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Examining the Benefits of Multidisciplinary Rehabilitation Intervention for Stroke Patients

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Abstract

Background: Stroke is the second leading global cause of death and disability, affecting 80 million survivors with residual symptoms. Rehabilitation, involving an interdisciplinary team approach, plays a crucial role in enhancing functional recovery, addressing deficits in fine motor skills, cognition, and communication through customized therapies, as highlighted in a randomized controlled trial comparing integrated rehabilitation approaches to conventional physical therapy for stroke recovery.

Methods: The study was a randomized controlled trial comparing integrated rehabilitation approaches with conventional rehabilitation in post-stroke patients aged 40-60 years over a four-month period. Conducted in a multidisciplinary rehabilitation center, the study included 90 participants, with 45 in each group. The experimental group received integrated rehabilitation involving tailored physical therapy to enhance balance, occupational therapy targeting fine motor skills, and speech therapy addressing swallowing and communication issues. The control group underwent conventional rehabilitation primarily focusing on physical therapy, omitting integrated approaches like occupational and speech therapy.

Results: The analyses of the findings had revealed that interdisciplinary rehabilitation program yielded a significantly better results $p<0.05$ in improving patients' conditions. The findings provided evidences that all outcome measures that were balance, fine motor function and swallowing and dysphagia were significantly improved $p<0.05$ both at within and between the group analyses after four months of integrated rehabilitation program.

Conclusion: The interdisciplinary rehabilitation programme that included physical, occupational, and speech therapies produced noticeably better outcomes than the conventional rehabilitation methods. The results highlight how well the integrated strategy works to improve swallowing/dysphagia, fine motor function, and balance outcomes.

Keywords
Physical Therapy, Occupational Therapy, Post-stroke Patients, Speech Therapy.

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Introduction

Stroke is the world's second leading risk factor for death, accounting for 6.5 million fatalities per year[1-2]. Stroke has become the second leading cause of mortality and disability worldwide with 80 million survivors living with residual symptoms[3]. According to Global Burden of Disease (GBD), stroke is merely engaged for 116 million Disability-Adjusted Life Years (DALYs) in 2016 which have potentially affected the quality of life of survivors, families, and caregivers[4]. According to the Stroke Council of American Heart/Stroke Association (2013), stroke is defined as a neurological deficit attributed to a focal injury to Central Nervous System (CNS) due to a vascular cause5. The prevalence rate of stroke is escalating globally, with an estimated frequency of 33 million per year, impacting one out of every six people over their lifespan[6-8]. The epidemiology of stroke is highest in Asia with an increasing incidence of 25% from 1990 to 2013 with the world's highest rate of stroke per capita reported in Pakistan with an incidence of 250 per 100,000 stroke individuals from the year 2000-2017[9-10]. Rehabilitation after a stroke greatly improves functional recovery, restoring independence and improving quality of life for patients. Rehabilitation reduces disability, encourages neuroplasticity, and provides long-term gains in mobility and general wellbeing through customized therapies[11]. Stroke-related deficits exhibit a broad range of clinical signs and symptoms. Thus, it has been determined that the key to successful stroke rehabilitation programs is an interdisciplinary team approach involving many specialists collaborating closely in the management of stroke[12-13].

Performing Activities of Daily Living (ADLs) can be difficult for stroke survivors because of their impaired fine motor skills and cognitive decline. Physical and Occupational therapists work in tandem with patients to create customized therapies that enhance fine motor skills, hand-eye coordination, and cognitive abilities, facilitating a more seamless transition back into daily life14-15. Speech therapy becomes a crucial component of stroke recovery, helping patients with the swallowing and communication issues that often follow brain damage from a stroke. Aphasia, dysarthria, or dysphagia are conditions that stroke survivors may experience. These conditions can hinder efficient verbal communication and pose dangers to respiratory and nutritional health[16]. Speech therapists use specific approaches to improve eating, articulation, and language skills, allowing for a full recovery of communicative abilities[16]. In the light of the need of integrated rehabilitation approaches in the management of stroke a randomized controlled trial

is conducted to determine the effects of integrated rehabilitation approaches versus conventional rehabilitation that include mainly physical therapy for stroke rehabilitation.

Methodology

Study Design

A randomized controlled trial was conducted to compare the effects of integrated rehabilitation approaches with conventional rehabilitation in post-stroke patients.

