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Original Research Paper

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TO COMPARATIVE THE EFFECTIVENESS OF AQUATIC THERAPY AND AQUATIC TREADMILL THERAPY TO IMPROVE GAIT AND BALANCE IN STROKE PATIENTS

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KEYWORDS :

INTRODUCTION

The World Health Organization defines a stroke as a quickly growing clinical symptom of localized (or global) disruption of brain function that lasts more than twenty-four hours or results in death, with no clear cause other than vascular origin. The American Heart Association and American Stroke Association have updated their definition of stroke to reflect advances in neuroimaging and a better understanding of cerebrovascular disease. In addition to the traditional clinical definition—based on the sudden onset of neurological deficits—they now include—silent|| events such as asymptomatic cerebral, spinal, and retinal infarctions, as well as silent haemorrhage[1].

Ischemic stroke is the most common type of stroke, and its prevalence is highest in developing countries[2].Ischemic stroke is caused by an embolic or thrombotic event that lowers the blood flow to the brain. The blood vessel that supplies blood to the brain malfunctions during a thrombotic event, which typically happens as a result of atherosclerotic disease, arterial dissection, fibro muscular dysplasia, or an inflammatory condition[2]

FES is a treatment that shows promise for promoting neuronal pathways and facilitating motor rehabilitation Theoretically, the combination of FES and gait rehabilitation seems to be an effective treatment for stroke since the device encourages electrically produced contractions that, when paired with voluntary contractions, can strengthen spinal synapses and cause cortical modifications[2]

Underwater treadmill training significantly reduces body weight; it can be recommended for stroke patients who have gait disturbances instead of land-based treadmill training. Furthermore, the combination of resistance and aerobic exercises with water resistance can raise energy expenditure. Additionally, exercising on an underwater treadmill offers resistance while moving in various directions and lessens the strain on weight bearing joints and the chance of falling. As a result, cardiovascular exercises performed underwater that mimic walking and running are becoming more and more popular[4]

Objectives of the Study

- To evaluate the effectiveness of aquatic therapy to improve gait and balance in stroke patients.
- To evaluate the effectiveness of aquatic treadmill therapy to improve gait and balance in stroke patients.
- To compare the effectiveness of aquatic therapy and aquatic treadmill therapy to improve gait and balance in stroke patient.

METHODOLOGY

Study Design: Pre and Post Comparative Study
Study Subject: Stroke Subjects
Sample Size: 66, The sample size calculated using YAMANE' formula $n = N/[1+N(e^2)]$
The estimated sample size is 33 in each group
Study Setting: Stroke units in and around Bengaluru
Source of Data: Florence college of Physiotherapy OPD
Duration of the Study: 6 weeks
Sampling Technique: Convenience Sampling

Inclusion Criteria

- Patients with 3-6 months post stroke[28]
- Either gender 40-65 year.
- Berg Balance Score should be above 21.
- Patients with normal cognitive function graded more than 24, according to MMSE scale[28]
- Patients who can walk at least 10m with or without assistive devices[28]

Exclusion Criteria

- Subjects with open wounds, skin allergies and skin infections.
- Subjects who are hydrophobic and cognitively impaired.

Ethical clearance has been obtained from the ethical committee of Florence college of physiotherapy Bengaluru.

Procedure

After obtaining ethical clearance from the institutional ethical committee, on the basis of inclusion and exclusion criteria, 66 participants will be included in the study. Subjects will be randomly divided in two different groups with 33 in each group. Group A will receive traditional aquatic therapy and Group B will receive aquatic treadmill therapy. Procedure will be explained to each subject and written consent (Annexure 2) will be obtained.Each group will receive the intervention for 60 min thrice a week for 6weeks.The interventions are divided into two groups: aquatic therapy and aquatic treadmill therapy which focuses majorly on gait and balance.

Group A (Aquatic Therapy)

For six weeks, the patients will participate in aquatic therapy sessions where they will do different exercises for 60 minutes three times a week in a therapeutic pool with water and room temperatures kept at 25–30°C and 35–40°C, respectively. The aquatic session consisted of a 10-minute on-land warm-up, 40 minutes of strengthening, balance, and coordination exercises, and a 10-minute cool down.

