



IMPROVEMENT OF MUSCLE STRENGTH IN ISCHEMIC STROKE PATIENTS WITH PASSIVE RANGE OF MOTION THERAPY: LITERATURE REVIEW

Anggia Astuti, Candra Alif Novyanto, Achlish Abdillah, Syaifuddin Kurnianto

Faculty of Nursing, University of Jember, Lumajang, Indonesia

ARTICLE INFO

Keywords:

Ischemic Stroke,
Decreased Muscle Strength,
Passive Range Of Motion

ABSTRACT

Introduction: Stroke is a disease that occurs due to blockage/disruption of blood flow to the brain, which can cause brain tissue death. Ischemic stroke is caused by a sudden loss of blood to the brain and will cause loss of nerve function to paralysis so that stroke patients experience mobility limitations. To overcome this problem can be done with passive range of motion therapy. **Method:** the method used in this study is a literature review. The source of the article uses the PubMed and Google Scholar databases. **Result:** Based on 8 journals obtained and reviewed, the results show that passive range of motion therapy is effective for increasing muscle strength in ischemic stroke patients. This exercise can stimulate muscle, which can increase neuromuscular, muscle and chemical activity. **Conclusion:** Passive range of motion therapy has benefits for increasing muscle strength. In addition, this therapy can also avoid complications of ischemic stroke due to physical mobility barriers experienced by clients such as limitations of some or all of the range of motion, stiffness, muscle weakness, postural disorders, muscle atrophy, pain, joint contractures that can cause disturbances in activities daily living (ADL).

E-mail:

candraalif66@gmail.com

1. Introduction

Ischemic stroke is caused by a sudden loss of blood circulation to the brain, resulting in neurological function loss and possibly paralysis [1]. Loss of blood circulation to the brain is caused by a thrombolytic or embolic. Thrombolytics can block blood flow to the brain caused by the blood vessels themselves, usually due to atherosclerotic disease, arterial dissection, fibromuscular dysplasia, or inflammatory conditions. Embolism is caused by a buildup of fat and oxygen in the arteries, resulting in a blockage of blood flow [2].

Loss of blood circulation to the brain can cause paralysis and physical mobility problems. Physical disorders are illnesses that impair the movement of one or more extremities [3]. physical mobility disease is not treated can cause stroke patients to experience limitations in part or all of their range of motion, stiffness, muscle weakness, postural disorders, muscle atrophy, pain, joint contractures which can cause disturbances in activities of daily living (ADL) (Sudarsini, 2017 in Anita, Pongantung, Ada, & Hingkam, 2018; Kim, Lee, & Sohng, 2014; Marsinova Bakara & Warsito, 2016; Sari, Agianto, & Wahid, 2015).

Worldwide, stroke is the second and third leading cause of death from disability. In developing countries, the percentage of stroke incidence reaches 70% and 87% of stroke-related deaths are adjusted for the disability that occurs. Over the last four decades, the incidence of stroke in middle- and low-income countries has doubled compared to high-income countries [8].

Riskesdas (2018) states that the incidence of non-communicable diseases such as cancer, chronic kidney failure, diabetes mellitus, hypertension, and stroke has increased compared to 2013. The incidence of stroke in Indonesia in 2018 with age ≥ 15 years was 10.9% or estimated as many as 2,120,362 people. In the province of East Java in 2018, the prevalence of stroke incidence rates reached 12.4% or an estimated 271,406 people. While the prevalence of stroke incidence in East Java province in 2013 reached 9.1%.

Kemenkes (2018) and Rahmadani, Rustandi, & Dehasen (2019) state that there are serious dangers that can threaten the lives of stroke patients. Stroke can cause the patient to experience paralysis

(hemiparesis), impaired sensibility in one or more limbs, decreased consciousness/coma, and death. Paralysis affects limbs such as hands, feet, and other limbs.

Nursing actions can be performed on stroke patients who experience hemiparesis with nursing problems with physical mobility disorders is range of motion (ROM) therapy. Range of motion (ROM) is a physical and psychological rehabilitation therapy used to prevent disability in stroke patients and can improve quality of life [12]. ROM is used to increase flexibility and muscle strength, and it can alter the sensorimotor cortex. This is because ROM therapy can stimulate the motor unit, the tighter the motor unit trained, the greater the muscular strength [13]–[15].

Research by Rhestifujiayani, Huriani, & Muharriza (2015) showed the results that ROM therapy can increase muscle strength in stroke patients with hemiparesis. Passive ROM exercises were performed 2 times a day for 7 days. Exercise movements include the upper extremities and limits such as flexion, extension, abduction, adduction, supination, pronation, rotation, external rotation and circumduction, dorsiflexion and plantar, inversion, and eversion. A similar study conducted by Hosseini et al. (2019) showed a significant increase in motor function in the upper and lower extremities. participated in this study was given passive ROM exercises 6-8 times with a time of 30 minutes for one to three months, before and after being given exercise the patients were measured muscle strength using the Oxford rating scale.