Study Setting

The study was conducted in a multidisciplinary rehabilitation center, Islamabad, Gujrat and Faisalabad. The center provided a conducive environment for the implementation of integrated rehabilitation programs, incorporating Physical Therapy (PT), Occupational Therapy (OT), and Speech Therapy.

Participants Recruitment

Males and females aged 40 to 60 years who had suffered from a recent episode of stroke and were undergoing rehabilitation were included. Stroke patients with severe cognitive impairments and unable to comprehend commands and those with uncontrolled cardiovascular and musculoskeletal disorders were excluded.

Study Duration

The study was completed within four months, during which experimental and control group participants attended rehabilitation sessions, which lasted for 60 minutes, three times per week.

Sample Size and Ethical Considerations

A sample size of n=90 patients was randomly assigned to the experimental group, which received integrated rehabilitation, and the control group, which received conventional rehabilitation. At the same time, informed consent was obtained from all the participants or guardians.

Intervention Groups

- ***Experimental Group Protocol:***

  Physical Therapy (PT)

  Tailored exercises were designed to enhance balance and improve fine motor skills, focusing on specific deficits identified in individual patients.

  Progressive strength training and functional mobility exercises were implemented to promote overall physical recovery.

  Occupational Therapy (OT)

  Customized interventions were developed to address fine motor skill deficits, incorporating activities of daily living (ADLs) to enhance independence.

Adaptive strategies and assistive devices were introduced to facilitate optimal performance in daily activities.

Speech Therapy

Speech therapists implemented interventions targeting swallowing and dysphagia issues prevalent in post-stroke patients. Communication skills, including articulation and language, were addressed using specialized exercises to enhance overall speech functionality.

- ***Control Group Protocol***

  Participants in the control group underwent conventional rehabilitation, primarily focusing on physical therapy. The sessions included exercises aimed at improving mobility, strength, and balance. However, the integrated approach involving occupational therapy and speech therapy was not employed.

Outcome Measures

- ***Balance***

  The Berg Balance Scale (BBS) was utilized to assess participants' balance, measuring their ability to perform various functional tasks.

- ***Fine Motor Skills***

  Fine motor skills were evaluated using standardized assessments, including the Nine-Hole Peg Test.

- ***Swallowing and Dysphagia***

  Swallowing function and dysphagia were assessed through Mann Assessment of Swallowing Ability (MASA).

Ethical Considerations

The study followed the criteria of Helsinki declaration of performing study on human subject. Autonomy and confidentiality of information was maintained and study was adhered with criteria of beneficence and non-maleficence for participant included in the study.

Results

The study comprised of n=90 participants divided into two group n=45 patients in each group the cumulative mean age of participants was 53.25±3.65 years. The number of male and female participants were 53 and 37 respectively. The detailed description were provided in Table-1:

Table-1 Demographic description of participants		
Variables	**Mean age**	**Standard Deviation**
Age in years	53.25	3.65
Number of male and females		
Variables	**Number of male (%)**	**Number of female (%)**
Experimental	27 (50.94%)	18 (48.64%)
Control	26 (49.05%)	19(51.35%)
Total	53 (58.89)	37(41.11)

** total percentage of male and female population was calculated out of 90*
male and female percentages in experimental and control groups were calculated from the number of population in each subgroup respectively

The analyses of the findings had revealed a significant improvement in within the group (pre-post) comparison at baseline and after four month of intervention. The values of BBS at baseline in experimental group was 25.56±3.56 that improved to 44.56±2.54 ($p<0.05$) whereas in controlled group the values were 26.54±4.12 that had improved to 43.58±5.52 after four months of training ($p<0.05$). Similar findings were also observed in nine-hole peg test where the values at baseline were 145.25±4.56 second for experimental group that reduces to 63.56±2.45 seconds ($p<0.05$). In control group the value at baseline were 147.56±3.89 second that reduces to 75.56±3.58 second after intervention ($p<0.05$). To assess swallowing and dysphagia MASA tool was used and the findings reveled that at baseline the values for experimental groups was 154.56±2.34 that improved to 177.56±4.32 ($p<0.05$) whereas in control group the values were 156.65±3.25 that improved to 160.35±2.56 ($p=0.04$) (Table-2).

