

AQUATIC THERAPY AS A NON-PHARMACOLOGICAL REHABILITATION APPROACH FOR POST-STROKE ELDERLY: A NARRATIVE REVIEW

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ABSTRACT

Stroke is a non-communicable disease associated with a high risk and serves as a major contributor to long-term disability in older adults. This condition affects not only physical function, such as mobility, balance, and muscle strength, but also psychological well-being, including increased anxiety, depression, and reduced overall quality of life. Thus, there is a need for rehabilitation approaches that are effective, safe, and easily accessible to enhance the quality of life of older adults recovering from stroke, primarily through non-pharmacological treatment options. This study aims to analyze the effectiveness of aquatic therapy as a non-pharmacological intervention for enhancing the quality of life in older adults after stroke. The research method used was a narrative review, with data sources obtained from relevant scientific journal articles indexed in Google Scholar, PubMed, and Scopus. Based on the analysis of five selected articles following the PRISMA guidelines, aquatic therapy demonstrated positive effects on improving the quality of life among post-stroke older adults. Physically, aquatic therapy improved balance, postural control, flexibility, range of motion (ROM), muscle strength, and reduced pain. Psychologically, it contributed to enhanced mood and reductions in depression and anxiety. These findings suggest that aquatic therapy is a beneficial non-pharmacological rehabilitation option to support recovery and improve the quality of life among older adults after stroke.

Keyword: Aquatic Therapy; Hydrotherapy; Non-farmakological; Elderly Post-stroke; Quality of Life

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INTRODUCTION

Stroke in the elderly is among the most dangerous diseases worldwide (Anggraini et al., 2023). Stroke is also among the most common non-communicable diseases worldwide (Venketasubramanian, Yoon, Pandian, & Navarro, 2017). Cases of stroke, both ischemic and hemorrhagic, are most dominant in individuals aged 50–64 years (Krishnamurthi et al., 2015). In developed nations, stroke remains a significant public health concern, ranking as the second primary cause of mortality following coronary heart disease (responsible for 13% of deaths). The prevalence of stroke demonstrates considerable global variation; for instance, the United States reports a prevalence rate of approximately 7 million individuals (3.0%), whereas China exhibits a stark difference, with rates fluctuating between 1.8% in rural areas and 9.4% in urban settings (Lisdiana, 2025). According to data from the Indonesian Health Survey, Stroke is a non-communicable disease associated with a high risk of death in individuals over 15 years of age. Stroke is a brain disorder that can cause fatal problems that can lead to paralysis or death in sufferers. In addition, it is a neurological condition that disrupts blood supply to the brain, resulting in damage to the nervous system and decreased body function (Daba et al., 2025).

The severity of stroke in older people is more complicated due to degenerative factors that cause problems and limitations in carrying out daily activities, so that older people are at risk of long-term dependency and increased burden of family care (Nadhifah & Sjarqiah, 2022). Risk factors for stroke are divided into two categories: those that can be changed and those that cannot. Risk factors that can be changed are hypertension, diabetes mellitus, hypercholesterolemia, smoking, atrial fibrillation, heart valve disease, and carotid stenosis. In contrast, risk factors that cannot be changed are age, gender, race or ethnicity, history of stroke in the family, and genetic factors (Imelda, Sjaaf, & PAF, 2020). For the elderly, stroke is one of the diseases that increases health disorders in carrying out daily activities (ÇOBANOĞLU, 2023). The leading cause of stroke sufferers is physical disorders and disabilities in carrying out daily activities (Feigin et al., 2016). According to (Chang & Do, 2015), physical disorders and disabilities after stroke will have an impact on mobility disorders and increase the risk of falls. Symptoms of disability in people with stroke include chronic functional disorders, coordination disorders, balance disorders, muscle contractures, and cognitive deficits (Fatria, 2023). The impact of stroke on adults or the elderly causes disabilities that increase the risk of falls (Daba, 2023). Motor impairment in both the upper and lower limbs is a frequent consequence of stroke, directly resulting from damage to the motor cortex. The most prevalent neurological deficits stemming from this cortical injury include hemiparesis, paralysis, muscular weakness, abnormal muscle tone, spasms, postural irregularities, dysfunctional synergistic muscle action, and diminished interjoint coordination (Kato & Izumiyama, 2013). Despite 80% of patients initially presenting with acute upper extremity paresis following a stroke, data indicate that only one-third ultimately achieve a complete functional recovery (Carrera & Tononi, 2014).

