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Original Article

Comparison of Routine Physical Therapy with and without Core-Stability Exercises on Dynamic Sitting Balance and Trunk Control in Sub-Acute Ischemic Stroke Patients

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ABSTRACT

Stroke patients suffer from severe postural instability and likely to have a frequent number of drops and a higher limitation of post-fall activities. Stroke burden is increasing day by day which leads to significant musculoskeletal problems, physical and mechanical issue. **Objectives:** To compare the effects of routine physical therapy with and without core-stability exercises on trunk control and sitting balance in sub-acute ischemic-stroke patients. **Methods:** It was a Single blinding Randomized controlled trial. Total 58 patients participated in this study (29 in each group) with 20% drop out from Rabbani Hospital Thokar Lahore setting. In both groups control and experimental groups treatment given for the 45 mints per day in 8 week which includes conventional physical therapy with and without core stability exercises in as well. Exercises performed in sitting position on couch, chair and physio ball. BBS and TIS scale used for this study purpose. Data were collected through standardized questionnaire. **Results:** Total 15(62.5%) male and 9(37.5%) females in control group while 11(45.8%) males and 13(54.2%) females in experimental groups were included in study. BBS score in treatment groups before and after the treatment in control group is 11.29 while 20.25 in experimental group. TIS score in treatment groups before and after the treatment is 3.13 in control group while 4.88 in experimental group as well. **Conclusions:** It is concluded that core stability exercise training combined with conventional treatment helps sub-acute post-stroke patients improve their trunk control as well as their dynamic sitting and standing balance, gait, and capacity to do daily living tasks.

INTRODUCTION

Stroke is defined as a neurological deficiency due to acute Central Nervous System (CNS) focal damage, a leading source of impairment and mortality globally and includes cerebral infarction, intracerebral hemorrhage, and subarachnoid hemorrhage [1]. Following a stroke, patients suffer from severe postural instability and likely to have a frequent number of drops and a higher limitation of post-fall activities. Reports show that only around 20-66 percent of stroke victims manage to rejoin the community freely [2]. Stroke is the most frequent cause of impairment or dependency in older people's daily lives (ADL). Trunk control is a critical component of ADL performance [3]. Stroke is the third leading cause of death and adult disability in the developing countries and is a major public health problem [4]. Stroke affects approximately 17 million people each year globally. Among these 5 million people die and 5 million people are permanently disabled [5]. Therefore, problems with complex tasks along with an increased risk of deterioration because of problems with walking or standing. The risk of sliding to the paretic continuous encouragement, in particular to functional constraints [6]. When brain stops working due to compromised blood supply of its any part then stroke occurs. Causes of strokes include loss of blood supply which called ischemia or

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bleeding in the brain which called hemorrhagic stroke. Those people who have high blood pressure, high cholesterol, diabetes, and those who smoke are at higher risk of ischemic stroke [7]. Balance impairment may develop owing to core muscle weakening in individuals with stroke. In particular, of the QL, the thickness of the back trunk muscles was strongly linked to functionality after a stroke on both affected and non-affected sides. The core rear muscle training program connected directly to functionality will improve the balance of trunk and locomotive function for people with a sub-acute stroke [8]. Balance is the result of vestibular interactions, proprioceptive, musculoskeletal, and mental. Equilibrium control is a critical element of safe and self-contained mobility and daily walking [9]. Neuro-rehabilitation is essential to reduce the long-term impact of stroke and provide an optimum functional recovery for rehabilitation in homes and communities. Physiotherapy is the fundamental rehabilitation therapy, and the focus of the physiotherapist's treatment is motor function. The main job of the brain and nervous system is to synchronize postures and movements so that the body can stable during motions. Coordination of the trunk is an essential component of proprioception and has been affected after the stroke [10]. Trunk-activating equilibrium exercises are necessary since trunk weakness is related to the functionality of people after a stroke [11]. Gait is one of the most important activities of daily living which affects stroke survivors [12]. It requires the integration of mechanism of locomotion with those of balance, motor control, cognition and musculoskeletal function while in stroke patients these all problems occurs [13]. The chronic motor and sensory abnormalities prevalent in individuals with a stroke are strongly related to balanced impairments [14]. Stroke balance the goal was to examine the connection among trunk management, key muscle strength, and autonomy to maintain the effectiveness of stroke patients in the chronic population and establish trunk performance metrics to achieve a balance of trust. For stroke survivors, the connection between trunk control, hip flexors, and mental balance is essential and advantageous. It requires a deeper investigation of the functional balance of the targeted rehabilitation techniques [15]. The core muscles have a great function in stability and mobility of body parts in maintaining posture and assisting the mobility of upper and lower limbs against gravity so facilitating function of arms and legs [16]. In Pakistan, stroke burden is increasing day by day which leads to significant musculoskeletal problems, physical and mechanical issue. The main reason of compromised life style of these patients is dynamic sitting balance and trunk control. Many recent studies have reported on core stability and its effects on athletes and patients with low back pain but few studies on the relationship between core-stability and trunk control and balance in patients with sub-acute stroke have been reported. There are lack of researches in Pakistan on specific feature of balance and gait control with core-stability exercises among stroke survivors. Hence, the purpose of this study is to examine the effect of core stability exercises for the rehabilitation of sub-acute ischemic stroke patients regarding these issues.

