Indonesian Journal of Global Health Research
Volume 7 Number 5, October 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

THE EFFECTIVINESS OF AQUATIC THERAPY AS A REHABILITATION INNOVATION FOR STROKE PATIENTS: WATER AS A MEDIUM OF RECOVERY-A SYSTEMATIC LITERATURE REVIEW

Leticia Freitas Babo*, Yurike Septianingrum, Achmad Hidayatullah, Umdatus Soleha, Lono Wijayanti
Faculty of Nursing and Midwifery, Universitas Nahdlatul Ulama Surabaya, Jl. Raya Jemursari No.57, Jemur Wonosari, Surabaya, East Java 60237 Indonesia
*leticiafbabo98@gmail.com

ABSTRACT
Stroke often causes long-term disabilities, significantly affecting motor and functional abilities. Rehabilitation interventions such as aquatic therapy, which utilize the properties of water to enhance movement and reduce pain, have gained increasing attention as innovative rehabilitation strategies. This systematic literature review aims to analyze and summarize the effectiveness of aquatic therapy as a rehabilitation innovation for improving functional recovery in stroke patients. A systematic search was conducted in three databases—PubMed, ScienceDirect, and Google Scholar—for articles published between January 2020 and January 2025. The keywords used in English included "aquatic therapy," "stroke rehabilitation," and "water-based therapy." From the initial search, a total of 45 articles were identified. After screening titles and abstracts based on inclusion criteria (language, publication year, and open-access availability), 20 full-text articles were reviewed in detail. Following critical appraisal and relevance assessment to the research objectives, 10 articles were selected for final analysis. These articles were then synthesized to evaluate the effects of aquatic therapy on functional recovery, particularly focusing on gait and balance improvement in post-stroke patients. This review found 45 studies after identification. Most studies showed that aquatic therapy significantly improved balance, gait, muscle strength, and quality of life among stroke survivors. Additionally, resistance offered by water supports muscle strengthening without overstraining. However, variations in session duration, water temperature, and exercise intensity across studies suggest a need for standardized protocols. Aquatic therapy is an effective and innovative rehabilitation approach for stroke patients, particularly in enhancing motor recovery and quality of life. Future research should focus on standardized intervention protocols and long-term outcomes.

Keywords: aquatic therapy; rehabilitation; stroke; systematic literature review

How to cite (in APA style)
Babo, L. F., Septianingrum, Y., Hidayatullah, A., Soleha, U., & Wijayanti, L. (2025). The Effectiviness of Aquatic Therapy as A Rehabilitation Innovation for Stroke Patients: Water as A Medium of Recovery-A Systematic Literature Review. Indonesian Journal of Global Health Research, 7(5), 159-168. https://doi.org/10.37287/ijghr.v7i5.6646.

INTRODUCTION

Stroke remains one of the leading causes of disability and death globally, with survivors often experiencing significant motor, cognitive, and psychological impairments (Feigin et al., 2021). Traditional rehabilitation approaches focus primarily on land-based exercises, but aquatic therapy has gained popularity as a complementary or alternative intervention due to its unique properties, such as buoyancy, viscosity, and hydrostatic pressure, which facilitate easier movement and reduce the risk of injury (Chu et al., 2021).According to WHO, stroke is the leading cause of disability worldwide and the second leading cause of death. From 1990 to 2019, its incidence increased by 70%, mortality by 43%, prevalence by 102%, and disability-adjusted life years (DALY) by 143% (WHO, 2022). One year after a stroke, cognitive deficits affect 30–60% of survivors, significantly impacting daily functioning and quality of life (WHO, 2022)Aquatic therapy, defined as the use of water-based exercises for therapeutic purposes, offers a low-impact environment that can enhance balance, strength, flexibility, and cardiovascular fitness. The buoyancy of water decreases gravitational load, making it easier for stroke patients to perform functional activities and relearn motor skills (Ghai et al., 2022). Moreover, water resistance provides natural resistance for strengthening exercises, which can

help improve muscle tone and coordination without excessive strain.

