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Original Article

Prevalence of Balance Impairment and Risk of Fall in Post-Stroke Patients; A Cross-Sectional Study

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ABSTRACT

Background: Stroke is considered the leading cause of long-term disability worldwide, which affects millions of people annually. Balance dysfunction and increased risk of falls has been recognized as the most common impairment following a stroke. **Objective:** This study aimed to evaluate the prevalence of balance impairment and risk of falls in post-stroke patients. **Methods:** This study is a cross-sectional study using a purposive sampling technique. Both male and female patients were recruited in this study. Patients who suffered their first stroke and ages ranging from 50 to 70 plus age were included in this study. Patients with at least one-year post-stroke and who reported walking with an assistive device up to 8 meters were prioritized to be recruited in this study. Patients who had a history of surgery, recent surgical treatment, patients having any recent trauma or any sort of systemic disease were not recruited in this study. The tools employed in this study were the Berg balance scale and the fall risk assessment tool. The results of this study were analyzed using Statistical Package for Social Sciences version 23. Frequency charts and percentages were plotted to represent the prevalence of balance impairment and risk of falls in post-stroke patients. **Results:** The results of this study show us that 40% of the patients recruited in the study suffered from moderate dependency after their first stroke while 60-80% of patients were observed with severe dependency and need of assistance to perform activities after their first stroke. P- value 0.0001 showed that there is a significant association between balance impairment and post-stroke spell. 40- 60% of post-stroke patients reported scoring more than 13 points on the fall risk assessment tool, which represents a high risk of falls. **Conclusion:** The study concludes that post-stroke patients with an increased age are at a higher risk of falling and a significant association exists between the balance impairment and post-stroke patients. A higher percentage of post-stroke patients, 40-60% post-stroke patients scored more than 13 scores on the Fall Risk Assessment tool, which concludes that post-stroke patients are at higher risk of falling.

INTRODUCTION

Stroke has been recognized as one of the leading causes of long-term disability globally. Post-stroke patients have always been observed to have balance impairments. These are at a high risk of falls, which ultimately might lead to serious injuries and disabilities and might even get fatal. Consequently, comprehending the prevalence rate of balance impairments and the risk of falls in post-stroke patients is very substantial for finding efficient and effective rehabilitation regimes and also aiding in reducing the risk of falls.[1-3] Various studies have testified fluctuating approximations of the rates of prevalence of balance impairments in post-stroke patients, ranging from 20% to 95%.[4-6] The rate of prevalence rate of falls in post-stroke patients is as high as 73% within the six-month duration after the spell of stroke.[7] Sensory deficits, motor deficits, cognitive impairments, increasing age and fear of falls, all have been recognized as the major contributing factors to balance impairments and a higher risk of falls in post-stroke patients.[8] Various multidisciplinary rehabilitation regimes have been structured which have strength training, balance training, cognitive training and fall prevention strategies incorporated in them. They are efficient and effective in improving balance and diminishing the risk of falls in post-stroke patients. Although the ideal approach of rehabilitation for post-stroke patients with balance impairments and higher risk of falls is still not well dignified and well defined, future researchers are recommended to develop and evaluate accurate and specific interventions to deal with these issues.[9]

This current study will give future researchers the prevalence rate of balance impairments and risk of fall in post-stroke patients of Lahore, Pakistan which will aid Pakistani physiotherapists and health professionals in developing more efficient rehabilitation programs for Pakistani post-stroke patients, which might be based on their needs specifically. This current study might also aid health professionals in developing preventive measures to prevent risk of falls among post-stroke patients in Pakistan considering their needs and issues. So, this current cross-sectional research aims to investigate the prevalence rate of balance impairments and risk of falls in post-stroke patients. The findings of this research might provide substantial insights into these issues in post-stroke patients and might also help in formulating efficient and effective rehabilitation strategies to diminish the risk of falls and improve functional outcomes.[10] Balance impairments and an increased risk of falls after the first spell of stroke not only cause physical impairments but it is also accompanied by psychological consequences, which include, diminished quality of life and fear of fall. Patients with a fear of falling after suffering from the first spell of stroke usually have limited physical activity which ultimately leads to a decline in physical functioning and social isolation.[11,12] Hence, recognizing and then addressing these issues is substantial in improving the overall physical and psychological well- being of a post-stroke patient.[13]