METHODS

48 People of having Sub-Acute ischemic stroke diagnosed by neuro-physician having 1st episode included in this randomized control trail. Persons who were having age gap between 25-60 years were eligible for this research [17] and male and female both subjects were included in this study. Patients in sub-acute stage (2-12 weeks) of stroke only meet the inclusion criteria of this study. Patients who can follow the instruction according to mini mental scale <7 are included and Minimum score of patient having on burg balance and trunk impairment scale to enter in rehab unit and include in any research i.e., TIS < 2 in scoring and BBS < 4 minimum scoring. Therefore, unconscious patients and having recurrent stroke or subject with radiating pain or nerve root involvement were not included. Also objects Diagnosed by any neurological condition other than stroke, or other clinical comorbidities that affect the trunk balance or Patient unable to follow the instructions or verbal commands are not meet the inclusion criteria. This trial was conducted after approval from Institutional Review Board (IRB) of Faculty of Allied Health Sciences, The University of Lahore. Duration of study was 9 months and data were collected from Physiotherapy department of Rabbani hospital Lahore. Informed consent was taken from all the participants of the study and all the participants were randomly allocated in experimental group and control group by using chit method. The study was single blinded and the assessor was not be aware of treatment given to both groups. Data were collected by using standardized questionnaires. Firstly baseline assessment was done then treatment for 4 weeks were given to the patients and Follow ups was done for further 4 weeks. In control group (A) only conventional therapy given that was included heating therapy, range of motion exercises in which patient have to perform normal amount of movement within a joint and stretching exercises in which a specific muscle or group of muscle have to elongate or stretch in order to improve elasticity, 45 mints per day for 8 weeks performed. Exercises was perform in sitting and supine line position. While in experimental group (B) core-stability exercises (deep breathing, back extension, seated trunk, trunk rotation and lateral rotation, exercises) performed 45 mints

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per day in 8 week along with conventional therapy. Exercises was perform in sitting position on couch, chair and physio ball. Exercises was performed on the chair with supported back in upright position then on the edge of couch or plinth without back supported and knees was bended at 90º and feet flat on the floor and when patient was able to sit on unstable surface then exercises performed in sitting position on physio ball. Outcomes was measured by two scales, Burg balance and trunk impairment scale. The burg balance scale was measured the balance during sit to stand while Trunk Impairment scales measured the static sitting balance, dynamic sitting balance and co-ordination. Age, Gender and Therapy were independent variable while the outcomes were the dependent variable.

RESULTS

There were total 48 participants fulfilled the inclusion criteria and recruited in the study.48 participants were further divided into control and experimental groups (Figure 1).