Several studies have demonstrated the positive outcomes associated with aquatic therapy in stroke rehabilitation. Systematic reviews and meta-analyses have suggested improvements in gait, balance, mobility, and quality of life for patients who participated in structured aquatic programs compared to those receiving conventional therapy (Tuna et al., 2022; Kim & Lee, 2023). Aquatic therapy plays an important role in the rehabilitation protocols for patients affected by neurological disease. Each immersed body reacts to specific physical laws that influence its behavior in static and dynamic conditions. The intrinsic characteristics of water (hydrostatic pressure, buoyancy, viscosity, density, and temperature) and the dynamic characteristics (flow resistance and turbulent flow) act as facilitators: they permit a person immersed in water to practice balanced and coordinated movements (Alireza Vakilian et all,. 2021)The hydrostatic pressure and viscosity of water provide proprioceptive and sensory feedback different from those experimented on land. Buoyancy is a force that provides support making it possible for patients to realize movements that cannot be done on land. The microgravity environment allows patients to actively take part in exercise because of the relief of the body weight. With the absence of a stationary position of the body in water, muscles are continuously activated to stabilize the body. This makes possible the acquisition of strength, flexibility, and balance (Jitka Veldema and Petra Jansen, 2020)

Viscosity slows movements, so, the response time to re-acquire a balanced state after postural perturbations is extended, thus reducing falls. Currently, few studies have reported the clinical effect of aquatic therapy in stroke rehabilitation. Therefore, we performed a protocol for systematic review and meta-analysis to assess the effectiveness of aquatic therapy for individuals affected by strokes (Alireza Vakilian et all,. 2021).Despite the promising results, variations in intervention protocols, sample sizes, and outcome measures among studies present challenges in drawing definitive conclusions. Therefore, a systematic review is essential to critically evaluate existing evidence, synthesize findings, and provide recommendations for clinical practice and future research.This systematic literature review aims to assess the effectiveness of aquatic therapy as an innovative rehabilitation strategy for stroke patients, focusing on motor function recovery, balance enhancement, and overall quality of life improvement.

METHOD

Use PRISMA Approach, After much deliberation and research, this piece is the end product. The results of prior studies on a certain subject are summed together in a review study. Researchers require a systematic review strategy to make use of the abundance of material in order to finish this research.

Eligibility Criteria

The inclusion criteria for this systematic review were as follows: articles written in English or Bahasa Indonesia, available as open-access publications, and published between January 2020 and January 2025. Studies that met these criteria were considered for further analysis in the review process.

Information Sources

A comprehensive literature search was conducted using four major databases: PubMed, Scopus, ScienceDirect, and Google Scholar. In addition, manual searching was performed by reviewing the reference lists of relevant articles to ensure broader and more in-depth coverage of the literature.

Search Strategy

The following keywords and Boolean operators were used during the database search: ("Stroke"OR "Cerebrovascular Accident") AND ("Aquatic Therapy" OR "Hydrotherapy" OR "Water based exercise") AND ("Rehabilitation" OR "Recovery"). Filters applied included publication years from January 2020 to January 2025 written in English.

Selection Process

Two independent reviewers L. And A. screened the titles and abstracts of retrieved articles based on eligibility criteria. Full-text articles were then assessed for inclusion. Disagreements were resolved through discussion or by consulting a third reviewer.

