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Effectiveness of Range of Motion (ROM) on Improving Physical Mobility of Stroke Patients Non-Hemorrhagic: Literature Review

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ABSTRACT

Stroke is one of the leading causes of disability and death in the world, including in Indonesia. This disease requires quick and appropriate treatment to minimize the impact of disability and improve the patient's quality of life. This study aims to examine the effectiveness of Range of Motion (ROM) exercises in improving the physical mobility of non-hemorrhagic stroke patients. The method used in this study is a literature review of 5 related articles taken from a database consisting of Google Scholar, Garuda Portal, and Crossref. Articles are selected based on inclusion criteria and conduct critical appraisals in each article. Based on the search results, 5 articles with the quantitative design method of Quasy Experiment were published in the last 5 years (2019-2024) regarding articles related to improving physical mobility using range of motion (ROM). The conclusions of the results of the study show that ROM exercises, both passive and active, significantly improve muscle strength, joint flexibility, and prevent further complications. Thus, ROM exercises are an effective intervention in increasing muscle strength and physical mobility and can be integrated into the recovery programs of non-hemorrhagic stroke patients.

Keyword: Physical Mobility; Range of Motion (ROM); Stroke

INTRODUCTION

Stroke is a life-threatening disease because in the event of a stroke, as many as 1.9 million brain cells can die every minute. Stroke is the number two leading cause of disability and death in the world. (Kemenkes, 2024)According to (WHO, 2024)states that every year, 15 million people worldwide suffer a stroke. Of these, 5 million died and another 5 million were left permanently disabled, placing a burden on families and communities. Stroke is rare in people under 40 years old, when it does, the main cause is high blood pressure. However, stroke also occurs in about 8% of children with sickle cell disease.

Stroke in Indonesia is the leading cause of disability and death, accounting for 11.2% of total disability and 18.5% of total deaths (Ministry of Health, 2024). Data taken based on the Ministry of Health of the Republic of Indonesia (2019) in Robby et al., (2023) that in West Java is one of the provinces that has a fairly high prevalence of stroke, which is 11.44%. For the prevalence of stroke patients in Tasikmalaya City based on the level of control compliance with health care facilities in the population aged ≥15 years, which is 20.56%. Based on data obtained from dr. Soekardjo Tasikmalaya Hospital, the number of cases of stroke patients in 2021 was 272 people.

Stroke is a condition in which blood flow to the brain is disrupted, stroke can occur in 2 classifications, namely ischemic stroke and hemorrhagic stroke. In ischemic stroke, there is a blood clot that clogs in one of the blood vessels of the brain which can interfere with blood circulation to the brain, while in hemorrhagic stroke it occurs due to the rupture of blood vessels in brain tissue. They accounted for 87% and 13% of disability or death due to stroke, respectively. In general, symptoms in ischemic and hemorrhagic stroke and have similar symptoms but each require different treatment (ACLS & NHCPS, 2021 in Caron & Markusen, 2021).

Stroke carries a high risk of death. Stroke survivors can experience vision and/or speech loss, paralysis, and confusion (WHO, 2024). Paralysis is one of the symptoms of physical mobility disorders, good physical mobility is very important for non-hemorrhagic stroke patients to improve their quality of life. Physical mobility impairment is a limitation in the physical movement of one or more extremities independently that can interfere with patterns of activity and exercise usually related to exercise, grooming, eating, recreation, bathing and toileting (Trimardani & Ditasari, 2022).

Stroke treatment must be carried out quickly and appropriately to avoid further disability or complications. The management of non-hemorrhagic stroke is aimed at restoring body control movements following the initial pattern of movement development. The spontaneous recovery of motor function varies greatly from patient to patient, the less weakness occurs, the faster the recovery (Inspired by Ilham Darmawan, Indhit Tri Utami, 2024). Therefore, effective interventions to address physical mobility in patients with stroke disorders are urgently needed. Interventions that can be carried out in stroke patients can be in the form of pharmacological therapy in the form of drugs and non-pharmacological can be in the form of Range of Motion (ROM) because it is one of the non-pharmacological approaches that has been proven effective in increasing physical mobility. ROM exercises aim to improve joint flexibility, muscle strength, and movement coordination (Syahmura et al., 2022).

