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APPLICATION OF RANGE OF MOTION EXERCISES TO INCREASE MUSCLE STRENGTH IN NON-HEMORRHAGIC STROKE PATIENTS

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ABSTRACT

Stroke is a disruption of blood flow in the brain, patients who suffer from weakness in the limbs can cause a decrease in muscle strength, so they cannot move their body. Solutions to prevent and reduce disability, complications and death after having a stroke. Rehabilitation in stroke patients one of them is by doing Range of Motion exercises. Objective: This study was to analyze the application of ROM exercise to increase muscle strength in ischemic stroke patients. Design: This study used quasi-experimental with Pre-Test and Post-Test approaches with a sample of 15 people using Purposive Sampling techniques. Data analysis using the Wilcoxon Match Pairs test. The data collected consisted of respondents' characteristics in the form of age, gender, history of stroke and muscle strength. The instrument used is an observation sheet and muscle strength measurement, MMT (Manual Muscle Testing). Results: Showed that there was an increase in muscle strength after (post-test) intervening with an average value of 4,13, while muscle strength up to condition 5 (normal) after implementing as many as 7 people (40,67%).

Keywords: muscle strength; non- hemorrhagic stroke; rom exercises

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INTRODUCTION

Stroke is a blood flow deficit in the cerebral vasculature, either of hemorrhagic or non-hemorrhagic origin, with different etiologies, as well as alternative causes that impact different physical, cognitive, and behavioral changes, depending on the area of the brain that is infiltrated (Barbosa et al., 2021). The type of stroke that is more commonly experienced by people is non-hemorrhagic stroke at 87%, while hemorrhagic stroke is only 13%(Hermita Manik et al., 2023). Non-hemorrhagic stroke is characterized by reduced blood circulation to certain areas of the brain. Among the most specific are habits and lifestyles, smoking, high fat intake, and a sedentary lifestyle. In addition, chronic degenerative diseases such as hypertension and diabetes mellitus (DM), can be risk factors for ischemic stroke (Filho et al., 2023). This is what makes stroke patients will have difficulty mobilizing such as walking, moving their legs or doing other activities. This movement disorder occurs because the patient's muscle strength decreases (Aditama et al., 2024).

According to the World Health Organization (WHO) in 2018 the prevalence of stroke worldwide was 29.4, and 10.3 million people died from stroke. The incidence of non-hemorrhagic stroke is estimated to reach 85% of all stroke cases(Mohamad et al., 2023). According to data that every 3 minutes 42 seconds there is one person who loses his life due to stroke and the number is increasing until it reaches 1 per 20 people in the USA (Indra Frana Jaya KK et al., 2024). The results of Riskesdas Indonesia in 2018 show that the incidence of stroke in Indonesia is 10.9 per 1000 people who have been diagnosed by health workers. The stroke rate in Indonesia has always increased. The incidence of stroke reached 50.2 per 1000

elderly people. The total number of strokes in Indonesia is estimated to reach 500,000 each year. Of these, about 2.5% or 250,000 people lose their lives, and the rest experience mild or severe disability. The incidence of stroke increased in East Java by 12.4%, namely 113,045, in West Java by 11.4%, namely 131,846, and stroke patients in Central Java by 11.8%, namely 96,794 (Kemenkes RI, 2018) in (Maesarah & Supriyanti, 2024). The factors that cause stroke are divided into two, namely risk factors that cannot be changed and risk factors that can be changed. Unchangeable risk factors are old age, male gender, low birth weight, and stroke heredity. Modifiable risk factors such as high blood pressure, smoking, heart disease, DM, dyslipidemia, and obesity(Saragih et al., 2024).