ROM has advantages over other therapies. The advantages of ROM therapy are that in its application it does not require special equipment, is easy to learn and remember, therapeutic training is more effective, easy to apply, low cost, and can be performed on all joints of the body, especially the head, upper and lower extremities [6], [11], [12], [17].

From the explanation above, the researcher is interested in conducting a literature review entitled "Improvement Of Muscle Strength In Ischemic Stroke Patients With Passive Range Of Motion Therapy: Literature Review".

2. Methods

The method used in this study is a literature review. The source of the article uses the PubMed and Google Scholar databases. The total number of articles that have been obtained is 629. Then it was reduced to (PubMed = 88, Google Scholar = 394) with a year limit of 2013. he search results were obtained then checked for duplication, it was found that 49 similar articles were omitted and 433 articles were left. Then the researcher conducted a screening based on the title (n = 433), abstract (n = 46), full text (n = 8) which was adjusted to the theme of the literature review. The results of the selection of study articles can be seen in Figure 1 below;

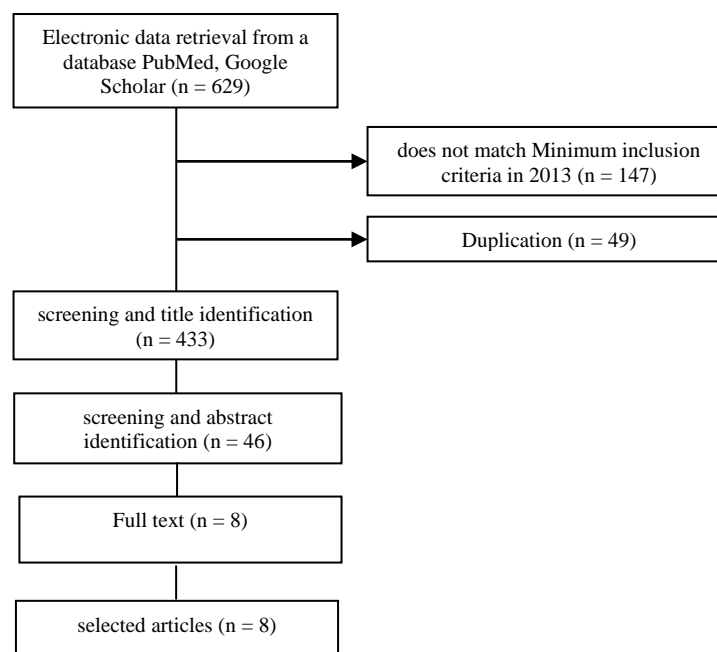




Figure 1. Diagram Flow

3. Results and Analysis

The results of a literature review of 8 articles that have been found, the total number of respondents from 8 journals was 206 respondents. From 206 respondents, the average age of respondents ischemic stroke patient is 45-60 years with more male respondents than females with a percentage ratio of 21.8%: 19%. Ischemic stroke patients with hemiparesis in one part of their body will receive a passive range of motion therapy as part of the study.

The duration for implementation of passive range of motion therapy in ischemic stroke patients in 8 articles that have been found have some differences, shown in table 1 below;

TABLE 1
Duration of Range Of Motion Therapy

No	Author	Exercise Euration
1	Hosseini et al.	Passive range of motion exercises was performed for 30 minutes 6 to 8 times for 3 months.
2	Kim et al.	Passive range of motion exercises was performed twice a day for 4 weeks
3	Agusrianto & Rantesigi	Passive range of motion exercises are given 2x a day in the morning and evening with a time of 15-20 minutes.
4	Rahmadani et al.	ROM therapy is given twice a day for 5 days.
5	Rhestifujiyayani et al.	Passive range of motion exercises are carried out for 7 days with intensity 2x a day.
6	Anggriani et al.	Ideally exercise 1x a day, carried out 30 minutes, each movement is repeated 10 times.
7	Kusuma & Sara	Unknown.
8	Indrawati et al.	Unknown.

To determine the increased muscle strength with passive range of motion therapy, it can be measured using a scale of 0 to 5. On a scale of 0 there is no muscle strength, on a scale of 1 there is minimal activity such as twitching without reaching full range of motion, on a scale of 2 being able to raise the hand and reach full movement but not strong against gravity, scale 3 muscles can resist gravity but not for long, scale 4 muscles can resist gravity, can withstand some resistance, scale 5 muscles can withstand full resistance and full movement [14], [16], [18].

