

Relationship Between Fear of Falling, Balance Impairment and Functional Mobility In Stroke Patients

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Abstract

Introduction: Fear of falling in stroke subjects is a major cause of loss of independence, which has an effect on the physical function in them. The aim of the study is to find whether a relationship exist among fear of falling, balance impairment and functional mobility in stroke population. **Method:** The sample consisted of 37 stroke subjects in sub-acute and chronic stage of age between 35 years to 65 years (mean=48.91, SD \pm 10.67). Fear of falling was measured using Falls Efficacy Scale (FES), balance was measured using Berg Balance Scale (BBS) and functional mobility was assessed using the Timed Up and Go test (TUG). **Result:** The data was analyzed using Pearson co-efficient of correlation to examine the relationship between FES, BBS and TUG test and with t-test. The correlation co-efficient between fall efficacy and balance performance was -0.75 ($p \leq 0.0001$) and correlation coefficient between fall efficacy and TUG was 0.60 ($p \leq 0.00068$). **Conclusion:** This study concluded that there was a significant association between fall efficacy, balance performance and functional mobility among subacute and chronic patients with stroke. This relationship has an implication for the development of rehabilitation programs that aim to improve the balance confidence as well to diminish its impact on function in stroke patients.

Keywords: Fear of fall; Balance; Mobility; Stroke

Introduction

Stroke (cerebrovascular accident) is defined as a rapid loss of neurological function caused by a blockage in the brain's blood supply. ^[1] Stroke is a clinical illness characterized by rapidly growing focal neurological deficit which causes abnormalities in brain function that continues for longer than 24 hours. Patients who have had a stroke frequently lose functions of the motor, sensory, and higher cognitive skills to varying degrees, resulting in loss of balance ^[2]. They present with loss of voluntary movements, spasticity, and difficulty to move independently ^[3]. Following stroke, people experience major abnormalities in coordination, balance, gait, and gross motor function, limiting their ability to perform activities of daily living. ^[4] Thus, patients who have had a hemiparetic stroke are at a higher risk of falling due to balance issues. ^[5] Balance is a complex motor skill that necessitates the central organization of vestibular, visual, and somatosensory information in order to activate the musculoskeletal system, which results in synchronized eye movements, posture, stance, and locomotion. ^[6] The term balance is an umbrella concept with four subcategories of motor skills; stationary postural control, voluntary movements, involuntary movements, and external disturbances.

A fall is described when a sudden unintended loss of balance leaves the individual in contact with the floor or another surface such as a step or chair. ^[7] Fear of falling is presented as a demoralizing cycle of confidence loss and decreased physical activity, which leads to reliance on the care giver of the subjects. ^[8] Stroke patients experience fall at least once during the course of disease, which creates a feeling of fear in their minds. Although they do not experience fall, they are aware of the condition of their limbs which is inadequate to balance their

body which would ultimately result in falls. ^[9]

Functional mobility is a product of the contribution of many systems, working together within their own maturational level, to produce movement that is suited for that specific human, at that specific time, in that specific environment, to complete a specific task. ^[10] This mobility is divided into three categories of stability needs or primary balance control functional goals: (1) maintaining specific postures in which the center of mass is repositioned within an existing (e.g. reaching) or newly established base of support (i.e. postural control); (2) facilitating voluntary movements in which the center of mass is repositioned within an existing (e.g. reaching) or newly established base of support (e.g. walking) and (3) reacting to external stimuli (i.e., reactive balance control). ^[11] Functional mobility is described as coordinated trunk, upper extremity, and lower extremity movements that can develop and be maintained if several key elements are present like adequate mobility and range of motion, appropriate muscle tone and strength, evidence of variability and isolation of movements, postural stability and central control, antigravity control, and proximal stability. ^[12]

There is limited literature studying the relationship among patients with fear of fall, balance performance and functional mobility among patients with stroke. Evidence suggests the relationship between fear of falls, balance issues and functional mobility in community dwelling older people. The aim of the

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present study is to investigate the correlation of fear of fall, balance performance and functional mobility in patients with subacute and chronic stroke.^[13]

Methodology

The present study is an observational study conducted in tertiary health care centers in patients with stroke of sub-acute and chronic phase. 50 patients were screened and 37 patients were included in the study. Patients age ranging between 35-65 years, walking independently, Mini Mental Examination Score >24 with intact vision and hearing were included in the study. Patients with history of myocardial infarction, coronary artery bypass or any other cardiac surgeries, respiratory conditions requiring oxygen supplementation, history of recent injury past 6 months (especially spinal or hip fracture) and other co-morbidities were excluded from the study.

