

Active Range of Motion Exercises and Muscle Strength in Post-Stroke Patients: A Study at Ketapang Health Center

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Abstract

Introduction: Stroke is a condition that occurs when the blood supply to the brain is disrupted or reduced due to a blockage (ischemic stroke) or rupture of a blood vessel (hemorrhagic stroke). Without blood supply, the brain will not receive oxygen and nutrients, causing cells in some areas of the brain to die. This condition causes the body parts controlled by the damaged brain area to not function properly.

Objective: The effect of active ROM on muscle strength of stroke patients in the working area of Ketapang Health Center, Ketapang District, South Lampung Regency in 2025.

Method: This type of research is quantitative research. The research design used in this study is a Two-group design. This research was conducted in January 2025 in the working area of the Ketapang Health Center, South Lampung Regency. The population in this study was 19 people. The sample in this study was 18 people who were divided into 2 groups, namely 9 people in the Active ROM group and 9 people in the passive ROM group.

Result: The results of the study showed that there was an increase in muscle strength values in respondents who were given active ROM actions, namely 0.56 points. Meanwhile, respondents who were not given ROM treatment experienced a decrease in muscle strength by 0.11 points. The results of the statistical test obtained a p value of 0.041, <0.05.

Conclusion: There is an effect of active ROM on muscle strength in stroke patients in the Ketapang Health Center work area, Ketapang District, South Lampung Regency in 2025.

Keywords: muscle strength, range of motion, stroke

Introduction

Stroke is a condition that occurs when the blood supply to the brain is disrupted or reduced due to a blockage (ischemic stroke) or rupture of a blood vessel (hemorrhagic stroke). Without blood supply, the brain will not receive oxygen and nutrients, causing cells in some areas of the brain to die. This condition causes the body parts controlled by the damaged brain area to not function properly (Mulyatsih & Ariza Ahmad, 2022). Stroke is a medical emergency that requires immediate treatment, as brain cells can die within minutes. Prompt and appropriate treatment can minimize the extent of brain damage and prevent potential complications (Auryn, 2019).

The lifetime risk of stroke has increased by 50% in 2022. Over the past 17 years, it is now estimated that 1 in 4 people will experience a stroke in their lifetime. From 1990 to 2019, there was a 70% increase in stroke incidence, a 43% increase in stroke deaths, a 102% increase in stroke prevalence, and a 143% increase in disability-adjusted life years (DALYs). The most striking finding is that the majority of the global stroke burden (86% of stroke deaths and 89% of DALYs) occurs in low- and lower-middle-income countries (WHO, 2022).

Stroke caused 162,890 deaths in the United States in 2021. The age-adjusted stroke mortality rate in the US, as the leading cause of death, was 41.1 per 100,000, an 8.4% increase from 2011. The number of stroke deaths actually increased by 26.3% during the same time period. There were 7.44 million deaths from stroke worldwide (3.71 million deaths from ischemic stroke, 3.38 million deaths from intracerebral hemorrhage, and 0.36 million from subarachnoid hemorrhage) in 2021. Oceania and Southeast and Central Asia had the highest overall stroke rates. Central Asia and Eastern Europe had the highest ischemic stroke mortality rates. Deaths from intracerebral hemorrhage were highest in Oceania, followed by Southeast Asia and central and eastern sub-Saharan Africa. Deaths from subarachnoid hemorrhage were highest in Oceania, followed by Andean Latin America, and Southeast and Central Asia (AHA, 2024).

Stroke is a leading cause of death in Indonesia. According to the 2018 Basic Health Research (Riskesdas), the prevalence of stroke in Indonesia increased from 7 per 1,000 population in 2013 to 10.9 per 1,000 population in 2018. Approximately 90% of stroke cases are preventable by controlling risk factors such as hypertension, smoking, an unbalanced diet, lack of physical activity, diabetes, and atrial fibrillation. (Ministry of Health, 2023).

The prevalence of stroke (per millennium) based on doctor's diagnosis among residents aged 15 years and over in Lampung Province in 2023 was 21,021 cases. (Indonesian Health Survey, 2023). The prevalence of non-communicable diseases diagnosed by healthcare professionals can be described as follows: joint disease (12.1%), hypertension (6.6%), and stroke (5.4%). Hemorrhagic stroke in 2009 was 708 cases, the third highest was non-hemorrhagic stroke in 2009 with 532 cases (Lampung Provincial Health Office, 2022).

An equally important step in stroke management is post-stroke care. Post-stroke therapy is part of the care required for stroke survivors. Exercises performed in post-stroke therapy aim to help survivors carry out daily routines independently while maintaining remaining brain function (Mulyatsih, 2022). Post-stroke therapy includes: memory therapy, for example (playing chess, putting objects in their proper places, remembering words); movement therapy, for example (range of motion exercises, walking, performing daily activities); and speech therapy (AIUEO exercises). The consequences of not receiving post-stroke care include permanent, difficult-to-recover paralysis, both affecting speech and movement (Abdul. Gofir, 2021).