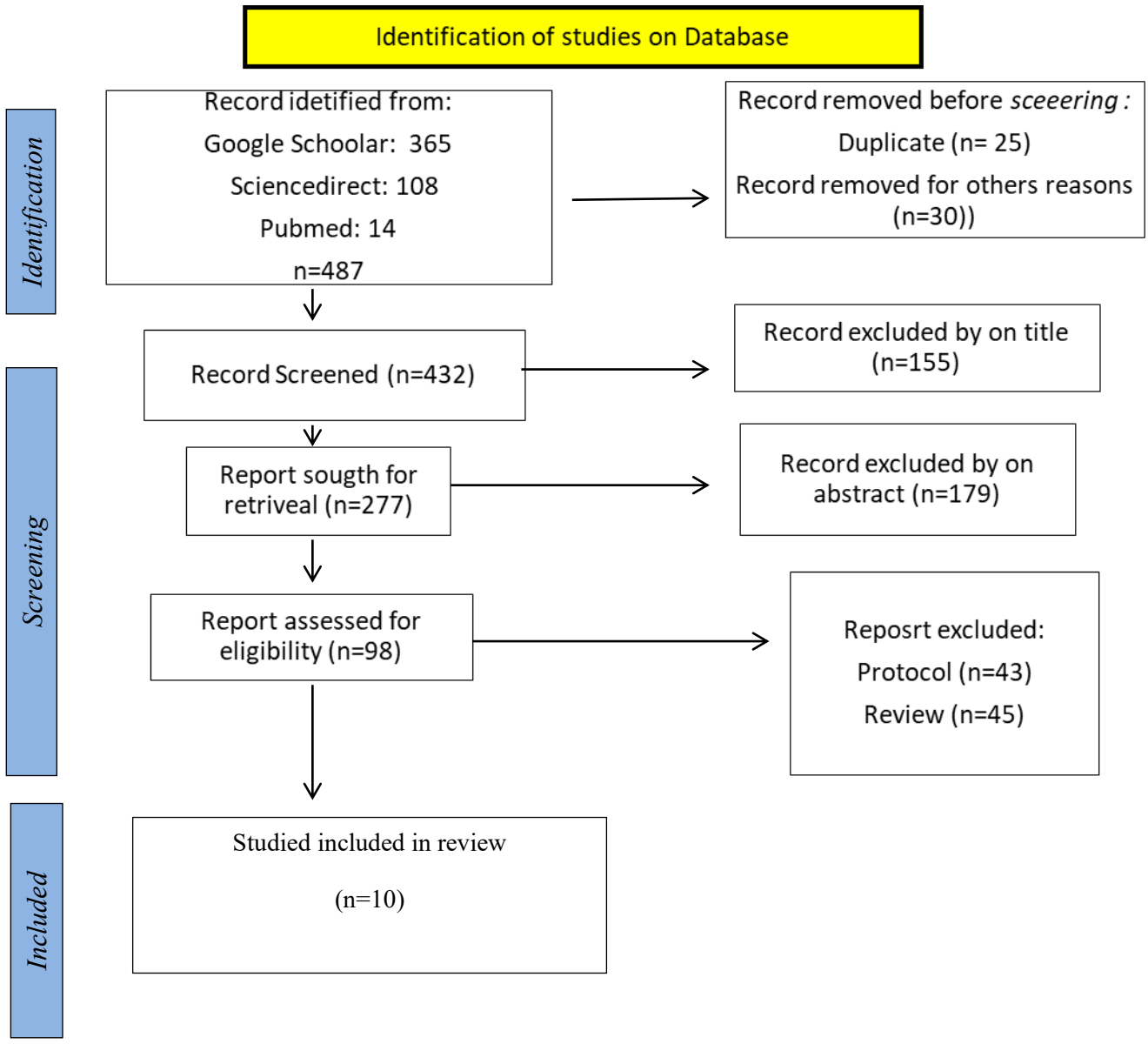

Figure 1. Diagram Flow Pencarian

The systematic review process commenced with the identification phase, during which 487 articles were gathered from various databases—14 from PubMed, 365 from Google Scholar, and 108 from ScienceDirect. An initial screening followed to remove duplicates, eliminating 25 articles. Furthermore, 30 articles were excluded due to other factors, leaving 432 articles

for the next stage. During the screening phase, 155 articles were dismissed based on title relevance, narrowing the selection to 277 articles for abstract evaluation. At this stage, 179 articles were excluded as they did not fulfill the eligibility criteria. The remaining 98 articles then underwent a full-text review to assess their relevance and feasibility. In the final selection stage, 43 articles were excluded for being protocol studies, while 45 were removed as they were literature reviews. Consequently, 10 articles met the inclusion criteria and were deemed of sufficient quality. This systematic approach ensured the selection of high-quality and relevant literature for the study.

RESULT

Table 1.
Characteristic of the studies

No	Author (year)	Research Purpose	Sample	Methods	Results
1	(Alireza Vakilian et all,. 2021)	The effect of aquatic training on static and semi-dynamic balance of patients with chronic ischemic stroke: A randomized clinical trial	35 Respondents	Randomized Controlled Trial	The results of the current study proved that the effect of a six-week aquatic training was significant on both the static and the SDB in male patients with CIS. The fact that the aquatic therapy could positively affect the balance of male patients with CIS in both intervention groups compared to the control group.
2	(Aline Cristina Carrascoa et all., 2021)	Evaluation of quality of life in individuals with chronic stroke who underwent aquatic exercises: A case series	4 Respondents	Case Study	All participants achieved a CID in the mobility domain; thus, the aquatic exercise intervention was considered meaningful. Moreover, the SIS is able to evaluate aspects of the recovery process regarding health-related quality of life after stroke, as demonstrated by the results of the overall recovery after aquatic exercises
3	(Sara Giuriati et all, 2021)	The effect of aquatic physical therapy in patients with stroke: A systematic review and meta-analysis	11 articles	Sistematic Literature Review	Aquatic physical therapy may be a valid means for the rehabilitation of people affected by stroke. The integration of this methodological approach with conventional physical therapy should be considered.
4	(OJ Manning et all, 2022)	Water-based therapeutic exercise in stroke: a scoping review	40 articles	Sistematic Literature Review	Water-based interventions for stroke survivors appear to have a beneficial impact on walking and balance. Given that an aquatic environment offers an opportunity for individuals with more