The study commenced after the approval of Institutional Ethical Committee. The purpose and the objectives of the study were explained to the subjects and written informed consent was taken from the patients with stroke. Demographic data including name, age, gender, hand dominance and the side affected were noted on the case record forms. The patients were then assessed for fall efficacy, balance performance and functional mobility. The Outcome Measure used to assess fall efficacy, balance performance and functional mobility are FES (Falls Efficacy Scale), BBS (Berg Balance scale), and TUG (Timed Up and Go test) Scale respectively. (Figures 1-3)

Statistical Analysis

The data was analyzed using SPSS version 24.0th. The data was normally distributed using Shapiro-wilk test. Mean and standard deviation were calculated for quantitative variables. Pearson correlation coefficient was applied to study the association between FES-BBS and FES-TUG. For both correlation the P-Value of <0.05 was considered statistically significant (Table 1).



Figure 1: Assessing patient for Falls Efficacy Scale.

Results

The statistical description of this study suggests that out of 37 (Male N=26, 70.27%, Female N=11, 29.72%) patients of age between 35 years to 65 years (Mean 48.919, SD \pm 10.67).

Patients who were in the age group of 35-45 years comprised of 43.24% and people who were in the age group of 46-65 years were 56.75% with Mean and SD being 48.91 ± 10.67 years (Table 2).

The present study comprised of maximum number of patients who were with right hand side dominance that is 89.18% and left-hand dominance was just 10.81% (Table 3).

The Pearson coefficient of correlation was used to examine the



Figure 2: Assessing of Berg Balance Scale.



Figure 3: Assessing of timed up and go test.

relationship among the FES, BBS, and TUG Scale scores, with FES score as the dependent variable. The Pearson's correlation coefficient between the FES and the BBS were -0.759 which showed a high correlation between them with the significance of $p < 0.0001$. The correlation between the FES and TUG test was 0.606 with the significance of $p < 0.000068$ which also showed a strong correlation between them. Between the FES and TUG the r-value is 0.60 suggesting positive correlation. This clinically implicates that high FES scores is predictive of longer duration to complete the task in TUG test (Table 4 and Figure 4).

Shows the negative correlation as their berg balance scale and fall efficacy scale variables in which one variable is getting

Table 1: Distribution of patients according to gender.

Gender	No. of patients	Percentage
Male	26	70.27%
Female	11	29.72%
Total	37	100.0%

Table 2: Distribution of patients according to age-group.

Age-Group	No. of patients	Percentage%
35-45	16	43.24%
46-65	21	56.75%
Total	37	100.0%
Mean \pm SD	48.91 \pm 10.67 years	

Table 3: Distribution of patients according to dominance side.

Dominance Side	No. of Patients	Percentage (%)
Right	33	89.18%
Left	4	10.81%
Total	37	100.0%

Table 4: Pearson correlation for Fall Efficacy Scale (FES), Berg Balance Scale (BBS) and Timed Up and Go test (TUG).

	Correlation coefficient (FES)	P value (t-test)
BBS	-0.75	0.0001
TUG	0.60	0.000068

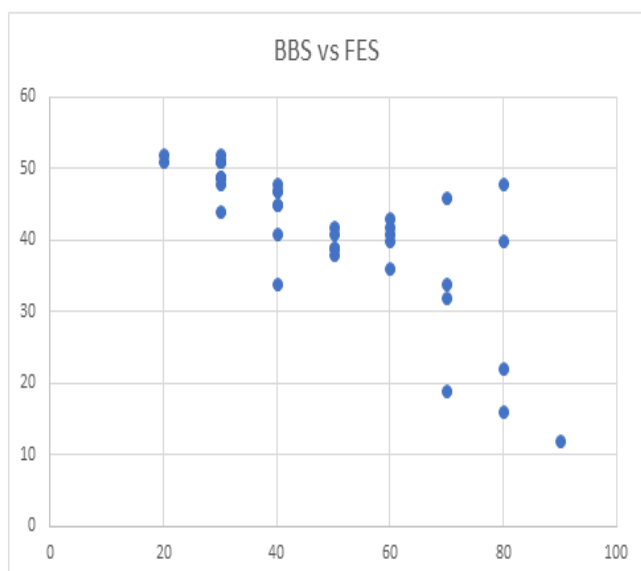


Figure 4: Scatter diagram. Correlation between Falls Efficacy Scale (FES) vs. Berg Balance Scale (BBS).

increasing as the other decreases, they were somewhat opposite to each other's. As FES score increases the other BBS gets decrease or opposite to this with each other. So, this indicates that the subject is having fear of fall that means subject also have poor balance. So, it strongly correlating with each other's (Figure 5).