Common nursing problems encountered when carrying out the nursing process in stroke patients are increased intracranial pressure capacity and limited physical activity (Khristiyani, 2024). The goal is to stimulate the hand so that it can move or contract the muscles properly so that the decreased motor function in the upper body can be increased or normalized (Rahmawati & Yuda, 2022). It is known that 70% to 80% of stroke patients suffer from hemiparesis, which can result in movement disorders. Of course, bone weakness can lead to functional disability, with limited ability to perform activities such as work, walking, communication, even eating and self-care (Maljuliani et al., 2023). Stroke patients need good care to avoid physical and psychological disability. Stroke suffered by adult patients can reduce productivity and can even burden others (Eva Dwi Ramayanti, 2022). Range of Motion (ROM) is a therapy performed to maintain or rehabilitate the level of completeness, the ability to mobilize joints normally and completely to optimize muscle mass and muscle tone (Elpriska, 2023).

There are two types of range of motion exercises, namely active range of motion exercises, where a patient performs exercise movements alone without assistance, and passive range of motion exercises, where a patient performs exercises with the help of others to do. (Ginanjar, 2024). ROM can be safely applied as a therapy in various patient conditions and has a positive impact both physically and psychologically, light exercises such as ROM have several advantages including being easier to learn and remember by patients and families, easy to apply and is a cheap nursing intervention that can be applied by stroke patients (Rahmadani & Rustandi, 2019). Mobility exercises that are not carried out properly can cause complications. In general, stroke complications that occur at an advanced stage or during the recovery phase are often caused by immobilization, such as pneumonia, bedsores, contractures, deep vein thrombosis, atropia, urinary and bowel incontinence. Cerebrovascular accident (CVA) is one of the cases that require attention, which often leads to complications and even a very high mortality rate (Fitria Kudadiri et al., 2024).

Based on the results of research conducted by (Sihotang et al., 2023) that the muscle strength of respondents in the neurology inpatient room has increased as many as 16 people (88.9%). Passive ROM exercises were performed by 16 people (88.9%). The value of $p = 0.000$ ($\alpha = 0.05$) with a comparison of $p < 0.05$ can be decided. Ha failed to be rejected, which means that there is a relationship between passive range of motion (ROM) training and upper limb muscle strength in non-hemorrhagic stroke patients in the neurology inpatient room at RSUD dr Pirngadi Medan. So the aim of this research is to determine the effect ROM exercises to rehabilitate and increase muscle strength in stroke patients.

METHOD

This type of research uses Quasi Experimental with Pre-test and post-test design approaches. The number of samples was 15 people using the Purposive Sampling technique. The data collected consisted of respondent characteristics in the form of age, gender, history of stroke and muscle strength. Accumulated data using observation sheets and MMT (Manual Muscle Testing) muscle strength measurement tools. This research was conducted at RSI. A. YANI Surabaya. The implementation of this study was carried out from January to February. Respondents in this study were non-hemorrhagic stroke patients who wanted to be respondents by 15 people by giving Range of Motion exercises 2 times a day in 1 week. This intervention is carried out by giving Range of Motion movements, by giving pre and post to respondents. This intervention is carried out by giving Range of Motion movements, by giving pre and post to respondents. Respondents gave an explanation and were given Range of Motion exercises then followed the direction of the researcher and applied using the help of researchers and then carried out ROM exercises. Researchers help conduct therapy to patients and observation of exercises carried out by researchers and each patient on observation sheets.

RESULTS

The search results yielded 36229 articles, which were then filtered and adjusted based on full text assessment to produce 11 articles. The flow diagram in this research is as follows:

Table 1.
The data collected consisted of respondent characteristics in the form of age, gender and degree of disability.

General Data	f	%
Age		
45-50	3	20
50-60	7	46.67
>603	5	33,33
Gender		
Male	9	60
Famale	6	40
History of Stroke		
None	5	33,33
Exist	10	66,67

Based on table 1, it shows that the majority of respondents with 50-60 years old were 7 patients (46.67%), male sex results were 9 patients (60%), women were 6 people (40%) and disease history results were 10 patients (66.67%).

Table 2.
Distribution of the degree of muscle strength before (Pre-Test intervenes Range Of Motion therapy in non-hemorrhagic stroke patients in RSI. A. YANI Surabaya.

Muscle Strength	f	%
Scale		
0	1	6,67
1	1	6,67
2	5	33,33
3	7	46,67
4	1	6,67

Table 2 shows that The statistical results of the muscle strength scale before doing Range of Motion therapy showed that the most increased values were degree 2 (33.33%) and scale 3 (46.67%).