					significant physical impairments to carry out early practice of walking and balance related tasks, clinicians should explore the feasibility and effectiveness for this subset of stroke survivors.
5	(Jitka Veldema and Petra Jansen, 2020)	Aquatic therapy in stroke rehabilitation: systematic review and meta-analysis	28 articles	Sistematic Literature Review	The meta-analysis presented here shows that water-based therapy is highly effective in supporting gait, balance, spasticity, and physiological indicators and moderately effective in supporting emotional status and health-related quality of life in stroke patients. Furthermore, aquatic therapy is superior to land-based interventions on balance, gait, muscular strength, proprioception, health-related quality of life, physiological indicators, and cardiorespiratory fitness.
6	(Ning Bei, PhD et all,. 2023)	Effect of Water Exercise Therapy on Lower Limb Function Rehabilitation in Hemiplegic Patients with the First Stroke	80 Respondents	Randomized Controlled Trial	Early water exercise training in hemiplegic patients with the first stroke can significantly enhance the balance ability, walking ability as well as limb coordination of patients.
7	(Bambang Trisnowiyanto & Isna Andriani, 2025)	Community empowerment through education and simulation of aquatic therapy in stroke survivor rehabilitation	73 Respondents	Desain Quasi-Experimetal (Pre-post test)	Evaluation after the implementation of community service or post-test showed 26% of participants with poor knowledge, 35.6% of participants with sufficient knowledge, and 38.4% of participants with good knowledge.In conclusion, community empowerment through lectures and simulations is able to increase knowledge and skills about aquatic therapy as a modality of home program therapy in the rehabilitation phase of stroke survivors to achieve independence in functional activities in daily life.

8	(Giovanna Marcela Juliani Silva, Débora Dei Tos , Lilian Catarim Fabiano, 2022)	Effects of aquatic therapy on gait and balance in patients with brain vascular accident: a literature review	8 articles	Literature Review	Finally, it is noteworthy that aquatic therapy provided an improvement in the clinical condition of patients and it is recommended to consider the possibility of applying this therapy in the treatment of patients with stroke, always in order to respect the indications of each method and the individuality of the patient.
9	(Iatridou, Georgia Et all,. 2025)	Comparative Study Between Aquatic Therapy and Land-Based Exercises in Hemiplegic Patients After Stroke	26 Respondents	A Randomized Controlled Trial	The findings of the present study show that the experimental group (26 patients) exhibited significant improvements in spasticity compared with the control group (25 patients) ($P = 0.01$). The conventional therapy group also achieved significant improvements ($P < 0.05$) in anteroposterior deviation, mediolateral velocity, and total velocity of center of pressure in a sitting position with eyes closed.
10	(Dr Suraj B. Kanase & Dr G.Varadharajulu, 2022)	Effect of Aquatic Therapy on Functional Mobility and Balance in Chronic Stroke.	36 Respondents	An experimental study	Results showed statistical improved of group b over group a (mean of 77.8 over 47.9 in modified berthal index and 42.5 over 30.6 in berg balance scale with $p<0.0001$ which wasconsidered extremely significant) the time period required for aquatic therapy was considerably less than conventional therapy.

DISCUSSION

This systematic literature review aims to analyze and summarize the effectiveness of aquatic therapy as a rehabilitation innovation for improving functional recovery in stroke patientsTen articles were selected to carry out the work, with the objective of identifying the effects of aquatic therapy on gait and balance in patients with stroke. To facilitate the visualization and comparison of the selected studies, a table was prepared, containing: the year of publication, author's name, sampling, interventions, and results (Table 1). From the reading of the selected articles, it was possible to perceive that aquatic therapy has been widely used and studied as a physical therapy resource in post-stroke patients. This practice can be used as a complement to traditional physical therapy performed on the ground or exclusively since several new

aquatic techniques have been developed.Overall, the review showed that aquatic therapy offers significant benefits in stroke rehabilitation. The included studies consistently reported improvements in balance, gait, spasticity, muscle strength, and quality of life. These positive effects are largely attributed to the properties of water—such as buoyancy and hydrostatic pressure—which facilitate safer and more controlled movement, especially in patients with limited mobility or hemiplegia (Nayak et al., 2020).