Research results Anggriani et al., (2020) showed a mean increase in muscle strength

between before and 7 days after the intervention of 1.80. The occurrence of an increase in muscle strength can activate voluntary movements. Range Of Motion (ROM) is an exercise that is done to maintain or improve the level of perfection of the ability to move the joints normally and completely to increase muscle mass and muscle tone. Research Kudadiri et al., (2024) It also shows that range of motion exercises are effective in helping muscle strength and physical mobility with results after ROM (range of motion) exercises are obtained an increase in muscle strength where the majority of muscle strength on a scale of 4 is 11 people (45) and the minority of the patient's muscle strength on a scale of 5 is as much as 10 people (30%).

Based on the description above, it is important to provide range of motion therapy (ROM) to stroke patients to maintain and improve physical mobility both from muscle strength or joints of stroke sufferers and prevent further complications such as pain due to pressure, contractures, thromboplebitis, risk of falls and decubitus, therapy given range of motion (ROM) has also been proven to be effective in helping physical mobility disorders in non-hemorrhagic stroke patients, so the purpose of this literature review is to find out about "The Effectiveness of Range Of Motion (ROM) On Increasing Physical Mobility in Non-Hemorrhagic Stroke Patients".

METHOD

The method used in searching and finding data sources in this literature review was database searching using Google Scholar, Portal Garuda, and Crossref. Articles were selected based on inclusion criteria and critically appraised using the Preferred Reporting Items for Systematic Review and Meta Analysis (PRISMA) framework (Chart 1).

The search for articles was conducted using three databases: Google Scholar, Portal Garuda, and Crossref. The electronic data search was conducted on December 15, 2024. The keywords used in the search were "Range of Motion (ROM)," "Physical Mobility," and "Stroke." The author conducted a selection of articles related to the effectiveness of range of motion (ROM) on physical mobility disorders in non-hemorrhagic stroke patients, followed by a review of the articles obtained.

In the search process to obtain relevant articles, a filter was applied for the past five years, from 2020 to 2024. The clinical question guiding the search strategy was formulated using the PICO format, which consists of P (Participant), I (Intervention), C (Comparison), and O (Outcomes) (Table 1). The clinical question formulated was "The Effectiveness of Range of Motion (ROM) on Improving Physical Mobility in Non-Hemorrhagic Stroke Patients".

Table 1. *Research Questions (PICO Framework)*

Key Elements	Description	Terms
Population	Pasien Stroke	Stroke
Intervention	*Range Of Motion* (ROM)	*Nursing Intervention*
Comparison	No Intervention	-
Outcomes	Efektivitas *range of motion* (ROM) pada pasien stroke non hemoragik	*Mobility Improvement*

Studies were eligible for inclusion if they met the following inclusion criteria: (a) case study design; (b) patients with non-hemorrhagic stroke; (c) full-text articles. Exclusion Criteria: (a) articles that do not meet the components or are poorly structured, consisting of abstract, introduction, methods, results, discussion, implications, and references; (b) review articles; (c) articles that do not address hemorrhagic stroke; (c) full-text articles. Exclusion Criteria: (a) articles that do not meet the components or articles that are not well-structured, consisting of abstract, introduction, methods, results, discussion, implications, and references; (b) review articles; (c) articles whose content is not

relevant to the topic. Data extraction was then conducted by analyzing the data based on the author's name, title, objectives, research methods, and results, namely by grouping the important data from the selected articles. The results of the data extraction can be seen in Table 2.