Movement therapy, specifically range of motion (ROM), is an important therapy in post-stroke care. Post-stroke refers to the condition after a person has been discharged from the hospital after a stroke. ROM exercises function to maintain or increase muscle flexibility and strength, maintain respiratory and cardiac function, prevent joint stiffness, stimulate blood circulation, prevent deformities, stiffness, and contractures, reduce pain, and restore muscle movement (Auryn, 2019). Therefore, ROM exercises are essential.

ROM exercises are excellent for stroke patients because they can improve flexibility, muscle strength, and joint range of motion, increase neuromuscular and muscular chemical activity, and increase muscle strength in the upper and lower extremities. ROM exercises can restore the physical condition of stroke patients and prevent complications such as pressure sores (Mei Fitria Kurniati, 2024).

Research conducted by Andriani et al. (2022) on the effect of ROM on muscle strength in stroke patients in the Ciamis area found a significant difference in muscle strength before and after ROM intervention of 0.000. This demonstrates the effectiveness of ROM in increasing muscle strength. A study conducted by Rahmadani & Rustandi (2019) on increasing muscle strength in non-hemorrhagic stroke patients with hemiparesis through passive range of motion (ROM) exercises found that the average pre-test and post-test muscle strength values increased in the intervention group and there was no increase in the control group. A significance value ($p = 0.008$) was found in the intervention group and ($p = 0.5$) in the control group. In conclusion, range of motion exercises significantly affected muscle strength in non-hemorrhagic stroke patients in the ICU of Curup Regional Hospital in 2019.

Eka Pratiwi Syahrim et al (2019) "Effectiveness of ROM exercises on increasing muscle strength in stroke patients: a systematic review study" found that based on six articles on the effectiveness of ROM exercises on increasing muscle strength in stroke patients, ROM exercises were 100% effective in addressing muscle weakness in stroke patients. The range of motion (ROM) exercises used in the selected journals were active and passive range of motion (ROM). ROM exercises should be performed at least twice daily, every morning and evening, for 15-35 minutes, and with a minimum of four repetitions of each movement. Based on the six journals selected according to the inclusion criteria, it can be concluded that ROM exercises are effective in increasing muscle strength. The exercises should be performed at least twice daily, every morning and evening, for 15-35 minutes, and with a minimum of four repetitions of each movement.

Based on data collected by researchers from the Ketapang District Health Center (Puskesmas), village health workers (Mentri), and village midwives, 19 stroke patients were found across three villages: Pendowo Village, Ketapang District. According to data from the Ketapang Health Center, there were 11 stroke patients in 2021, 10 in 2022, 14 in 2023, and 14 in 2024. These stroke patients were previously hospitalized but are no longer receiving treatment. They are being cared for at home and undergoing alternative treatments. While at home, they generally do not perform ROM exercises. This significantly increases the risk of joint stiffness, which can exacerbate patient suffering. Therefore, researchers want to implement ROM exercises as research material.

A pre-survey conducted by researchers with five stroke patients through brief interviews regarding joint range of motion exercises revealed that four frequently practiced their own range of motion exercises, but researchers observed that their movements were random and unstructured. One person stated that they tended to only do the movements in a stationary position, but when the researcher helped them move their joints, they refused. From the pre-survey data, the researchers concluded that, in general, stroke patients are

willing to do active ROM exercises, but only need structured guidance. A small percentage of stroke patients are more comfortable doing nothing. Therefore, based on this background, the researchers wanted to delve deeper into the influence of active ROM exercises on muscle strength in stroke patients in the Ketapang Community Health Center, Ketapang District, South Lampung Regency, in 2025.

Objective

The effect of active ROM on muscle strength of stroke patients in the working area of Ketapang Health Center, Ketapang District, South Lampung Regency in 2025.

Method

The method used was Pre-Experiment where the researcher attempted to reveal the influence of Active ROM on muscle strength of stroke patients in the working area of the Ketapang Health Center, Ketapang District, South Lampung Regency in 2025 without taking other factors into account.

The research design used in this study is a Two-group design. The population in this study were all stroke patients at the Ketapang District Health Center in November 2024, totaling 19 people. The population in this study consisted of 19 respondents, so the sample in this study was the total population, namely 18 respondents divided into two groups. The implementation of the study began by visiting the respondents' homes door to door to inform the respondents that the researcher was conducting the study and then providing informed consent forms to the samples who were willing to become respondents while explaining the intent and purpose of this study for each group. Next, the researcher taught ROM to the respondents accompanied by 1 or 2 family members of the patient. Then the researcher asked the respondents to do ROM independently every time they woke up and before going to bed, while asking the family to supervise and ensure that the respondents did the ROM. Then the researcher provided a research observation sheet to the respondents to record the respondents' muscle strength.

This type of research is quantitative research. The research design used in this study is a Two-group design. This research was conducted in January 2025 in the working area of the Ketapang Health Center, South Lampung Regency. The population in this study was 19 people. The sample in this study was 18 people who were divided into 2 groups, namely 9 people in the Active ROM group and 9 people in the passive ROM group. The bivariate analysis of this study will use the T-test, namely the Independent T-Test. In this study, the comparison of the experimental and control groups is made up of two unpaired samples. In this study, the calculation of the difference test is carried out using a statistical test application, namely the p-value, then compared with $\alpha = 0.05$. If the p-value is $< \alpha = 0.05$, there is a relationship or difference between the two variables. The independent T-Test is an analysis that aims to compare two unpaired samples (Pahleviannur et al., 2023).