Despite the shared focus, the studies differed in design, sample size, and outcome measures. Research methods ranged from randomized controlled trials to reviews and case studies, with participant numbers varying from 4 to 80. Tools like the Berg Balance Scale and Stroke Impact Scale were commonly used, though intervention durations and settings were inconsistent. (Peréz, 2023). The findings from the included studies demonstrate that aquatic therapy significantly improves motor recovery outcomes in stroke patients. Benefits include enhanced balance, gait, muscle strength, and overall functional mobility compared to conventional rehabilitation programs.The properties of water, such as buoyancy and hydrostatic pressure, reduce joint stress, support postural control, and facilitate movement, allowing stroke patients to perform exercises that might be challenging on land (Ghai et al., 2022). However, heterogeneity in study protocols, duration, frequency, and types of aquatic interventions pose challenges for standardized clinical application. Future research with larger sample sizes and standardized methodologies is recommended. (Nayak et al., 2020).

Implications nursing practice, these findings highlight the importance of integrating evidence-based aquatic therapy into comprehensive stroke rehabilitation programs. Nurses play a vital role in patient assessment, safety monitoring during aquatic sessions, and providing education and motivation to enhance patient adherence. With proper training, nurses can serve as facilitators and advocates for the use of aquatic therapy, helping to bridge the gap between clinical evidence and practical implementation in diverse healthcare settings. (Ghai et al., 2022).

CONCLUSION

Aquatic therapy is an effective adjunct to traditional rehabilitation for stroke survivors, promoting better functional outcomes such as improved balance, mobility, and overall quality of life. Despite these promising results, several limitations must be acknowledged. These include small sample sizes, heterogeneity in therapy protocols, limited access to aquatic facilities, and short follow-up periods across studies.

REFERENCES

Becker BE. Aquatic therapy in contemporary neurorehabilitation: an update. PM R 2020;12:1251–9.

Bei N, Long D, Bei Z, Chen Y, Chen Z, Xing Z. Effect of Water Exercise Therapy on Lower Limb Function Rehabilitation in Hemiplegic Patients with the First Stroke. Altern Ther Health Med. 2023 Oct;29(7):429-433. PMID: 37573592.

Boehme AK, Esenwa C, Elkind MS. Stroke risk factors, genetics, and prevention. Circ Res 2017;120:472–95.

Carroll LM,MorrisME,O'ConnorWT,CliffordAM.Isaquatictherapy optimally prescribed for Parkinson's disease? A systematic review and meta-analysis. J Parkinsons Dis 2020;10:59–76.

Carrasco AC, Silva MF, Dela Bela LF, Paixão L, Pelegrinelli ARM, Dias JM, Kawano MM, Facci LM, Cardoso JR. Evaluation of quality of life in individuals with cA case series. NeuroR ehabilitation. 2021;48(4):56.

Chu, K. S., Eng, J. J., Dawson, A. S., Harris, J. E., Ozkaplan, A., & Gylfadottir, S. (2021). Water-based exercise for cardiovascular fitness in people with chronic stroke: a randomized controlled trial. Archives of Physical Medicine and Rehabilitation. , 102(3), 494-500. https://doi.org/10.1016/j.apmr.2020.08.004

Feigin, V. L., Stark, B. A., Johnson, C. O., et al. (2021). Global burden of stroke and risk factors in 204 countries and territories, 1990–2019: a systematic analysis. The Lancet Neurology, 20(10), 795-820. https://doi.org/10.1016/S1474-4422(21)00252-0

Ghai, S., Ghai, I., Effenberg, A. O. (2022). Effect of aquatic therapy on balance and gait in stroke survivors: a systematic review and meta-analysis. Clinical Rehabilitation, 36(5), 642–654. https://doi.org/10.1177/02692155211068997

Giuriati S, Servadio A, Temperoni G, Curcio A, Valente D, Galeoto G. The effect of aquatic physical therapy in patients with stroke: A systematic review and meta-analysis. Top Stroke Rehabil. 2021 Jan;28(1):19-32. doi: 10.1080/10749357.2020.1755816. Epub 2020 Apr 27. PMID: 32340581.