The inability of older adults to perform daily activities independently is a significant challenge that affects their physical, psychological, and social Well-being, so physiotherapy intervention is crucial for maximizing functional recovery and improving quality of life (Aditya, Utami, & Multazam, 2022). Physiotherapy programs for post-stroke older adults should focus on increasing movement capacity through structured, sustainable, and individualized physical exercise (Aditya et al., 2022; Ismaningsih, Muawanah, Nuraliza, Triyulianti, & Saniya, 2022). Appropriate treatment methods can minimize immobilization complications, stimulate neuroplasticity, and aid in the recovery of basic movement abilities (Fitrian, Kushartanti, Arovah, Graha, & Dirgantoro, 2025; Graha, Fitrian, & Nasrulloh, 2023). Therefore, proper rehabilitation is key to restoring physical function and preventing disability.

Non-pharmacological therapy, or drug-free rehabilitation, is becoming more common and can be initiated immediately after a stroke, making it ideal for combining with pharmacological treatment, which can further preserve affected brain tissue (Chen et al., 2014). Pharmacological therapy can stabilize medical conditions, but it does not fully restore motor function. Furthermore, medications also have side effects, especially in elderly patients with comorbidities, which ultimately lead to non-adherence to medication and discontinuation of drugs, ultimately leading to failure to achieve therapeutic goals (Ariani, Amalia, Gunadharma, & Anggadiredja, 2023). Therefore, comprehensive non-pharmacological rehabilitation management is necessary.

Although non-pharmacological therapies have been widely used in post-stroke rehabilitation, available evidence regarding their effectiveness specifically in the elderly population is limited and inconsistent. A systematic review found that physiotherapy and occupational therapy interventions can improve activities of daily living (ADL) in older adults (>65 years). However, the methodological quality of the studies was low, and the number of studies exclusively targeting older adults was minimal (Stewart et al., 2018). Furthermore, a recent



meta-analysis indicated that non-pharmacological interventions such as fitness training and drug-free therapies have a positive effect on the quality of life of stroke survivors in general. However, it is unclear which components of these therapies are most effective and how their impact differs in older adults specifically (Gao, Li, Li, Li, & Zhang, 2024). Furthermore, some of the increasingly proposed non-pharmacological interventions, such as functional stimulation, physical exercise, or behavioral management, have been little tested in the elderly neurological population (Logan et al., 2020). In this context, aquatic therapy has gained attention for its potential to improve balance, muscle strength, range of motion, and psychological well-being, while offering a safe environment for individuals with limited mobility and a high risk of falls. Therefore, this study seeks to expand the scientific context by critically reviewing and synthesizing current evidence through a narrative review approach to evaluate the effectiveness of aquatic therapy as a promising non-pharmacological intervention to enhance the quality of life of older adults after stroke and to guide future research and clinical practice.

METHOD

The method used in this study was a narrative review with data sources derived from relevant scientific journal articles. The search process was conducted across the Google Scholar, Scopus, and PubMed databases using the Publish or Perish software and Mendeley, with keywords tailored to the research topic: non-pharmacological intervention OR Hydrotherapy OR Aquatic Exercise AND Quality of Life AND elderly post-stroke. The search was limited to the period 2020–2024 to obtain the most recent, evidence-based literature. The inclusion criteria used included studies involving elderly subjects with a history of stroke, studies testing non-pharmacological interventions, specifically aquatic therapy, having research results evaluating motor function, motor abilities, or quality of life, available in full text, and in Indonesian or English.

Exclusion criteria included articles that were solely review articles, editorials, letters to the editor, scientific commentaries, or did not provide quantitative data/research results. Articles that met the criteria were then screened for title, abstract, and full text to ensure they aligned with the research focus. Data obtained were then extracted, including author(s), year, type of intervention, sample size, and main results, for descriptive analysis.

Data validation in this study was conducted in accordance with the PRISMA guidelines to ensure a systematic, transparent, and replicable literature selection process. The validation procedure involved four main stages: identification of studies through database searches, screening to eliminate duplicate and irrelevant articles, assessment of eligibility based on predetermined inclusion and exclusion criteria, and final inclusion of studies that demonstrated methodological quality and relevance to the research focus. Furthermore, the methodological rigor of each selected study was critically evaluated, and the entire selection process was documented using a PRISMA flowchart to minimize potential bias and strengthen the narrative synthesis. Based on the study identification process across various databases, 1,278 articles were identified: 959 from Google Scholar, 312 from PubMed, and seven from Scopus. After initial screening, 61 articles were removed due to duplication, leaving 1,217 articles for the screening stage. During the title and abstract screening stage, 1,011 articles were excluded for irrelevance to the research topic. A total of 206 articles were selected for full-text review, but 191 were inaccessible or unavailable in full. Of the 15 articles reviewed in detail, 10 did not meet the inclusion criteria or used inappropriate research methods. Therefore, the final number of eligible studies included in the analysis was five articles. This number reflects the limitations of research that explicitly addresses non-pharmacological interventions, such as aquatic therapy, in improving the quality of life of older people. The PRISMA flowchart is presented in Figure 1.