Table 3.
Distribution of degrees of muscle strength after (Post-Test) intervention of Range of Motion therapy and in non-hemorrhagic stroke patients at RSI. A. YANI Surabaya.

Muscle Strength	f	%
2	1	6,67
3	3	20
4	4	26,67
5	7	46,67

Table 3 shows that The statistical results of the muscle strength scale after doing Range of Motion therapy increased muscle strength on a scale of 4 people (26.67%) and a scale of 5 or recovery stage which was 7 people (46.67%).

Table 4.
Value of muscle strength before and after the Range of Motion were performed in non-hemorrhagic stroke patients at RSI. A. YANI Surabaya

Muscle Strength Scale	Mean	Standar Deviasi	Minimal	Maximal
Pre-Test	2,40	0,986	0	4
Post-Test	4,13	0,990	2	5

Table 4 shows that The statistical value of the degree of muscle strength before (Pre-Test) doing Range of Motion therapy and Warm Water Compresses shows that the results of minimal muscle strength are at degree 0 and the maximum value of muscle strength on a scale of 4 with an average result of increasing muscle strength of 2,40. While after (Post-Test) doing Range of Motion Exercises and Warm Water Compresses the value showed that the increase in muscle strength where the average result was at least a scale of 2 and the maximum result was on a scale of 5 with an average value of increasing muscle strength of 4,13. The results of the Wilcoxon test show that p values of $0.000 < 0.05$ mean that there is an influence.

DISCUSSION

Characteristics by Age

Based on the results of this study, the highest with stroke cases is aged 50-60 years as many as 7 respondents (46.67%). In second place, namely from the age of 45-50 years with 5 people (33.33%). Age is categorized as a risk factor that cannot be modified. The older a person is, the more susceptible it will be to stroke. Stroke cases increase due to age. After the age of 55 years, the risk of non-hemorrhagic stroke increases 2 times every decade (Aini et al., 2020). Like-wise some other studies that say that the majority of stroke cases attack everyone over the age of 50 years. However, with the diet and type of food that exists today, it does not rule out the possibility that stroke can attack those who are still young (Sutejo et al., 2023). Stroke can affect individuals of any age, although it has traditionally been considered a disease of the elderly, with the incidence doubling each decade after age 55. In recent years, the average age of stroke has decreased, and stroke incidence and hospitalization rates have increased globally in younger individuals. DM, smoking, low exercise fitness, and obesity are the leading causes of stroke in younger patients. Modifiable factors, clinical presentation, and outcomes of stroke differ among patients of different ages and sexes. Younger stroke patients have an increased risk of cardiovascular mortality and morbidity compared with the general population (Soto-Cámara, R., González-Bernal, J. J., González-Santos, J., Aguilar-Parra, J. M., Trigueros, R., & López-Liria, R., 2020).

Characteristics by Gender

The results of this study showed that the magnitude of stroke cases attacked people who were male as many as 9 respondents (60%) and 6 people (40%) who were female. This is supported by previous research, namely Gender is one of the factors that can cause stroke attacks. Based on risk factors, stroke attacks men 19% more than women (Sutejo et al., 2023). This is in line with research (Irsan et al., 2023) the gender of respondents is dominant, namely; men with 7 respondents (70%), while women with 3 respondents (30%). In men have a higher risk of stroke, this is due to lifestyle or behavioral influences. In men have a higher risk of stroke, this is due to lifestyle or behavioral influences. Based on previous research, it was stated that the male sex was 12 people (52.2%) in the treatment group, while 16 people (69.6%) in the control group (Wedri et al., 2017).

Characteristics with a History of Stroke

Based on the results of this study showed that a history of stroke as many as 10 people (66.67%) and no history of stroke as many as 5 people (33.33%). This shows that people who have a history of stroke are high risk to have a stroke. The characteristics of respondents with a previous history of disease (Sholihany et al.,2021) stated that respondents in the unilateral ROM group had the most history of disease as much as 65.4%, while patients in the bilateral ROM group stated that respondents with hereditary diseases were 61.5%.