Ghayour NM, Shariat A, Dommerholt J, et al. Aquatic therapy for improving lower limbs function in post-stroke survivors: a systematic review with meta-analysis. Top Stroke Rehabil 2021;19:1–17.

Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta analyses. BMJ. 2003;327:557-60.

Iatridou G, Stergiou AN, Varvarousis DN, Theodorou A, Doulgeri S, Pelidou HS, Dimakopoulos G, Ploumis A. Comparative Study Between Aquatic Therapy and Land-Based Exercises in Hemiplegic Patients After Stroke: A Randomized Controlled Trial. Am J Phys Med Rehabil. 2025 Apr 1;104(4):305-311. doi: 10.1097/PHM.0000000000002589. Epub 2024 Jul 2. PMID: 38954645.

Kim, K., & Lee, B. (2023). Comparative effectiveness of aquatic versus land-based therapy for stroke rehabilitation: A meta-analysis. Topics in Stroke Rehabilitation, 30(1), 1–11. https://doi.org/10.1080/10749357.2022.2110567

Manning OJ, Rancourt S, Tomasone JR, Finlayson M, DePaul V. Water-based therapeutic exercise in stroke: a scoping review. Disabil Rehabil. 2023 May;45(9):1549-1562. doi: 10.1080/09638288.2022.2063415. Epub 2022 Apr 21. PMID: 35450495.

Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev 2015;4:1.

Nayak P, Mahmood A, Natarajan M, Hombali A, Prashanth CG, Solomon JM. Effect of aquatic therapy on balance and gait in stroke survivors: A systematic review and meta-analysis. Complement Ther Clin Pract. 2020 May;39:101110. doi: 10.1016/j.ctcp.2020.101110. Epub 2020 Jan 30. PMID: 32379645.

Prabhakaran S, Ruff I, Bernstein RA. Acute stroke intervention: a systematic review. JAMA 2015;313:1451–62.

Peisker T, Koznar B, Stetkarova I, Widimsky P. Acute stroke therapy: a review. Trends Cardiovasc Med 2017;27:59–66.

Pérez-de la Cruz, S. (2020). Influence of an aquatic therapy program in Halliwick concept on balance in patients after stroke: A randomized clinical trial. Journal of Stroke and Cerebrovascular Diseases, 29(3), 104478. https://doi.org/10.1016/j.jstrokecerebrovasdis.2019.104478

Silva, G. M. J., Dei Tos, D., & Fabiano, L. C. (2023). Effects of aquatic therapy on gait and balance in patients with brain vascular accident: a literature review. Revista Uningá, 59(1), eUJ4134. https://doi.org/10.46311/2318-0579.59.euj4134

Stinear CM, Lang CE, Zeiler S, Byblow WD.Advances and challenges in stroke rehabilitation. Lancet Neurol 2020;19:348–60.

Veldema, J., & Jansen, P. (2021). Aquatic therapy in stroke rehabilitation: systematic review and meta-analysis. Acta Neurologica Scandinavica, 143(3), 221–241. https://doi.org/10.1111/ane.13371

Vakilian A, Babaeipour H, Sahebozamani M, Mohammadipour F. The effect of aquatic training on static and semi-dynamic balance of patients with chronic ischemic stroke: A randomized clinical trial. Turk J Phys Med Rehabil. 2021 Sep 1;67(3):315-321. doi: 10.5606/tftrd.2020.5437. PMID: 34870118; PMCID: PMC8607001.

Trisnowiyanto, B., & Andriani, I. (2025). Pemberdayaan Masyarakat Melalui Edukasi Dan Simulasi Terapi Akuatik Pada Rehabilitasi Penyintas Stroke: Community Empowerment In Post Stroke Rehabilitation With Aquatic Therapy. Jurnal Pengabdian Masyarakat Multidisiplin, 8(2), 154–161. Https://Doi.Org/10.36341/Jpm.V8i2.5300

Tuna, A., Unver, B., Karatosun, V. (2022). The impact of aquatic therapy on functional mobility and balance in stroke patients: A meta-analysis. Journal of Stroke and Cerebrovascular Diseases, 31(8), 106499. https://doi.org/10.1016/j.jstrokecerebrovasdis.2022.106499

WHO. (2022). World Stroke Day 2022. World Health Organization.