The results of passive range of motion therapy from 8 articles that have been found show that there is an increase in muscle strength. The results can be seen in Table 2 below,

TABLE 2
Article Research Results

No	Journal Articles	Result
1	Hosseini et al.	The experimental group increased upper extremity strength from the control group 1.09 (0.84) vs 0.58 (0.90), $p = 0.045$ and in the lower extremity in the first month it showed a value of 0.76 (0.71) vs 0,00 (1,11), ($p=0,004$).
2	Kim et al.	Upper limb function of acute stroke patients in the experimental group increased by 1.58 points between weeks 2 and 4 from 4.75 to 6.33. Meanwhile in the control group it increased by 0.36 between weeks 2 and 4 from 4.93 to 5.29. Difference between the two groups ($p = 0.015$)
3	Agusrianto & Rantesigi	There is an increase in muscle strength in the right upper/lower extremity from the initial 2, increased to 3, and in the upper/lower left extremity from 0 to 1.
4	Rahmadani et al.	The average value of muscle strength in the intervention group before ROM exercise was 1.60, while the average value after ROM exercise was 2.30, and p -value (<0.05).
5	Rhestifujiyayani et al.	The experimental group got the difference in the highest muscle strength score was 2 and the lowest was 0, with average muscle strength of 1.10 ± 0.568 . Mann Whitney test results for both groups obtained p -value of the upper extremity was 0.002 ($p < 0.05$) and 0.006 of the lower extremity ($p < 0.05$).
6	Anggriani et al.	An increase in muscle strength occurred in the extremities of the hand from the average muscle strength of 2.5 to 3.11. While in the extremities of the legs there was a change from 3.11 to 3.93.
7	Indrawati et al.; Kusuma & Sara	Passive range of motion therapy can provide benefits in muscle gain. Range of motion therapy should be done as early as possible to prevent complications from physical mobility barriers experienced by stroke patients.

4. Conclusion

Ischemic stroke patients who experienced hemiplegia in the journal articles were found to be more than 45 years old. This result is in accordance with the explanation put forward by Anita et al. (2018) and Rhestifujiyani et al. (2015) stated that the incidence of stroke increases with age, age over 55 years increases the risk of ischemic stroke 2-fold. This is because in old age there are changes in the musculoskeletal system caused by a decrease in function and cell mass, loose muscles, often feeling tired, reduced energy, disorders of joint cartilage and brittle joints so that the recovery process can be disrupted.

The highest percentage of ischemic stroke patients was male as much as 21.8% with 55 men and 48 women. This can be caused by bad habits that occur in the male sex for example smokers, drinking coffee, and lack of activity. Smoke generated from smokers can cause damage to artery walls. Damaged artery walls will cause accumulation of fat, cholesterol, platelets so that the smooth muscle layer and arterial walls thicken and cause lumen narrowing. While the habit of drinking coffee can increase heart rate significantly because coffee stimulates the central nervous system which has an impact on the work of the heart pumping faster and is at risk of hypertension. The habit of lack of activity causes the risk of obesity and stroke [19].

The results of the study from 8 journal articles can be seen in Table 2 which shows that this therapy can increase muscle strength in ischemic stroke patients who experience decreased muscle strength. This is caused by the occurrence of a contraction mechanism that can increase smooth muscle in the extremities. Passive ROM exercises also can stimulation so that it increases the activity of the neuromuscular, muscular, and chemical (Guyton, 2007 in Anggriani et al., 2018). In addition, passive ROM exercises can also change the sensorimotor cortex and increase muscle strength because ROM exercises can stimulate the muscles being trained so the number of motor units involved when trained will increase muscle strength. Passive range of motion therapy can increase muscle strength, especially in the acute phase [7], [13], [14], [16], [18].

Range of motion therapy should be done as early as possible to prevent complications from physical mobility barriers experienced by stroke patients (atrophy, contractures). This therapy has benefits in addition to preventing complications, it can also improve circulation and can maximize self-care. The success of a range of motion therapy is influenced by client compliance in carrying out therapy [17], [20].