Table-2 Within-the group analyses for Balance, Fine Motor Skills and Dysphagia					
Variables	**Pre ± SD**	**Post ± SD**	**t-test**	**T-critical**	**Level of significance**
Experimental Group					
Balance (BBS)	25.56±3.56	44.56±2.54	4.56	2.56	P<0.05
Fine Motor Skills Nine Hole Peg test	145.25±4.56	63.56±2.45	15.11		P<0.05
Swallowing and dysphagia MASA tool	154.56±2.34	177.56±4.32	10.85		P<0.05

Control Group					
Balance (BBS)	26.54±4.12	43.58±5.52	4.55	2.56	P<0.05
Fine Motor Skills Nine Hole Peg test	147.56±3.89	75.56±3.58	14.45		P<0.05
Swallowing and dysphagia MASA tool	156.65±3.25	160.35±2.56	6.65		P=0.04

Independent t test was applied to determine between group comparisons. The values suggested that no significant difference was observed in balance improvement as both the group produced similar results (p>0.05). However on fine motor skills and swallowing and dysphagia integrated rehabilitation program (experimental group) had reveled significant improvement p<0.005 than control group (Table-3).

Table-3 Between-the group analyses for Balance, Fine motor Skills and Dysphagia

Variables	Experimental group Mean ± SD	Control group Mean ± SD	t-test	T-critical	Level of significance
Balance (BBS)	44.56±2.54	43.58±5.52	1.53	3.25	P=0.07
Fine Motor Skills Nine Hole Peg test	63.56±2.45	75.56±3.58	9.56		P<0.05
Swallowing and dysphagia MASA tool	177.56±4.32	160.35±2.56	11.22		P<0.05

Discussion

The results revealed that both groups revealed improvement in balance after 3 weeks of treatment (p<0.05). However for Fine Motor Skills Swallowing and dysphagia greater mean difference was observed in the group which received physical therapy, occupational therapy, and speech therapy. In a study conducted by Dogan in 2023, the effects of standard care vs. occupational therapy were analyzed on hemiplegic stroke patients. Within group improvement was observed for all outcome measures that include motor recovery, and functional independence. However, there was no significant difference between both groups[17]. In a study conducted in 2021 in Ukraine on effects of physical therapy after stroke. The findings showed The multidisciplinary team attempts, on the basis of evidence-based medicine, an integrated and personalized strategy to activate an independent life, assist and restore the patient's lost functions, compensate, and find a way out where others refuse[18]. Multidisciplinary rehabilitation intervention for stroke patients is a comprehensive and holistic approach that involves the collaboration of various healthcare professionals such as physical, occupational, and speech

therapy to address the diverse needs of individuals recovering from a stroke. This integrated approach aims to optimize the physical, cognitive, and emotional well-being of stroke survivors, ultimately enhancing their overall quality of life. In this discussion, we will explore the significant benefits of multidisciplinary rehabilitation intervention for stroke patients[19]. In a retrospective study on the outcomes, frequency, duration, and intensity of occupational, physical, and speech therapy in inpatient stroke rehabilitation. The patients in this study were seen for skilled OT, PT, and ST for about 30 minutes per session, 1.5 times per day, and received therapy services for 5 to 6 days per week on average. These findings suggested inpatient stroke rehabilitation has an impact on the rehabilitation process[20]. In another study by Kimura et al, on combine effects of standard care, physical and occupational therapy on stroke patients, the results revealed that compare to the group which received physical and occupational therapy alone, significant improvements were observed in the group which received combine therapy[21].

A key part of recovering from a stroke is physical rehabilitation, which focuses on regaining mobility and motor function. Physical therapists collaborate closely with patients to enhance their balance, coordination, and muscle strength. Occupational therapists, on the other hand, help people who have had strokes restore the abilities needed for everyday tasks like cooking, cleaning, and clothing. Speech therapists are essential in helping stroke patients get past their inability to swallow and communicate. The cooperation of various fields guarantees a thorough and well-rounded approach to rehabilitation, increasing the likelihood of success.

Conclusion

The interdisciplinary rehabilitation programme that included physical, occupational, and speech therapies produced noticeably better outcomes than the conventional rehabilitation methods. The results highlight how well the integrated strategy works to improve swallowing/dysphagia, fine motor function, and balance outcomes. This underlines the necessity of a thorough interdisciplinary team approach in stroke rehabilitation and underscores the significance of a holistic and customized rehabilitation plan in improving functional recovery for stroke survivors.

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None.

Conflict of Interest

None.

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None.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design: Khunsha IW, Azmat F

Acquisition, Analysis or Interpretation of Data: Hassan H, Ameen A, Fatima S

Manuscript Writing & Approval: Badar F, Farrukh A

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.