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An Assessment of Functional Status of Stroke Patients Using the Functional Independence Measure on the Hospitalization, Discharge, and Three Months Post-Stroke: Analytical Cross-Sectional Study

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ABSTRACT

Stroke is one of the leading causes of impairment in the world, with effects on the motor functions, cognitive and mental processes, and the general quality of life of the patients. **Objectives:** To determine the full functional condition of stroke patients through the change in the Functional Independence Measure (FIM) scores at the time of admission, discharge, and three months post-stroke. **Methods:** This was an analytical cross-sectional study conducted on 108 patients with ischemic stroke in the age group of 18-75 years, at the Department of Neurology, Services Hospital, Lahore. Functional independence was assessed with the FIM scale thrice, on admission, at discharge from the hospital, and three months post-stroke. Repeated ANOVA and paired t-tests were used to compare the changes in FIM scores over time. **Results:** The average age of the participants was 58.4 years with a standard deviation of 10.2, and men made up 61.1% of the sample. The mean FIM scores did increase significantly between 86.33 +/-14.5 at the time of admission and 102.7 ± 16.5 at discharge, and 118.9 ± 15.8 at three months after stroke ($p<0.001$). The younger patients (18-50 years) had more functional improvement than the older patients (>=50 years) ($p=0.002$). A high negative correlation was found between age and functional recovery ($r = -0.42$, $p=0.004$). **Conclusions:** Patients with ischemic stroke recover much of their functional abilities with time, with age at younger years, fewer days in the hospital, and higher baseline FIM scores serving as independent predictors of improved outcomes.

INTRODUCTION

Recent data on stroke and stroke mortality present the picture of a high burden of the disease in the whole world, even though stroke is one of the conditions that can be prevented [1]. In addition, post-stroke disability also contributes to such indicators as Disability Adjusted Life Years (DALYs) [2]. The impairments that may be experienced by a stroke patient include those affecting cognitive functioning, both gross and fine motor skills, the sensory system, activities of daily living (ADLs), and consciousness [3]. These post-stroke outcomes are not temporary because they may persist even more than a year in patients, affecting their quality of life, and this is why a patient-centered program of rehabilitation should be introduced to enhance these post-stroke sequelae [4]. Besides healthcare management of stroke, the patient-centered rehabilitation should involve an extensive examination of the impairments or deficits due to a stroke in a multidisciplinary approach strategy that integrates psychological support, physical therapy, and occupational therapy [5]. This rehab program can also be changed or modified according to various phases of the stroke, in order to enhance the overall quality of life and recovery of self-

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sustenance in day-to-day activities. Rehabilitation efficacy is also multi-factorial and highly relies on the time of intervention, intensity of the intervention, and some patient-specific factors, including underlying health conditions, motivation, and social support [6]. The need to quantify the consequences of stroke and rehabilitation over time is enhanced by a standard measurement known as the Functional Independence Measurement, which assesses a comprehensive functional recovery among the affected patients. The Functional Independence Measure (FIM) is a measure of dependence, which gathers information about functional recovery and subsequently compares the findings of therapy, which aids in monitoring the progress of patients and their treatment plan [7]. The FIM documents recovery or degradation through the scrutiny of activities of daily living (ADLs) such as eating, cleaning, washing, dressing, using the toilet, swallowing, control of the sphincter, moving, transferring, and moving [8]. The FIM questionnaire is employed to survey regularly on subjects regularly at the time when they are admitted, when they are discharged, and on regular follow-ups. The questionnaire is simple to complete, and it takes approximately 30 minutes. The research can play a significant role in terms of the recovery of stroke patients and possibly offer shorter stays and less dependency with stroke patients in several ways. The study will be able to determine the trends and patterns in functional recovery by evaluating the overall and all-encompassing functional status of stroke patients at different stages in the rehabilitation process using the FIM scale. It is then possible to use this information to design rehabilitation programs that are more customized.

This study aimed to determine the mean FIM score at the time of admission, discharge, and 3 months follow-up in patients with ischemic stroke presenting in the Department of Neurology in Services Hospital, Lahore.