The underlying pathophysiology of these issues in post-stroke patients is multifactorial and rather complex. Stroke has been known to cause damage to sensory and motor systems accompanied by damaging the vestibular system which then disrupts the balance control. The location and severity of lesions of strokes have been to influence balance impairments. Patients having lesions in the cerebellum and basal ganglia are at a higher risk of balance deficiencies.[14] While assessing the risk of falls and balance impairments in post-stroke patients a comprehensive evaluation of sensory, motor and cognitive function is done. Assessment of fear of falls

and environmental factors is also incorporated in the evaluation procedure.[15,16] Numerous assessing tools have been validated and developed for evaluating these issues which include, the Time Up and Go test, Berg balance scale and activities balance confidence scale.[17,18] Our current study aims to fill the research gap in knowledge considering the prevalence of balance impairment and risk of falls in post-stroke patients in the Pakistani population.

Less literature is available when talking about the Pakistani population as it is a developing country and is in dire need of more authentic literature so that more work could be done on preventing these issues in post-stroke patients and developing more rehabilitation strategies that are cost-effective and more efficient. This study used a population of Pakistani post-stroke patients to explore the factors associated with increased risk of falls and balance impairments. The leading cause of long-term disability and the 5th leading cause of death is stroke in the United States. The occurrence of stroke has been observed to increase with age and with aging the encumbrance of stroke is predicted to increase.[19] Cross-sectional studies have been known to be efficient and cost-effective methods for determining the prevalence of a specific condition or evaluating a specific risk factor in a population and recognizing probable associations with other factors.[20] This current study was conducted at various clinical setups in Lahore and some home-based patients were also recruited in this study. The post-stroke patients underwent a comprehensive evaluation of their, sensory, motor, cognition, assessment of their fear of falling and other environmental factors. Our research aims to fill the research gaps in the existing literature on the prevalence rate of balance impairment and risk of falls considering the Pakistani post-stroke population. Precisely our current study might

also provide insights into the prevalence, risk factors and influence of balance impairments and falls on the quality of life of post-stroke patients.

METHODS

This study is an observational cross-sectional study. This study was completed within six months after the approval of the synopsis. This study was approved by the ethical board committee of Hajvery University, Lahore, Pakistan. The sample size of this study was taken to be 90 which was calculated using Rao software.15 Confidence level was taken at 0.95 and the desired precision of estimate was taken at 0.05. The sample size n and margin of error were represented by: $X = Z(c/100)2r(100-r)$, $N = N \, x/((N-1)E2 + x)$, $E = Sqrt[(N - n)x/n(N-1)]$. Here N is considered as the population size, r is the fraction of responses that we were interested in and Z $(c/100)$ is the critical value for the confidence level c. Data for this study was collected from post-stroke patients from Lahore, Pakistan, either private patients who were under home visit physiotherapy treatments or who were under hospital care.

To recruit patients purposive sampling technique was employed. Both male and female patients were recruited in this study. Patients who suffered their first stroke and ages ranging from 50 to 70 plus age were included in this study.[1, 8] Patients with at least one year post-stroke and who reported walking with an assistive device up to 8 meters were prioritized to be recruited in this study.[9] Patients who had a history of surgery, recent surgical treatment, patients having any recent trauma or any sort of systemic disease were not recruited in this study.[1] Collected data was analyzed using a statistical package for social sciences version 23. The descriptive statistics were represented by percentages and frequency charts. Pie charts and bar graphs were also plotted. Consent forms both in

English and Urdu were explained, the signed by every patient recruited in this study. The tools employed were the Berg balance scale and the fall risk assessment tool. The tools were selected based on the objectives of our study which were filled by the physiotherapist and the researcher himself and herself.