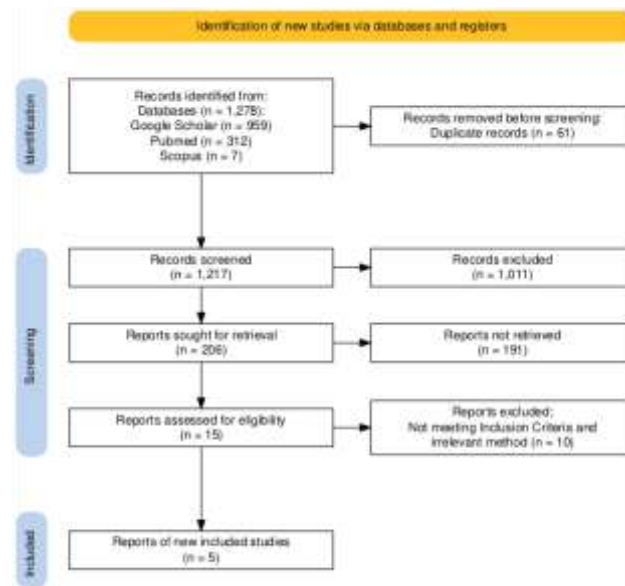


Figure 1. PRISMA flow diagram for literature search process

RESULT

The following are the results of several studies on non-pharmacological interventions, specifically aquatic therapy, and their effectiveness in post-stroke elderly individuals.

Author / Year	Study Design & Sample	Intervention	Outcome Measures	Main Findings	Conclusion
Vakilian et al . (2021)	Randomized Clinical Trial; 36 male chronic ischemic stroke patients; age 40–70 years	Aquatic aerobic exercise 6 weeks, 3×/week, 30 min (shallow vs deep water)	Static & semi-dynamic balance	Significant improvement in semi-dynamic balance in both aquatic groups vs control; no significant difference between water depth groups	Aquatic exercise improves balance due to water resistance and neural adaptation; useful for functional recovery and postural stability
Pérez-De la Cruz (2020b)	Single-blind Randomized Controlled Trial; 45 chronic stroke patients	Ai Chi Aquatic Therapy vs Land Therapy vs Combined therapy for 12 weeks	Pain, stress, resilience, quality of life	Significant reduction in pain & increased resilience in Ai Chi and combined groups; QoL improved mainly in physical & emotional domains	Ai Chi therapy beneficial alone or combined with land therapy; recommended for neurorehabilitation; needs larger-sample research
Abdelrehim et al. (2022)	Randomized Controlled Trial; 40 male stroke patients	Underwater treadmill vs land-based	Gait speed, balance, lower-	Increased gait speed in both groups, but greater	Underwater treadmill more effective for balance



		treadmill for 4 weeks	extremity motor function	improvement in balance & lower-extremity function in underwater treadmill group	improvements due to hydrostatic pressure and sensory stimulation
Kanase & Vardharajulu (2022)	Experimental Pretest–Posttest Study; 36 stroke patients	Aquatic + conventional therapy vs conventional therapy only; 6 weeks, 45 min/session	Functional mobility & balance	Significant improvement in aquatic + conventional group vs control; reduced fall risk and improved ADL independence	Aquatic therapy enhances mobility, comfort, postural stability and fall prevention
Pérez-De la Cruz (2020a)	Pilot Experimental Single-group Study; 29 stroke patients	12 aquatic therapy sessions, 3×/week	Postural stability & balance control	Significant improvement in postural stability & balance; effects maintained 1 month post-therapy	Aquatic therapy has medium-term benefits; increases ROM, reduces pain & stress, improves balance and stability