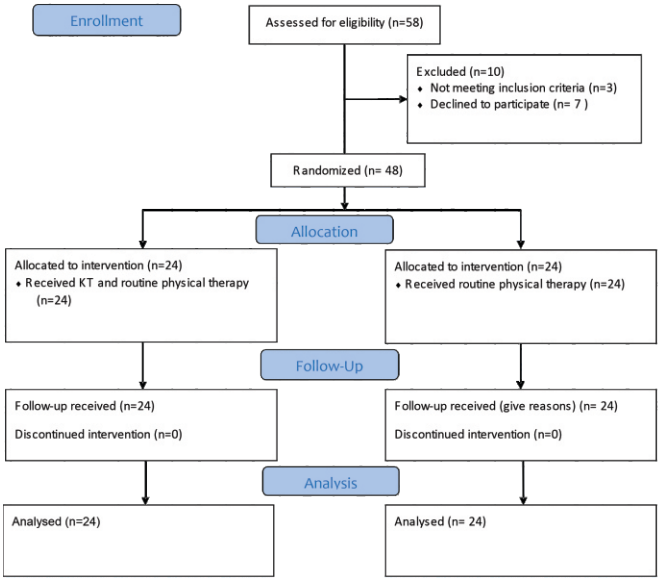

Figure 1: Consort Flow Diagram

24 participants were included in each group. In this study, total 26 males and 22 females participated. 15(62.5%) male and 9(37.5%) were female in group A (control group) while 11(45.8%) male and 13(54.2%) females in group B (experimental group). The mean age of study participants were in group A was 47.91 years and standard deviation was 8.00 while the mean age in group B were 50.20 years and standard deviation was 7.52 as well. After the completion of time period of 8 weeks of treatment there was a significant increase in the mean scores of Burg Balance scale and Trunk Impairment scale. However there was a marked difference in means values of experimental group. Intergroup scores 20.70 ± 40.95 of mean ± SD on Burg balance scale at baseline in control and experimental groups were 19.37 and 40.95±3.82 respectively. While the p-value is <0.20, which is larger than 0.05 p-value. Scale scores mean in pretreatment and post treatment 30.66 ± 6.55 and 40.95 ± 3.82 respectively. TIS Scale scores mean of control and experimental group in pretreatment is 11.66 ± 2.58, 11.20 3.64 and 14.79 ± 1.93, 16.08 ± 1.81 respectively. P-value is 0.001 which is smaller than significant 0.05 p-value. Results details shows the significant difference in Group A and Group B scores which concluded that the core stability exercises with conventional therapy is more effective in rehabilitation of sub-acute stroke patients (Table 1, 2).

Group3	Measurements	Pre-treatment Mean ± SD	Post-treatment Mean ± SD	Mean difference	p-value
Control group	BBS Score	11.66 ± 2.58	14.79 ± 1.93	3.13	0.001*
	TIS Score	19.37 ± 9.19	30.66 ± 6.55	11.29	0.001*
Experimental Group	BBS Score	11.20 ± 3.64	16.08 ± 1.81	4.88	0.001*
	TIS Score	20.7 ± 07.39	40.95 ± 3.82	20.25	0.001*

Table 1: Intra-group analysis for Berg balance scale and Trunk impairment scale Measurements

Parameter	Group	Mean ± SD	Mean ± SD
Pre-BBS	Group-A (control)	19.375 ± 9.197	.583
	Group-B (exp.)	20.708 ± 7.392	
Post-BBS	Group-A (control)	30.666 ± 6.551	.000
	Group-B (exp.)	40.958 ± 3.827	
Follow up-BBS	Group-A (control)	24.125 ± 7.7813	.000
	Group-B (exp.)	32.541 ± 5.555	
Pre-TIS	Group-A (control)	11.666 ± 2.5819	.618
	Group-B (exp.)	11.208 ± 3.647	
Post-TIS	Group-A (control)	14.791 ± 1.933	.021
	Group-B (exp.)	16.083 ± 1.815	
Follow-up TIS	Group-A (control)	14.125 ± 1.962	.129
	Group-B (exp.)	13.125 ± 2.490	