5. Reference

- [1] E. C. Jauch, "Ischemic Stroke," *medscape*, 2020. [Online]. Available: <https://emedicine.medscape.com/article/1916852-overview#a1>. [Accessed: 21-Nov-2020].
- [2] C. Hui, P. Tadi, and L. Patti., "Ischemic Stroke," *NCBI*, 2020. [Online]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK499997/>. [Accessed: 05-Feb-2021].
- [3] SDKI, *Standar Diagnosis Keperawatan Indonesia Definisi dan Indikator Diagnostik*, 1st ed. Jakarta selatan: Dewan Pengurus Pusat Persatuan Perawat Nasional Indonesia, 2016.
- [4] S. H. Sari, Agianto, and A. Wahid, *Batasan Karakteristik dan Faktor yang Berhubungan (etiologi) Diagnosa Keperawatan: Hambatan Mobilitas Fisik Pada Pasien Stroke*. EGC, 2015.
- [5] F. Anita, H. Pongantung, P. V. Ada, and V. Hingkam, "Pengaruh Latihan Range of Motion Terhadap Rentang Gerak Sendi Ekstremitas Atas Pada Pasien Pasca Stroke Di Makassar," *J. Islam. Nurs.*, vol. 3, no. 1, pp. 97–99, 2018.
- [6] H. J. Kim, Y. Lee, and K. Y. Sohng, "Effects Of Bilateral Passive Range Of Motion Exercise OnThe Function Of Upper Extremities and Activities Of Daily Living In Patients With Acute Stroke," *J. Phys. Ther. Sci.*, vol. 26, no. 1, pp. 149–156, 2014.
- [7] D. Marsinova Bakara and S. Warsito, "Latihan Range Of Motion (ROM) Pasif Terhadap Rentan Sendi Pasien Pasca Stroke Exercise Range of Motion (ROM) Passive to Increase Joint Range of Post-Stroke Patients," *Idea Nurs. J.*, vol. VII, no. 2, 2016.
- [8] W. Johnson, O. Onuma, M. Owolabi, and S. Sachdev, "Stroke: A Global Response Is Needed," *Bull. World Health Organ.*, vol. 94, no. 9, pp. 634A-635A, 2016.
- [9] K. Riskesdas, "Hasil Utama Riset Kesehata Dasar (RISKESDAS)," *J. Phys. A Math. Theor.*, vol. 44, no. 8, pp. 1–200, 2018.



- [10] Kemenkes, “Apa saja bahaya Stroke? Yuk, simak bag.1,” *kemenkes RI*, 2018. [Online]. Available: <http://p2ptm.kemkes.go.id/infographic-p2ptm/stroke/apa-saja-bahaya-stroke-yuk-simak-bag1>. [Accessed: 21-Feb-2021].
- [11] E. Rahmadani, H. Rustandi, and Dehasen, “Peningkatan Kekuatan Otot Pasien Stroke Non Hemoragik dengan Hemiparese melalui Latihan Range of Motion (ROM) Pasif,” *J. Telenursing*, vol. 1, no. 2, pp. 354–363, 2019.
- [12] M. Iskandar, Mardiyono, and H. Rumahorbo, “The Effectiveness Of Discharge Planning and Range Of Motion (ROM) Training In Increasing Muscle Strength Of Nonhemorrhagic Stroke Patients,” *Glob. Heal. Manag. J.*, vol. 2, no. 1, pp. 9–12, 2018.
- [13] Anggriani, Zulkarnain, Sulaimani, and R. Gunawan, “Pengaruh ROM (Range of Motion) Terhadap Kekuatan Otot Ekstremitas Pada Pasien Stroke Non Hemoragic,” *J. Ris. Hesti Medan*, 2018.
- [14] Z.-S. Hosseini, H. Peyrovi, and M. Gohari, “The Effect of Early Passive Range of Motion Exercise on Motor Function of People with Stroke: a Randomized Controlled Trial,” *J. Caring Sci.*, vol. 8, no. 1, pp. 39–44, 2019.
- [15] M. Irfan, *Fisioterapi bagi insan stroke [Physiotherapy for human stroke]*, Graha Ilmu. Yogyakarta, 2010.
- [16] E. Rhestifujiayani, E. Huriani, and M. Muharriza, “Comparison of Muscle Strength in Stroke Patients between The Given and Not Given Range of Motion Exercise,” *Nurse Media J. Nurs.*, vol. 5, no. 2, p. 88, 2015.
- [17] . Indrawati, I. K. Sudiana, and M. Sajidin, “Active, Passive, and Active-Assistive Range of Motion (ROM) Exercise to Improve Muscle Strength in Post Stroke Clients: A Systematic Review,” no. Inc, pp. 329–337, 2019.
- [18] Agusrianto and N. Rantesigi, “Penerapan Latihan Range of Motion (ROM) Pasif terhadap Peningkatan Kekuatan Otot Ekstremitas pada Pasien dengan Kasus Stroke,” *J. Ilm. Kesehat.*, vol. 2, no. 2, pp. 61–66, 2020.
- [19] Murtaqib, “Perbedaan Latihan Range Of Motion (ROM) Pasif Dan Aktif Selama 1 - 2 Minggu Terhadap Peningkatan Rentan Gerak Sendi Pada Penderita Stroke Di Kecamatan Tanggul Kabupaten Jember,” *J. Keperawatan Soedirman (The Soedirman J. Nursing)*, vol. 5, no. 2, pp. 105–114, 2013.
- [20] A. S. Kusuma and O. Sara, “Penerapan Prosedur Latihan Range Of Motion (ROM) Pasif Sedini Mungkin Pada Pasien Stroke Non Hemoragik (SNH),” *Syntax Lit. J. Ilm. Indones.*, vol. 53, no. 9, pp. 1689–1699, 2020.