Muscle Strength Characteristics

Based on the results of the study, from 15 patients it was stated that all patients experienced an increase in muscle strength scale from a scale of 0-1 to a scale of 2, while a scale of 2 pre-test muscle strength there were 5 patients who experienced muscle strength weakness but after the intervention (post-test) became 2 patients. The pre-test muscle strength scale with a scale of 3 there were 6 patients, then 3 patients who experienced an increase in muscle strength. From a scale of 4 pre-tests there was 1 patient then after the intervention (post-test) increased to 4 patients. While the scale of muscle strength before (pre-test) was 0, but after therapy there were 6 stroke patients who expressed muscle strength increased to a scale of 5 or became normal. According to previous research, Kamelia (2021) showed that Post Stroke Patients before being given ROM Exercise mostly experienced 2nd and 3rd degree Muscle weakness as many as 13 Patients (37.1%), while after being given ROM (Range Of Motion) Exercise a minority experienced Scale 2 Muscle Weakness as many as 12 Patients (34.3%). However, stroke patients who experienced an increase in muscle strength as many as 22 patients and who did not experience an increase or remained as many as 13 patients were seen from the observation data that I have obtained.

Rehabilitation that can be given to patients is range of motion training or commonly called ROM is an exercise used to maintain or optimize the level of perfection of the ability to move joints normally and perfectly to increase muscle mass and muscle tone. ROM training in non-hemorrhagic stroke patients is a requirement to achieve client independence, because motion therapy can help slowly the limbs and arms return or become normal, the weak strength in these patients to maintain mobilization and the effect if not given ROM rehabilitation can cause muscle and joint stiffness, the patient's physical mobility can depend totally on the family, the patient is difficult to fulfill physical activity(Pratama et al., 2021). In the future, the nurse recommends that patients continue to do ROM twice a day for 10 to 15 minutes at home, and families are advised to always encourage and support patients in undergoing ROM exercises. This is in accordance with several other studies which show that respondents are recommended to do physical activity to maintain muscle strength, including flexion and extension exercises (Fauziyah et al., 2023).

Range of motion (ROM) exercises are exercises performed to maintain or improve the level of perfection of the ability to move joints normally and completely to increase muscle mass and tone. ROM exercises are usually performed on semi-comatose and unconscious patients, patients with limited mobility who are unable to perform some or all range of motion exercises independently, patients on total bed rest or patients with total limb paralysis. This exercise aims to maintain or preserve muscle strength, maintain joint mobility, stimulate blood circulation and prevent deformities (Maesarah, D., & Supriyanti, E., 2024) A stroke can cause weakness and paralysis on one or even both sides of the patient's body. This weakness can cause difficulty walking and doing activities.

This requires patient immobilization. In fact, with this immobilization, the patient will lose muscle strength. Meanwhile, stroke patients with left hemiparesis have an average strength value of 3, right hemiparesis 4, paraparesis 3, hemiplegia 2, hemiplegia alternans 2, and paraplegia 3. Where 3 states that ROM is full, muscles are only actively able to resist gravity, 4 states full ROM, able to withstand gravity but weak when given resistance, and 2 states muscles are able to resist gravity but with assistance (passive ROM) this is in accordance with the concept that states that the main pathophysiological element in stroke is the presence of motor deficits in the form of hemiparesis or hemiplegia which can result in immobility. This condition can cause a decrease in muscle strength which can result in general inability to the muscles of the extremities, decreased flexibility and joint stiffness which can result in contractures so that in the end the patient will experience limitations/disabilities especially in carrying out activities of daily living (ADL) (Kusuma, A. S., & Sara, O., 2020; Rahmadani, E., & Rustandi, H., 2019).

CONCLUSION

Based on the results of research that has been conducted on 15 respondents in non-hemorrhagic stroke patients at RSI. A. Yani Surabaya can conclude as follows: There was an increase in muscle strength after (post-test) intervening with an average value of 4,13 while muscle strength up to condition 5 (normal) after implementing as many as 7 people (46,67%). The combination of Range of Motion therapy and warm water compresses is very effective for increasing.

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