Table 2: Inter-group analysis for Berg balance scale and Trunk impairment scale Measurements

DISCUSSION

The findings of the research revealed that adding 45 minutes per day for eight weeks performance of extra core stability exercises to a patient's daily routine improved dynamic sitting balance and trunk function in sample size of 48 patients who had a sub-acute stroke. The findings also indicate that core stability exercises have a carry-over impact on standing balance, gait, and activities of daily living after they are completed.in this purpose berg balance and trunk impairment scale is used. While another study which conducted in 2017 having sample size of forty patients and given both conventional and core stability therapies to both group for six weeks by using Berg balance and Modified Barthel index [18]. On the other hand one past study conducted in 2021 to measure the improvement in dynamic sitting balance by using Virtual-reality device and they had a sample size of 20 patients which equally divided

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in two groups and therapy duration was 30 min per day thrice a week for the eight weeks and results were much significant [19]. One more RCT conduct by Jong to improve the balance by using Berg balance and Trunk impairment scale by providing Whole-body vibration therapy and conventional therapy to both equally distributed groups and the duration was 30 min twice a day five days in week for 2 weeks and the results shows optimal effects as well [20]. One of the present study's strengths is that it's the first time when core-stability exercises have been perform in two groups of stroke patients with an average age of 25-60 years in each group. In addition, all outcomes were assessed by the same therapist in a blinded fashion throughout the study. Another important feature of present research was the description and standardization of the progression of exercises at three levels of increasing difficulty. This was a first in our field. The use of such techniques not only improved repeatability, but they also permitted the inclusion of patients who were unable to endure the sitting position in our research, which was in contrast to many prior studies in which eligible patients were required to stay in the sitting position. It was suggested that post-stroke patients should undergo regular and progressive training programs to enhance their balance and walking ability. The particular core-stability exercises techniques utilized in this research were created to increase the endurance of the core muscles whose support the trunk and pelvis based on past experimental therapy conducted in randomized control trials, this approach takes the physiological foundation of exercise into account when prescribing exercise. Response time, which are an essential component in maintaining optimum balance, was improved via the use of the core-stability exercises. Recently published research has shown, core muscles endurance is related with balance performance in older individuals. This finding is consistent with that research. This discrepancy may be explained by the fact that our research included workouts that were done in both sitting and bending postures. Other researches, which contained a similar set of activities, have confirmed these findings. Training the core muscles on an unstable surface, such as a physio ball, improves stability, proprioceptive skills and balance. The improvement in standing balance in the experimental group, as measured by the BBS, was almost three times greater than that in the control group. Due to the core stability training program, it's possible that the patients in the experimental group acquired excellent sitting balance sooner than those in the control group, enabling them to begin the more difficult standing activities earlier than those in the control group. The findings of this research also point to the presence of a beneficial connection between core stability exercises and gait. Additionally, all results demonstrate a link between better trunk control and improved walking. Core stability is critical for the effective execution of activities of daily living in older, healthy individuals. There are several limitations of present research. First and foremost, the control group did not get any extra treatment. It is possible, the gains seen with core stability exercises are related to the longer duration of the activity, but we do not think that, the sole explanation for the improvements reported with core stability exercises. Previous studies had included different time durations of treatment in their intervention groups [21] while the findings were comparable size to ours, leading us to infer that these exercises alone are a significant component in explaining the improvements seen in our research. A second restriction is insufficient long-term follow-ups of the patients to establish if the improvement seen in the short term it can be sustained over time. Future study should apply the core stability exercises to discover how to teach patients to do these exercises without the assistance of a therapist.

CONCLUSIONS

It is concluded that core stability exercise training combined with conventional treatment is more beneficial in sub-acute post-stroke patients to improve their trunk control as well as their dynamic sitting balance, standing balance, gait, and capacity to do daily living tasks. Consequently, the findings of this study are statistically significant, therefore, we suggest that core stability exercise training should be included in an early stroke rehabilitation program to improve trunk control and sitting balance.

Conflicts of Interest

The authors declare no conflict of interest.

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