RESULTS

About 18 post-stroke patients out of 90 patients showed severe dependency, 54 post-stroke patients showed moderate dependency while 18 post-stroke patients showed mild dependency while they were asked to sit from a standing position. The chi-square test was used to find the relationship between the spell of post-stroke and balance impairment issues. The cluster diagram in Figure I shows that 40-60% of post-stroke patients need assistance to perform function and any kind of work, they score >13 score which means they are at a high risk of falls.

Table I: Descriptive Statistics for Age

Age range	Frequency	Percentage
50-55 years	36	40%
55-60 years	18	20%
60-65 years	18	20%
65-70 years	18	20%
Total	**90**	**100%**

DISCUSSION

This current study determined the prevalence of balance impairment and risk of falls in post-stroke patients of Lahore, Pakistan. Assessing balance impairments in post-stroke patients and evaluating the risk of falls in them must be recognized as substantial, as

objective of the study was explained and were they are significant predictors of long-term mobility, physical function and apparent recovery.[21] A study conducted by F. Khan and co-workers determined the prevalence of balance impairment and other factors associated with balance among patients with stroke.[21] Both studies recognize the importance of determining the prevalence of factors associated with post-stroke patients. The results of our study are predicted to be of help to other researchers and healthcare professionals in evaluating, customizing and planning efficient and effective treatment interventions for post-stoke patients. The data that is already present are mostly from European countries,[22] India[23] and Africa,[24] the data from the Pakistani population was scarce,

Table II: Standing to Sitting

Dependency	Frequency	Percentage
Uses the back of legs against the chair to control descent	18	20%
Controls descent by using hand	54	60%
Sit safely with minimal use of hand	18	20%
Total	**90**	**100%**

thus making our study necessary. The prevalence of balance impairment in our study was calculated to be 60%, which is a clear indication that this impairment was present in more than half of the post-stroke patients. The data which was reported earlier by studies on the prevalence was in contrast to the findings of our study. The results from a study conducted in the United Kingdom showed a higher rate of prevalence of balance impairment which was 83%.[22] If our study had

Table III: Correlation Between Post-Stroke Patients and Balance Impairment

|	Value	p-value	Asymptotic Significance (2-sided)
Pearson Chi-Square	81.000	0.0001	.000
Likelihood Ratio	94.943	0.0001	.000
Linear-by-Linear Association	57.214	0.0001	.000
Number of Valid Cases	90	-	-

showed a higher rate of prevalence. The study conducted in Nigeria[24] and Sri Lanka[23] showed prevalence to be 36.8% and 16.7% respectively, which are rather lower rates of prevalence of balance impairments among post-stroke patients. Their results were very much associated with the age of the patients included, claiming that the elderly population has a higher rate of prevalence of balance impairments. Our study and Khan's study both recommend that it would be advantageous to include a balance assessment tool in the daily routine protocol or physical therapy for planning and implementing a physical therapy intervention.[25] Our current study has shown that stroke-related factors have a more significant association with balance impairments than the socio-demographic influencing stroke. Although, a varying relationship exists between balance impairment and other stroke-related factors has been distinguished in previously conducted studies[26,27], while in contrast to this, factors related to stroke such as severity and the side of the stroke[27] have been observed to be significantly associated with balance impairments.

In our study, the variables that have shown to be in significant relationship with balance impairment are the use of walking aid, speed, knee extension and flexion, their strengths, strength of ankle dorsiflexion, depression, disability and activities of daily living. These factors are known to be modifiable factors, although, in previously conducted studies, these factors that significantly influenced balance were often non-modifiable factors, such as gender, age and duration periods after the spell of stroke.[24]

Depression has been also observed to be associated with stroke and this association has been established in the previous literature, with almost 20% of post-stroke patients suffering from depression.[28] These findings when implemented with the findings of our study imply that depression increases the risk of falls and balance impairments in post-stroke patients. Thus, the assessment of balance and depression in post-stroke patients is essential, accompanied by disability level and activities of daily living.[29] These assessments must be made a part of daily routine administrated by health care professionals for providing the proper care and treatment. The integration and implementation of a multidisciplinary team for treating and rehabilitating post-stroke patients is thus accentuated by these findings.[30] Even though there is a substantial influence of balance impairment and risk of falls on post-stroke patients, these issues are mostly not identified and recognized in clinical practice. A systematic review conducted on determining interventions for preventing falls in survivors of stroke showed us that the bulk of the studies focused only on preventing the risk of falls in the older population rather than focusing specifically on post-stroke patients.[31]