Group B (Aquatic Treadmill Therapy)

In this case, participants will walk on a treadmill and perform aquatic exercises for 60 minutes three times a week for six weeks. This group's protocols include a 10-minute warm-up on land, 30-minute water workouts, ten minutes on a treadmill at a personal walking pace, a subsequent speed increase of 0.05 m/s every five minutes, and cool-down exercises.

Fig I Side Walking

Fig II Normal Straight Walking

Data Analysis

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24, with a significance level of p value less than 0.05 and a 95% confidence interval set for all analysis.

Comparison of Dynamic Gait Index Score Between Group – A and Group - B in Pre and Post Test

Test	Group - A		Group - B		t - test	df	Significance
	Mean	S.D	Mean	S.D			
Pre Test	14.42	1.09	14.75	1.25	-1.15	64	.253*
Post Test	17.78	.927	19.51	1.03	-7.14	64	.001**

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom (df) and p-value between Group A & Group B in pretest and posttest. This table shows that there is no significant difference in pretest values between Group A & Group B at $P > 0.05$

Comparison of Berg Balance Scale Score Within Group – A and Group - B - Pre and Post Test

Groups	Pre Test		Post Test		t - test	Significance
	Mean	S.D	Mean	S.D		
Group- A	29.24	2.35	41.69	2.86	-19.07	.001**
Group- B	29.84	2.29	46.69	2.40	-15.21	.001**

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group – A & Group – B. There is a statistically significant difference between the pretest and posttest values within Group A and Group B at $P \leq 0.05$.

Comparison of Dynamic Gait Index Score Within Group – A and Group - B Between Pre and Post Test

Groups	Pre Test		Post Test		t - test	Significance
	Mean	S.D	Mean	S.D		
Group- A	14.42	1.09	17.78	.927	-34.07	.001**
Group- B	14.75	1.25	19.51	1.03	-19.62	.001**

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group – A & Group – B. There is a statistically significant difference between the pretest and posttest values within Group A and Group B at $P \leq 0.05$.

On comparing the Mean Values of Group, A & Group B on Berg Balance Scale Score, it shows a significant increase in the posttest mean values in both groups, but (Group B) shows 46.69 ± 2.40 which has the higher mean value is more effective than (Group A) 41.69 ± 2.86 at $P \leq 0.05$. Hence the null hypothesis is rejected.

On comparing the Mean Values of Group, A & Group B on Dynamic Gait Index Score, it shows a significant increase in the posttest mean values in both groups, but (Group B) shows 19.51 ± 1.03 which has the higher mean value is more effective than (Group A) 17.78 ± 0.927 at $P \leq 0.05$. Hence the null hypothesis is rejected.

On comparing Pretest and Posttest within Group A & Group B on Berg Balance Scale Score & Dynamic Gait Index Score shows significant difference in the mean values at $P \leq 0.05$.

DISCUSSION & CONCLUSION

The present study was undertaken to compare the effectiveness of Aquatic Therapy (AT) and Aquatic Treadmill Therapy (ATT) in improving gait and balance among stroke patients. Stroke is one of the leading causes of long-term disability worldwide, often resulting in impairments in motor control, balance, and gait, which significantly limit functional independence and reduce quality of life. Restoration of gait and balance is therefore a primary goal of rehabilitation. Previous literature has highlighted that targeted rehabilitation interventions focusing on task-specific training and environmental facilitation play a critical role in enhancing recovery outcomes in stroke survivors Bersano & Gatti, 2023.

In conclusion, the present study demonstrates that both Aquatic Therapy and Aquatic Treadmill Therapy are effective in improving gait and balance in stroke patients. However, Aquatic Treadmill Therapy is superior due to its task-specific, repetitive, and progressive training approach, which enhances motor relearning, gait symmetry, and dynamic balance. Therefore, aquatic treadmill therapy can be considered a more effective and clinically valuable intervention for improving functional mobility and independence in stroke rehabilitation.

Based on the findings of the study, it can be concluded that both Aquatic Therapy and Aquatic Treadmill Therapy are effective interventions in enhancing balance and gait performance, as evidenced by significant improvements in Berg Balance Scale and Dynamic Gait Index scores within both groups. Thus, it can be concluded that while both interventions are beneficial, Aquatic Treadmill Therapy is more effective than Aquatic Therapy in improving gait and balance in stroke patients. Hence, Aquatic Treadmill Therapy can be considered a more efficient and clinically valuable approach in stroke rehabilitation programs aimed at improving functional independence and quality of life.

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