The study by Vakilian et al. (2021) aimed to investigate the effects of 6 weeks of aquatic exercise on improving static and semi-dynamic balance in male patients with chronic ischemic stroke. The study used a randomized clinical trial involving 36 men with chronic ischemic stroke, who were randomly assigned to three groups: two groups that underwent water exercise (one at shallow depths and one at deep depths) and a control group that did not undergo water exercise. The average age of the participants was approximately 60.2 years, with an age range of 40 to 70 years. The intervention in this study was 6 weeks of aquatic aerobic exercise, 3 times per week for 30 minutes. The results showed that the groups at both moderate and deep water depths improved semi-dynamic balance compared to the control group that did not receive exercise. Although there were no significant differences between the two aquatic exercise groups in post-exercise outcomes, both groups improved balance compared with the non-exercise control group. The main finding of this article is that 6 weeks of aquatic exercise can be an effective intervention for improving balance in patients with chronic stroke. The positive effects of aquatic therapy are explained by the presence of permanent resistance to movement, which can stimulate neural adaptations and increase stability, thereby improving motor performance and contributing to the effectiveness of functional recovery and overall postural stability. The following are the results of several studies on non-pharmacological interventions, specifically aquatic therapy, and their efficacy in post-stroke elderly individuals.

The study by Pérez-De la Cruz (2020b) aimed to evaluate the effects of the Ai Chi Aquatic Therapy program on pain, stress, and quality of life in patients with chronic stroke. This study aimed to determine whether Aquatic Therapy could provide significant benefits compared to conventional land therapy or a combination of both. This study used a single-blind randomized controlled trial with three intervention groups: traditional land therapy, Ai Chi aquatic therapy, and a combination of land therapy and Ai Chi aquatic therapy, involving 45 chronic stroke patients over 12 weeks. The results showed that the group that did Ai Chi Aquatic Therapy and the combined group experienced a significant reduction in pain and an increase in resilience (mental resilience). Improvements in quality of life were also observed, especially in physical and emotional activities, although not all aspects showed significant differences. The findings of this study were that Ai Chi Aquatic Therapy can reduce pain and improve the quality of life in patients with chronic stroke. This effect was more significant when the therapy was carried out in an integrated manner or in combination with land therapy. This study suggests that this therapy should be considered as part of a neurological rehabilitation program. However, further research with a larger sample and a more extended follow-up period is needed to confirm these results. The positive effects of Ai Chi aquatic therapy are evident through the combination of slow movements, controlled breathing, and water



buoyancy, which synergistically improve muscle strength, balance, relaxation, and quality of life in post-stroke patients.

The study by Abdelrehim et al. (2022) aimed to determine whether training on an underwater treadmill could improve the motor skills and balance of stroke patients more effectively than land-based treadmill training. This study used a randomized controlled trial method with a pretest-posttest design. The study population consisted of 40 male patients who had experienced a stroke and had problems with walking and balance. The study group was divided into two groups: the experimental group using an underwater treadmill and the control group using a land-based treadmill, for 4 weeks. The results showed an increase in walking speed after the intervention, but there was no significant difference between the two groups. However, the group that underwent underwater treadmill training showed a greater improvement in balance and lower extremity function than the land treadmill group. These findings indicate that the underwater treadmill exercise program is more effective than other programs at improving balance and lower-extremity motor function in stroke patients. This positive effect is supported by water's physical properties, which increase receptor stimulation in the body, helping stabilize and reposition patients during exercise.

The study by (Kanase & Vardharajulu, 2022) aimed to investigate the additional effects of aquatic therapy on functional mobility and balance in patients with chronic stroke. The research method used an experimental pretest-posttest design. The population used was 36 stroke patients with two interventions, divided into an experimental group, namely a combination of conventional therapy and aquatic therapy, and a control group, namely traditional treatment, for 6 weeks, with each session lasting 45 minutes. The results showed that the group receiving aquatic treatment experienced significant improvement compared to the group receiving only conventional therapy. The research findings indicated that the combination of marine and conventional therapy significantly improved functional mobility and balance in patients with chronic stroke. In addition, aquatic treatment helped reduce the risk of falls and improved the patients' ability to perform daily activities independently. This is due to the positive effects of Aquatic Therapy, including reduced joint load, increased comfort during exercise, and improved postural stability through dynamic and static exercises in the water.

(Pérez-De la Cruz, 2020a) study aimed to determine the extent to which patients' postural stability and balance control improved after 12 weeks of therapy sessions. The research method used a pilot experimental study design with a single-group approach. Twenty-nine stroke patients participated in 12 aquatic therapy sessions, conducted three times a week. The study found a significant increase in postural stability and balance control following aquatic therapy. The main finding was that aquatic therapy can significantly improve balance and stability in stroke patients. These changes persisted for 1 month after therapy, indicating the medium-term effects of the treatment. The impact of Aquatic Therapy includes reducing body weight, increasing ROM and flexibility, relaxing muscles and reducing pain, improving stability and balance, and reducing levels of depression and stress.