Figure I: Cluster Diagram of Berg Balance Scale and Fall Risk Assessment Tool
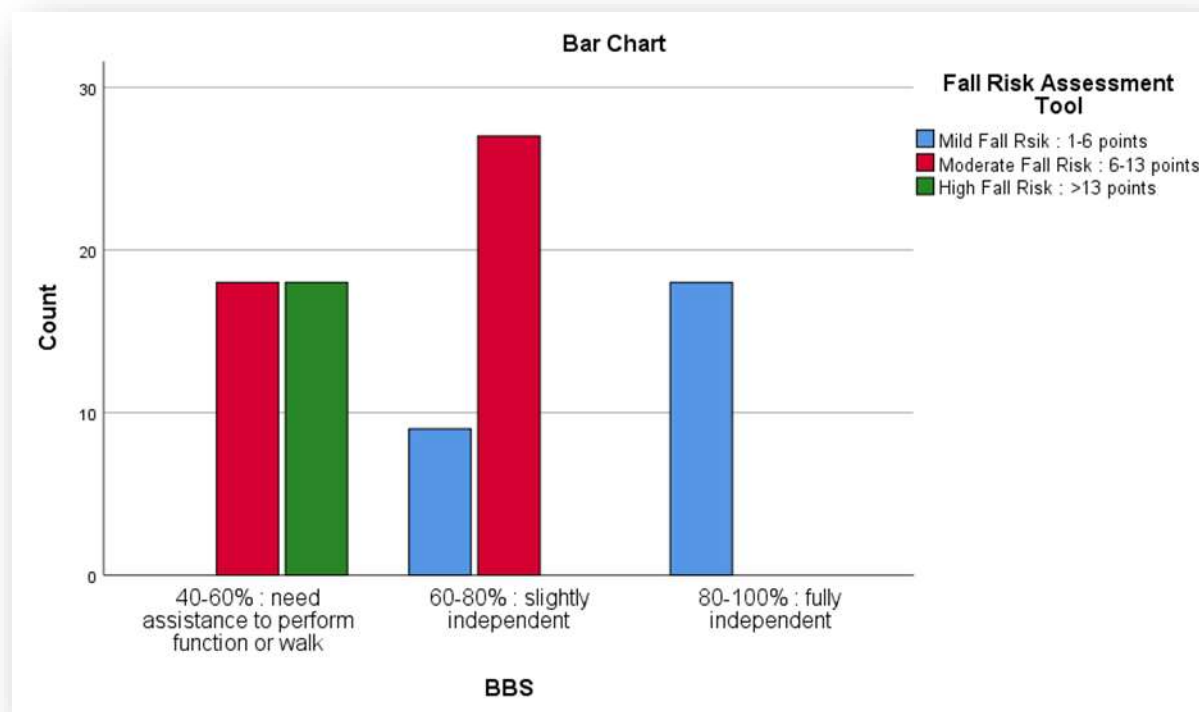
Both studies highlighted the need for further work to be done on determining the prevalence and associated risk factors and customizing more effective interventions to improve balance impairments and reduce the risk of falls in this population. Our study has drawbacks. A rather less representative sample size was used so the results cannot be generalized. The data for this study was only collected from Lahore, future researchers are recommended to collect data from other cities of Pakistan, making the results more generalized on all the post-stroke patients of Pakistan.

CONCLUSION

The study concludes that post-stroke patients with an increased age are at a higher risk of falling and a significant association exists between the balance impairment and post-stroke patients. A higher percentage of post-stroke patients, 40-60% post-stroke patients scored more than 13 scores on the Fall Risk

Assessment tool, which concludes that post-stroke patients are at higher risk of falling.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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