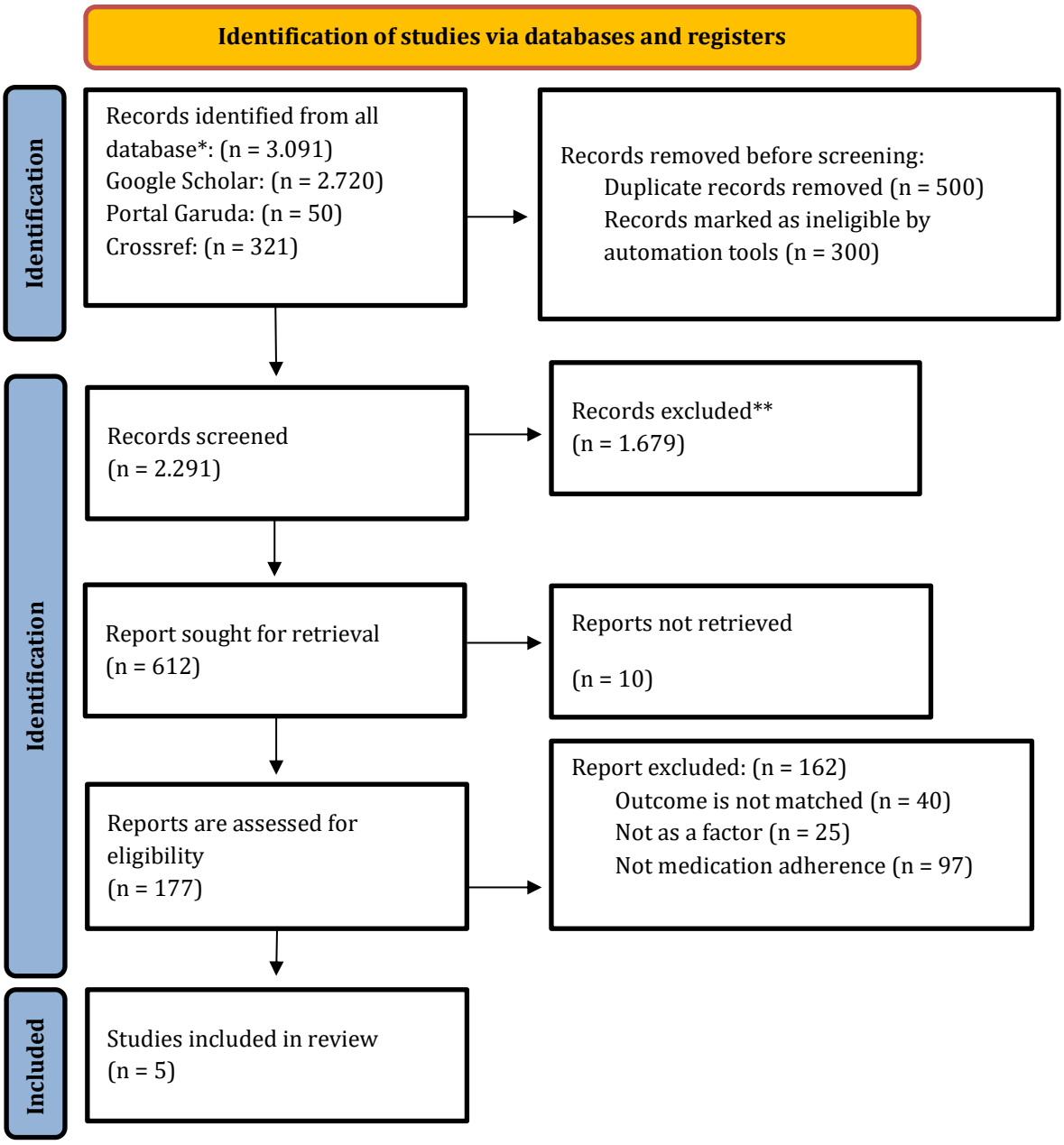

Chart 1. Prism Diagram

RESULT

Based on the search results, 10 articles were selected using a descriptive qualitative case study design from three databases on articles that related to the effectiveness of range of motion (ROM) on improving mobility in non-hemorrhagic stroke.