Result

Table 1. The Effect of Active ROM on Muscle Strength of Stroke Patients

	Range of motion	Mean	Std. Deviation	p-value
Muscle Strength	Not Given	.11	.333	0.041
	Given	.56	.527	

Based on Table 4.8, it can be seen that there was an increase in muscle strength scores of 0.56 points in respondents who received active ROM. Meanwhile, respondents who did not receive ROM experienced a decrease in muscle strength of 0.11 points. The p value was 0.041, a p value <0.05 , indicating that active ROM had an effect on muscle strength of stroke patients within the Ketapang Community Health Center, Ketapang District, South Lampung Regency, in 2025.

Discussion

Based on the research results, it was found that there was an increase in muscle strength scores of 0.56 points in respondents who received active ROM exercises. Meanwhile, respondents who did not receive ROM exercises experienced a decrease in muscle strength of 0.11 points. The p value was 0.041, a p value <0.05 , indicating an effect of active ROM on muscle strength in stroke patients.

The research data showed an increase in muscle strength scores of 0.56 points in respondents who received active ROM exercises. This figure indicates that ROM exercises positively contributed to increased muscle strength. Conversely, respondents who did not receive active ROM exercises showed a decrease in muscle strength of 0.11 points. This figure further strengthens the position that ROM exercises positively contribute to increased muscle strength, as without ROM, muscle strength decreases.

Research conducted by Widya Addiarso et al. (2023) compared the effectiveness of active ROM exercises and acupressure on upper extremity muscle strength in non-hemorrhagic stroke patients in the Inpatient Ward of Dr. Soetomo General Hospital. Haryoto Lumajang. Results showed that before ROM therapy, 11 respondents (61.1%) had poor muscle tone, and before acupressure therapy, 15 respondents (83.3%) had poor muscle tone. After ROM therapy, 13 respondents (72.2%) had adequate muscle tone, and after acupressure therapy, 14 respondents (77.8%) had poor muscle tone. The Mann-Whitney analysis showed an α of 0.003, indicating a comparative effectiveness of active ROM training and acupressure on upper limb muscle strength in non-hemorrhagic stroke patients.

In line with research conducted by Rafiudin et al. (2024) on the application of active range of motion (ROM) using the cylindrical grip on muscle strength in non-hemorrhagic stroke patients, data showed that after applying active ROM using the Cylindrical Grip twice daily for 7 days for 10 minutes, muscle strength increased in both subjects. Subject I's muscle strength increased from 16.2 kg to 19.0 kg and Subject II's muscle strength increased from 29.5 kg to 34.5 kg. Regular active ROM training can increase muscle strength.

Purba et al. (2022) found that the effectiveness of ROM (Range of Motion) on muscle strength in stroke patients at Royal Prima Hospital showed that the majority of respondents' muscle strength was at a scale of 3 (67.9%), while a minority of respondents' muscle strength was at a scale of 4 (10.7%). After performing ROM (Range of Motion) exercises, there was an increase in muscle strength, with the majority of patients' muscle strength at a scale of 4 (45.5), and a minority of patients' muscle strength at a scale of 5 (30.0%). The effectiveness of ROM (Range of Motion) on muscle strength in stroke patients at Royal Prima Hospital Medan in 2021 was demonstrated, with a p -value of 0.004.

This is also in line with research conducted by Dian Maesarah. Maesarah & Endang Supriyanti (2023). The results of a case study showed that muscle strength before ROM exercises was at a minimum of 1 and a maximum of 3, with an average value of 2.20. Meanwhile, after ROM exercises, there was an increase in muscle strength, with a minimum

of 2 and a maximum of 3, with an average value of 2.60. Therefore, it can be concluded that ROM exercises are beneficial for increasing muscle strength in non-hemorrhagic stroke patients.

Conclusion

There was an increase in muscle strength values in respondents who were given active ROM actions, namely 0.56 points. Meanwhile, respondents who were not given ROM actions experienced a decrease in muscle strength values of 0.11 points. The p value was 0.041, p value <0.05 so that there was an effect of active ROM on muscle strength of stroke patients in the working area of the Ketapang Community Health Center, Ketapang District, South Lampung Regency in 2025.

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Not applicable.

Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The researchers stated that there is no conflict of interest related to the implementation and publication of the results of this research. The entire research process, from planning, data collection, analysis, to report preparation, was carried out independently without any influence or pressure from any third party. A commitment to research ethics is upheld throughout the research process, ensuring transparency, accuracy and honesty in reporting results. Respondents' participation was voluntary with informed consent, and their confidentiality and privacy were maintained in accordance with applicable research ethics standards. With this statement, researchers hope that the research results can be trusted and used as a valid reference for the development of science and health practices related to ethnomedicine and reproductive health.

Ethical consideration

Not applicable.

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