DISCUSSION

A literature review of 5 published articles found that aquatic therapy in post-stroke elderly patients has a positive impact. It is seen that elderly stroke patients experience improved balance, Range of Motion, flexibility, muscle relaxation, motor function, reduced risk of falls, and pain. Therefore, the application of aquatic therapy in post-stroke elderly helps improve quality of life. Aquatic therapy has a positive impact on the quality of life of post-stroke elderly due to the nature of water, namely hydrostatic pressure, which makes exercise in water easier for post-stroke elderly to move because gravity is reduced and provides natural resistance throughout the body, thereby decreasing post-stroke disorders and encouraging physical activity (Irandoost et al., 2019; Jain, Kanase, & Rainak, 2022).

Another advantage of aquatic therapy is the resistance properties of water to movement. Consequently, the continuous hydrostatic resistance exerted by water inherently contributes to enhanced cardiovascular fitness and muscle tonicity. Furthermore, the viscosity of the aquatic medium provides a uniform and gentle resistance, thus mitigating the potential for injury often associated with conventional weight-bearing exercise. Moreover, the capacity to regulate water temperature adds significant therapeutic value. Utilizing warm water promotes muscular relaxation, decreases spasticity, and facilitates increased blood circulation to the immersed limbs. This therapeutic warmth can alleviate stiffness and pain, enabling patients to execute necessary rehabilitation exercises more easily. Beyond the physical effects, the soothing nature of warm water also contributes to stress reduction and fosters an increased sense of well-being among patients undergoing the rehabilitation process (Patil et al. 2024). This is in line with the opinion of Deng et al. (2024) that when exercising in water, resistance causes muscles to engage in "isokinetic contractions," thereby helping to increase muscle endurance and strength. Other studies have also



shown that aquatic therapy creates buoyancy, counteracts gravity's effects, reduces joint load and pain, and promotes relaxation (Kargarfard et al. 2018).

The positive impact of Aquatic Therapy extends beyond the physical health of older people to their psychological Well-being post-stroke. Evidenced by research conducted by Aidar et al. (2018) aquatic exercise programs have a positive effect in reducing levels of anxiety and depression in post-stroke patients, while increasing functional capacity. Another study by Pérez-De la Cruz (Pérez-De la Cruz, 2020c) found that physical exercise in water has a positive effect on several factors that improve mood and quality of life in people with brain injuries. In addition, a systematic analysis conducted by Tang et al. (2022) shows that aquatic exercise has antidepressant and anxiolytic effects achieved through a combination of water resistance and endorphin effects, which improve mood and psychological Well-being.

The significance of this study lies in its contribution to strengthening the evidence regarding the role of aquatic therapy as an effective non-pharmacological intervention for improving the quality of life in older adults after stroke. While previous studies have demonstrated the benefits of conventional land-based rehabilitation therapies, this review highlights that aquatic therapy offers unique advantages related to water properties, such as buoyancy, hydrostatic pressure, and resistance, which enable safer and more accessible exercise for individuals with limited mobility or high fall risk. The findings of this narrative review align with previous research showing improvements in physical function, such as balance, muscle strength, and range of motion, as well as psychological outcomes, including reduced depression and anxiety. Therefore, this study reinforces the growing body of evidence supporting aquatic therapy as a valuable complementary approach in post-stroke rehabilitation and emphasizes its potential to enhance patient-centered recovery outcomes.

LIMITATION AND CAUTIONS

While this study makes a meaningful contribution to our understanding of the effects of aquatic therapy on the quality of life among post-stroke older adults, it is important to recognize several limitations. The wide variation in study designs and participant characteristics, such as age, stroke severity, and duration of the intervention, restricts the generalizability of the results. Additionally, inconsistencies in aquatic therapy protocols, including differences in pool type, water depth, and exercise intensity, make it challenging to draw uniform conclusions. The limited accessibility of full-text articles and publications in foreign languages further constrained the comprehensiveness of the evidence synthesis.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future research should address these limitations, particularly by using more consistent study designs and participant characteristics to allow for broader applicability of the results. Furthermore, expanding the research to include more non-pharmacological therapy approaches, particularly the application of water or aquatic therapy, will help develop more practical and effective interventions for older adults recovering from stroke.

CONCLUSION

Researchers concluded that non-pharmacological approaches such as aquatic therapy offer benefits to older adults recovering from stroke. The hydrostatic properties of water, such as buoyancy, resistance, and temperature regulation, contribute to physical and psychological improvements in individuals after stroke. Therefore, aquatic therapy is a promising non-pharmacological approach to improving the quality of life of older stroke survivors.

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