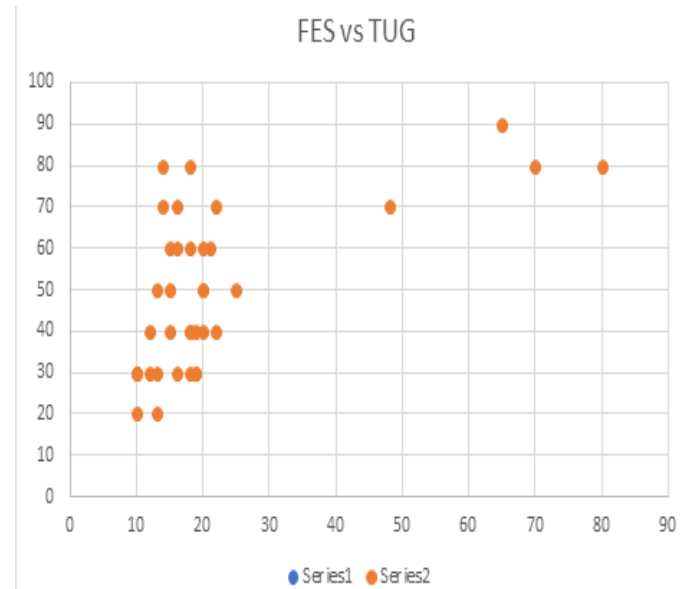


Figure 5: Scatter diagram. Correlation between Falls Efficacy Scale (FES) vs. Timed Up and Go test (TUG).

In timed up and go test and fall efficacy scale Figure 5 shows that positive correlation. There are a positive correlation shows between TUG and FES that is in the same direction, as in this maximum the fall efficacy scale score increases other variable timed up and go test time duration also gets increase, so it is strongly says that poor the balance maximum the time required for completing the task performance test TUG (Figures 6-8).

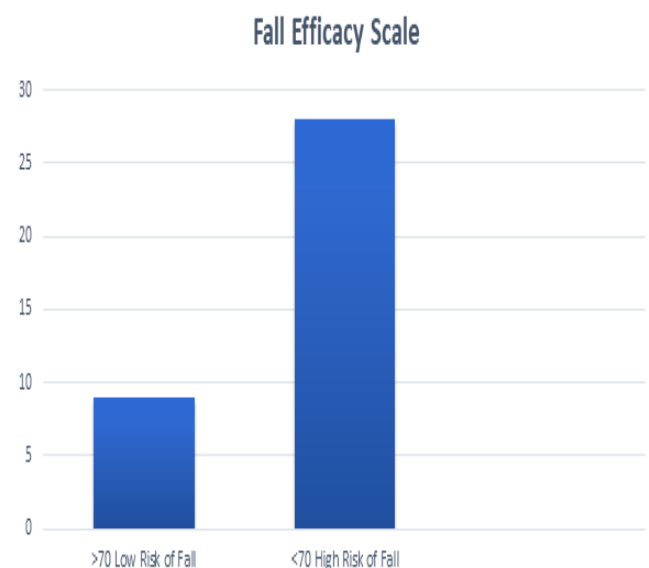


Figure 6: Score of fall efficacy scale.

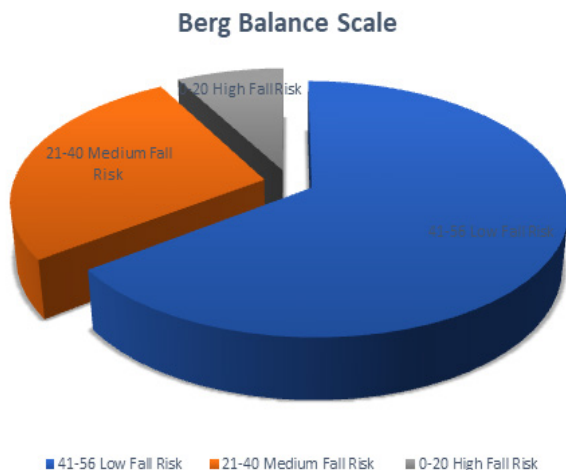


Figure 7: Score of berg balance scale.

