethical commission of the Bengkulu Ministry of Health Poltekkes No.KEP.BKL/091/03/2023 taking into account ethical principles.

RESULTS AND DISCUSSION

Univariate analysis in this study was to look at the characteristics of the respondents, the characteristics of the limb muscle strength before and after the intervention or control. The number of respondents in this study was 40 samples divided into 20 people in the intervention group and 20 people in the control group

Table 1: Frequency Distribution of Respondent Characteristics

No	Variable	Group		pValue
		Intervention	control	
1	**Age**			
	Mean	58.30	58.60	0.897**
	Min	45	47	
	Max	68	69	
	SD	6.705	7.836	
	SE	1.499	1.752	
	CI 95%	55.16-61.44	54.93-62.62	
2	**Gender**			
	Woman	6 (30.0%)	7 (35.0%)	1.000*
	Man	14 (70.0%)	13 (65.0%)	
3	**Education**			
	SD	4 (20.0%)	4 (20.0%)	0.861*
	SMP	3 (20.0%)	5 (25.0%)	
	SMA	9 (45.0%)	7 (35.0%)	
	PT	4 (20.0%)	4 (20.0%)	
4	**Stroke type**			1.000*
	Hemorrhagic	4 (20.0%)	6 (30.0%)	
	Non Hemoragik	16 (80.0%)	14 (70.0%)	
5	**Attack frequency**			
	More than twice	5 (25.0%)	4 (20.0%)	1.000*
	Second	5 (25.0%)	6 (30.0%)	
	First	10 (50.0%)	10 (50.0%)	

Based on table 1 above, the results of the analysis obtained that the mean age in the intervention group was 58.30 years with a standard deviation of 6.705 years. The results of interval estimation can be concluded that 95% believed the mean age of the patients was 55.16-61.44 while the mean age in the control group was 58.60 years with a standard deviation of 7.836 years. The results of interval estimation can be concluded that it is 95% believed that the mean age of the patient is 54.93-62.62

Table 2: Average Upper Extremity Muscle Strength Before and After Treatment

Variable	Mean	Min	Max	SD	SE	CI 95%
Before treatment						
Intervention	3.20	3	4	0.410	0.092	3.01-3.39
Control	3.20	3	4	0.410	0.092	3.01-3.39
After treatment						
Intervention	4.20	4	5	0.410	0.092	4.01-4.39
control	3.60	3	5	0.821	0.184	3.22-3.98

Based on table 2, the results of the analysis showed that the average upper extremity muscle strength before treatment was carried out in the intervention group of 3.20 with an SD of 0.410, SE of 0.092 and an estimated result of 95% believed to be an interval of 3.01-3.39. After the intervention, it was 4.20 with SD 0.410, SE 0.092 and the estimated interval results were 95% believed to be the interval 4.01-4.39, while the mean muscle strength before treatment in the control group was 3.20 with SD 0.410, SE

0.092 and the estimated results were 95% believed to be the interval 3.01- 3.39, after treatment in the control group of 3.60 with SD 0.821, SE 0.184 and 95% estimation results believed interval 3.22-3.98

Table 3: Data Normality Test Results in the Intervention Group and Control Group

Variabel	*P Value (Shapiro-wilk)*
Pre-Test upper extremity muscle strenght	
Group Intervention	0.000
Group control	0.000
Post-Test upper extremity muscle strenght	
Group Intervention	0.000
Group control	0.000

Based on table 3 above, it shows the results of the data normality test with the Shapiro-Wilk data processing results in the intervention group and the control group, it can be concluded that all variables have a p value <0.05, so it can be concluded that the data is not normally distributed

Table 4: Differences in Mean Upper Extremity Muscle Strength Before and After Treatment in the Intervention Group

	N	Median (Min-Max)	Z	*P Value*
Strength value				
Before Intervention	20	3.00 (3-4)	-4.472	0.000*
After Intervention	20	4.00 (4-5)		

the Wilxocon Signed Rank Test statistic test show a *p value of 0.000* $\leq \alpha$ 0.05, which means that there is a difference in the average upper limb muscle strength before and after the intervention in the intervention group.