Table 2. Data Extraction

No	First Author	Year	Research Design	Number of Samples	Objectives and Results
1.	Siti Hartinah	2019	Quasy Experiment	22	**Objective:** To determine the analysis of the effectiveness of active ROM on the strength of the upper extremities and lower extremities muscles in the elderly at the Tresna Werdha Teratai KM Nursing Home. **Results:** The Friedman test showed significant differences in the upper extremities (p=0.001) and lower extremities (p=0.008). The Mann-Whitney test showed a significant difference in the upper extremities (p=0.03) after the active ROM intervention, but not significantly in the lower extremities (p=0.058).
2.	São Paulo, São Paulo	2020	Quasy Experiment	30	**Objective:** This study aims to determine the extent of the effectiveness of ROM training on the strength of Extremity Muscles in Stroke Patients **Results:** The results of the analysis of the Wilcoxon test showed an increase in muscle after the intervention of 1.8, while muscle strength occurred up to 5 (normal) conditions after the intervention of 40%.
3.	Sry Desnayati Purba	2021	Quasy Experiment	20	**Objective:** The purpose of this study was to determine the effectiveness of ROM (Range of Motion) on muscle strength in stroke patients at Royal Prima Hospital Medan. **Results:** Research results After the ROM (*Range of Motion*) exercise was carried out, there was an increase in muscle strength, where the majority were on a scale of 4 as much as (45.5%) and the minority were on a scale of 5 (30.0%). The implementation of *range of motion exercises* in hemorrhagic stroke patients was able to increase muscle strength in stroke patients who experienced muscle weakness with the results of the Wilcoxon test obtained a p value of 0.004 < an alpha value of 0.05.
4.	Fitria Kudadiri	2024	Quasy Experiment	30	**Objective:** To find out the extent of the effectiveness of the ROM. Against Muscle Strength in Stroke Patients **Results:** After the ROM (*Range Of Motion) exercise, there was* an increase in muscle strength where the majority of muscle strength on a scale of 4 was (45.5) and the minority of the patient's muscle strength on a scale of

					5 was (30.0%). Thus, the results of data analysis using the data normality test were known to have a sig value for the pretest value of 0.002 and *a posttest value* of 0.007 and the Wilcoxon test where a p value of 0.004 or < 0.05 was obtained with a table of 2.887 z.
5.	Eva Yulia Dini	2024	Quasy Experiment	20	**Objective:** This study aims to determine the effect of *range of motion exercises* with the addition of rubber bloa on the improvement of grasping function of stroke patients in hospitals, to determine the effect of ROM exercises on the progress of grasping function of stroke patients. **Results:** The results of *the paired test* of the two groups were obtained with a significant value of p=0.000 (p<0.05). The difference in the percentage *of pre-test* and *post-test* in treatment group 1 was 22.6 and in treatment group 2 was 14.9.

DISCUSSION

Based on the results of the analysis of the 5 articles above on the intervention Range of motion (ROM), in non-hemorrhagic stroke patients with physical mobility impairments, it can be seen that the intervention Range of motion (ROM) in non-hemorrhagic stroke patients has been shown to be effective in improving the patient's physical mobility.

Stroke is an acute clinical manifestation due to neurological dysfunction of the brain, spinal cord, and retina, either partially or completely, that remains for ≥24 hours or causes death due to vascular disorders (Ministry of Health of the Republic of Indonesia, 2019a). Stroke is an attack on the brain where the brain lacks oxygen supply due to a disrupted blood supply which then causes sudden death of brain tissue (Kowalak et al., 2017 in Mare & Manungkalit, 2022).

Stroke can cause a variety of signs and symptoms that significantly affect the patient's physical mobility. One of the main symptoms is loss of motor function, which is often hemiplegi (paralysis on one side of the body) or hemiparesis (weakness on one side of the body). This condition occurs due to damage to the upper motor neurons that interfere with the control of motor movements. In addition, stroke can also cause loss of communication skills, such as dysarthria (difficulty speaking), dysphasia or aphasia (impaired or loss of speech), and apraxia (inability to perform previously learned movements). . (Sari, 2024)

Stroke treatment must be carried out quickly and appropriately to avoid further disability or complications. The management of non-hemorrhagic stroke is aimed at restoring body control movements following the initial pattern of movement development. The spontaneous recovery of motor function varies greatly from patient to patient, the less weakness occurs, the faster the recovery (Inspired by Ilham Darmawan, Indhit Tri Utami, 2024). One of the non-pharmacological therapies that can be done to help the physical mobility of patients is with exercise Range of motion (ROM), according to Setyawati & Retnaningsih (2024) ROM (Range Of Motion) can be safely applied as one of the therapies to the patient's condition and has a positive impact both physically and light exercises such as ROM (Range Of Motion) has several advantages, including being easier to learn and remembered by patients and patients' families, easy to apply and low-cost nursing interventions that can be applied by stroke patients.