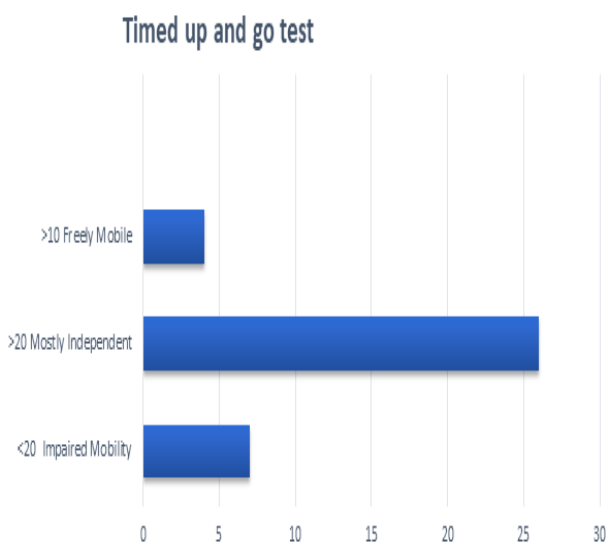


Figure 8: Score of timed up and go test.

Discussion

The result of this study showed the association between the fall efficacy, balance performance and the functional mobility in the patients with stroke. This finding suggested that stroke patients those who had the fear of falling might have the balance deficit. It demonstrated the link between fall efficacy (fear of falling) and balancing skills while performing functional tasks. Fear of falling also had a role in explaining self-efficacy, implying that stroke patients with a high self-efficacy score not only have compromised balance, but also fear falling as a result of these limitations.

TUG assessed ability to maintain balance during timed locomotion and ambulatory transfers. It is also correlated with FES demonstrating that a relationship existed between fear of falling and functional mobility in the stroke subjects. The finding also demonstrated that the ability to maintain balance during functional activities could be present irrespective of fall history in stroke patients. It is not clear whether impaired balance has an impact on falls efficacy or whether diminished falls efficacy results in a deterioration of balance ability.

Several major risk factors among community stroke survivors have been identified which are impaired mobility, reduced balance, use of psychotropic medications, disability in self-care, depression, cognitive impairment and also a previous history of fall. [14] Depression and anxiety, along with other mood disorders are very common in post stroke patients. This could be attributed to their dependency for basic and instrumental activities of daily living on their family or care giver. However, if the subject is not physically capable of performing the task effectively, it may lead to risk of fall. Fear of fall has a major role in addressing the confidence of stroke patients who already have suffered at sensory and motor levels due to their cerebrovascular accident. It therefore suggests that these stroke subjects when assessed for fall efficacy have higher scores suggesting impaired balance and a fear of falling as a result of these physical or environmental constraints. These finding imply that those who had a fear of fall may have balance deficits. Thus, suggesting an existence of association with fall efficacy (fear of falling) and balance abilities while performing everyday activities.

TUG when used to assess functional mobility of the subject focused on to evaluate how well people could keep their balance throughout the time required for locomotion and mobility transfers. It also had a correlation with self-confidence (falls efficacy scale), indicating that there was a correlation between fear of falling and functional mobility in the stroke. Fear of falls and activity limitations, as well as self-reported decrease in mobility and physical function in persons with low fall-related self-efficacy, have all shown similar results. [15]

People who had previously fallen at-least once exhibited fear of fall. The percentage of people who were afraid of falling (N=28, 76%) were higher than the percentage of those who previously had history of fall (N=9, 24%). This implies that even though patients did not have a history of previous fall, there existed a fear of fall in them.

It is however not clear if poor balance affects the falls efficacy or whether a reduction in fall efficacy causes a decline in balance ability.

Conclusion

The study concluded that there was a significant correlation between the fall efficacy, balance performance and the functional mobility in the stroke patients. This relationship has an important implication for the development of the rehabilitation programs that aims to improve the balance confidence and diminish its impact on function in patients with stroke.

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