Table 5: Differences in Mean Upper Extremity Muscle Strength Before and After Treatment in the Control Group

	N	Median (Min-Max)	Z	*P Value*
Strength value muscle				
Before Intervention	20	3.00 (3-4)	-2.828	0.005*
After Control	20	3.00 (3-5)		

Based on table 5 above, it illustrates that the statistical test results of *the Wilxocon Signed Rank Test* show a *p value* ≤ *α* 0.05, which means that there is a difference in the average upper extremity muscle strength before and after treatment in the control group

Table 6: The Effect of Combination of Shoulder Exercise and Isometric Handgrip Exercise on Upper Extremity Muscle Strength in Post-Stroke Patients in the Work Area of Puskesmas Sawah Lebar in Bengkulu City

	N	Median (Min-Max)	U	*P Value*
Strength value muscle				
intervention	40	1.00 (1-1)	160.000	0.037*
Control	40	1.00 (0-1)		

Based on table 6 above, it illustrates that the results of the Mann Whitney statistical test showed a p value of 0.037 ≤ α 0.05, which means that there was a difference in the average upper extremity muscle strength between the intervention group and the control group. So it can be concluded that the combination of shoulder exercise and isometric handgrip exercise is more influential than range of motion (ROM) exercises.

The results showed that the average age of respondents who had a stroke was 58.30 years with a minimum age of 45 years and a maximum of 68 years for the intervention group while the mean age of the control group was 58.60 years with a minimum age of 47 years and a maximum of 69 years, which means that stroke sufferers in the study the average age is over 50 years, all ages can have a stroke, including children but the older you get, the greater the risk of stroke. It is estimated by the Ministry of Health that many stroke cases occur at the age of over 45 years.

The results of the analysis showed that the average upper extremity muscle strength before treatment in the intervention group was 3.20 with an SD of 0.410, SE of 0.092 and an estimated result of 95%

believed to be an interval of 3.01-3.39. After the treatment in the intervention group was 4.20 with SD 0.410, SE 0.092 and the estimated results of the 95% interval were believed to be with intervals of 4.01-4.39, while the average muscle strength before treatment in the control group was 3.20 with SD 0.410, SE 0.092 and the estimated results were 95% believed interval 3.01-3.39, after treatment in the control group of 3.60 with SD 0.821, SE 0.184 and 95% estimation results believed interval 3.22-3.98

The statistical test results of the Wilxocon signed rank test in the intervention group showed a p value of 0.000 (p value ≤ α 0.05) (z = -4.472) in the upper extremities, which means that there was a difference in the average value of upper extremity muscle strength before and after treatment in the intervention group. so that it can be concluded that there is an effect of a combination of shoulder exercise and isometric handgrip exercise on upper limb muscle strength in the intervention group. The results of the analysis of the control group showed a p value of 0.005 (p value ≤ α 0.05) (z = -2.828), which means that there was a difference in the mean value of upper extremity muscle strength before and after treatment in the control group, so it can be concluded that there is an effect of Range of Motion (ROM) on upper extremity muscle strength in the control group

Research on "The Effect of a Combination of Shoulder Exercise and Isometric Handgrip Exercise on Lower Extremity Muscle Strength in Post-Stroke Patients in the Working Area of Puskesmas Sawah Lebar in Bengkulu City" based on the results of the Mann-Withney U Test statistic showed a p value of 0.037 (p value ≤ α 0.05) which means that there is a difference in the average value of upper extremity muscle strength between groups after intervention and control. The results of this analysis indicate the intervention effect of a combination of shoulder exercise and isometric handgrip exercise on increasing upper limb muscle strength in post-stroke patients.

CONCLUSION

The mean age of the respondents was 58 years, the sex of the majority was male, the education in this study was mostly High School, most types of stroke were non-hemorrhagic and the frequency of the first attack was mostly in this study.

The results showed that the average value of upper extremity muscle strength before being given treatment in the intervention group of the combination of shoulder exercise and isometric handgrip exercise was 3.20 and after being given treatment in the intervention group it was 4.20. Which means that the value of the upper extremity muscle strength of the respondent after being given treatment increased from before being given treatment.

The results showed that the average upper extremity muscle strength before being given treatment in the control group, Range of Motion (ROM) was 3.20 and after being given treatment in the control group, it was 3.60. Which means that the value of the upper extremity muscle strength of the respondent after being given treatment increased from before being given treatment. The combination of shoulder exercise and isometric handgrip exercise has an effect on increasing upper extremity muscle strength in post-stroke patients

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