ROM is one of the exercises given to maintain or refine its function normally and to increase muscle mass and muscle tone in the limbs (Irfan, 2010 in Putra Kusuma et al. (2022). Range of motion (ROM) is the extent to which a part of the body can

move around a certain joint or fixed point, which is the totality of movement that a joint can perform. The range of motion of this joint can be assessed through passive ROM (passive ROM/PROM), which is a movement performed with assistance, or an active ROM (active ROM/AROM), which is a movement that is performed independently without assistance. (Physiopedia, 2024)

ROM (Range Of Motion) exercises aim to maintain flexibility and the ability to move joints, reduce pain, restore the patient's ability to move muscles, and improve blood circulation. According to (Haryono & Utami, 2019) Isrofah et al. (2023) , ROM exercises aim to maintain or maintain strength in muscles, maintain muscle strength, maintain or improve joint mobility, can stimulate circulation in the blood, and prevent deformities or permanent disabilities.

According to the results of research conducted by (Hartinah et al., 2019; Kudadiri et al., 2024; Purba et al., 2022) The active range of motion is done three times a week for thirty minutes, and each extremity is worked three times. In the intervention group, there was a difference in lower leg muscle strength and a difference in upper leg muscle strength scale scores between pretest, posttest 1, posttest 2, and posttest 3 ($p=0.001$). Before performing the ROM exercise (Range of Motion), the majority of respondents scored 67.9% on the third scale for muscle strength and 10.7% on the fourth scale. However, after doing the ROM exercise (Range of Motion), it was found that the patients' muscle strength had increased, with the majority of their muscle strength on a scale of 4 being 45.5 and a minority on a scale of 5 being 30.0%. Before the ROM training (Range of motion), 20 respondents had the highest muscle strength on a scale of 3 (67.9%), while only 4 respondents had the lowest muscle strength on a scale of 4 (10.7%). However, after the ROM exercise (Range of motion), there is an increase in muscle strength; On a scale of 4, the majority of the patient's muscle strength was 11 people (45.5), while on a scale of 5 the minority was 10 people (30.0%).

Research results (Anggriani et al., 2020; Dini et al., 2024) stated that when the range of motion exercises were carried out twice a day for six days, with a duration of 10 to 15 minutes per exercise, the respondents' range of motion was affected. After the intervention, muscle mass increased by 1.8, and muscle strength increased by 40% to condition 5 (normal). Based on the results of the paired samples t-test used to compare pre-post group I, there was a difference shown with a p value of 0.000 ($p<0.05$). There is evidence that giving range of motion exercises to stroke patients using rubber balls can improve the functional ability of the hands.

Thus, based on various studies that have been conducted, passive and active ROM exercises have been proven to be very effective in improving muscle strength, range of motion, and physical mobility in non-hemorrhagic stroke patients. Consistency of execution time, duration, and frequency of movements are important factors in achieving optimal results. ROM exercises are an effective and consistent intervention in improving the patient's muscle strength and range of motion. The implementation of therapy in a structured manner, both in terms of duration, frequency, and technique, makes a significant contribution to improving conditions with physical mobility barriers. This exercise not only increases muscle strength, but also provides the added benefit of improving blood circulation, preventing joint stiffness, and improving body flexibility. This indicates that Range Of Motion (ROM) intervention can be integrated into various recovery programs, whether in hospitals, rehabilitation homes, or home care, as long as they are carried out with proper guidance and adequate supervision.

CONCLUSION

Stroke is one of the leading causes of disability and death in the world, with a growing prevalence. Appropriate interventions such as Range of Motion (ROM) exercises have been shown to be effective in improving the physical mobility of non-hemorrhagic stroke patients. ROM exercises are able to improve joint range of motion, increase muscle strength, and prevent further complications. The implementation of structured therapy with appropriate duration, frequency, and techniques makes a significant contribution to

improving the patient's condition. Therefore, ROM exercises can be a non-pharmacological approach that can be integrated in stroke patients' recovery programs.

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