METHODS

This analytical cross-sectional study was carried out at the Department of Neurology, Services Hospital, Lahore, in the span of 4 months from January 2025 to April 2025. Ethical approval was obtained from the College of Physicians and Surgeons (Ref # CPSP/REU/NEU-2021-068-695) as well as from IRB Services Hospital (Ref # IRB/2025/1518/SIMS). All eligible patients were asked for their written consent during the initial appointment after being informed about the study's methodology. A non-probability consecutive sampling technique was used to recruit patients based on predefined criteria of inclusion and exclusion. The study was done on 108 ischemic stroke patients of both genders, aged 18 to 75 years, who had experienced their very first stroke event leading to functional loss or impairment. Only patients with medical and hemodynamic stability and a stroke duration of at least one day were enrolled. Patients who had a history of recurrent stroke events, transient ischemic attack, or hemorrhagic stroke were excluded from the investigation. Candidates having orthopedic surgeries, cancers, or chronic neurological diseases like dementia were also not featured in the study. Individuals who had other conditions that made them disabled or unable to function, and those who didn't agree to take part, were also eliminated. The same doctor did all the examinations and visits. After enrolling in the study, participants' medical information was recorded, including gender, age, stroke type (ischemic or hemorrhagic), length of hospital stays, and FIM scores. The FIM scale, the most widely used instrument in rehabilitation medicine, has eighteen categories divided into two primary domains: motor function (13 items) and cognitive function (5 items). Tasks in the motor function area include self-care (e.g., eating, grooming, bathing), mobility (e.g., transferring, walking), and sphincter control. The cognitive function domain evaluates both communication (e.g., understanding, expression) and social cognition (e.g., problem-solving, memory). Each item on the FIM scale will be rated on a 1–7 scale, with 1 representing total dependency and 7 indicating complete independence [9]. The FIM scale has shown significantly strong evidence of validity and reliability (Cronbach's alpha of 0.94), be it inter-observer or intra-observer, in multiple studies [10-12]. Using the FIM questionnaire, the functional status of the subjects was evaluated during admission, upon discharge, and at three months following the occurrence of stroke. An expert in physical medicine and rehabilitation conducted the examinations. An assigned physician monitored the patient during task completion during the admission and discharge visits to gauge their level of independence. Patients were questioned about their condition at a three-month follow-up appointment, and data were gathered based on their verbal responses. The services of a rehabilitation expert were provided to patients admitted to the neurology department. During their stay, all patients received physical therapy. In the time after discharge, they also got a home plan and follow-up in the physiotherapy department, depending on their disability. SPSS software (version 18, SPSS Inc., Chicago, IL, USA) was employed for the purpose of data analysis. Descriptive statistics were employed to characterize the research population's demographic as well as the Functional Independence Measure (FIM) scores at several time points (hospitalization, discharge, and three months post-stroke). Continuous variables that include age and FIM scores were reported as means with standard deviations (SD). Categorical factors like gender were characterized in terms of frequencies and percentages. The Shapiro-Wilk test and Kolmogorov–Smirnov test were employed to

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assess the normality of data after descriptive analysis. A Repeated Measures ANOVA was used to evaluate changes in FIM scores across three repeated time points (admission, discharge, and three months after the stroke) within the same patients. This test is used for comparing means when measurements are taken repeatedly on the same subjects and takes into account within-subject correlations. Paired sample t-tests were applied to make pairwise comparisons (admission versus discharge, discharge versus three months, and admission versus three months) to identify specific intervals that can be used as indicators of a significant functional improvement. In order to examine the relationship between continuous data, we applied the Pearson correlation test, which measures the strength and direction of a linear relationship. They were also able to establish correlations between age and FIM improvement, length of hospital stay, and FIM improvement as they were interested in analyzing the importance of these variables concerning recovery. The level of significance of p was taken to be p<0.05.

RESULTS

A total of 108 patients were included in the investigation, and the mean age of the study patients was 58.4 ± 10.2. The total of the male participants was 61.1%. Conversely, 38.9% of the participants were female (Table 1).

Table 1: Demographic and Clinical Characteristics of Study Participants

Characteristics	Mean ± SD / n (%)
Sample Size	108
Mean Age (Years)	58.4 ± 10.2
Male	66 (61.1%)
Female	42 (38.9%)
Mean Length of Hospital Stay (days)	7.6 ± 3.2

After running the descriptive statistics, both normality tests (K–S and S–W) were found significant with p>0.05.

The mean Functional Independence Measure (FIM) scores recorded at admission, discharge, and three months post-stroke were 86.3 ± 14.5, 102.7 ± 16.2, and 118.9 ± 15.8, respectively. A repeated measures ANOVA test was conducted to analyze the differences in FIM scores across the three time points, showing a statistically significant improvement over time (p<0.001) (Table 2).

Table 2: Functional Independence Measure (FIM) Scores at Different Time Points

Time Point	FIM Score (Mean ± SD)	p-value (Repeated Measures ANOVA)
At Admission	86.3 ± 14.5	<0.001*
At Discharge	102.7 ± 16.2	
3 Months Post-Stroke	118.9 ± 15.8	

*A Repeated Measures ANOVA test was employed to see the statistical comparison between the three-time intervals.

Paired t-tests showed that there is a significant difference in the FIM scores, admission and discharge (p<0.001), and discharge to the three-month follow-up (p<0.001). The paired sample t-test was used to test the differences between FIM scores across various time points (Admission vs. Discharge, Discharge vs. 3 Months Post-Stroke, and Admission vs. 3 Months Post-Stroke). The test was used to identify whether the differences in the functional status between the two-time intervals were statistically significant (Table 3).

Table 3: Results of Paired Sample t-Test for Functional Independence Measure (FIM) Scores

Comparisons	Mean ± SD	p-value
Admission vs. Discharge	16.4 ± 8.5	<0.001**
Discharge vs. 3 Months Post-Stroke	16.2 ± 7.9	<0.001**
Admission vs. 3 Months Post-Stroke	32.6 ± 10.2	<0.001**

**Paired t-test was employed to see the statistical differences between two different time intervals.

Age-specific stratified analysis revealed that younger patients (1850 years) had a greater improvement in functional independence than older patients (50 years and above) (p=0.002) (Table 4).

Table 4: Comparison of Functional Independence Measure (FIM) Improvement Across Age Groups

Age Group (Years)	n	Mean FIM Score at Admission (Mean ± SD)	Mean FIM Scoreat Discharge (Mean ± SD)	Mean FIM Score at 3 Months (Mean ± SD)	Mean FIM Improvement (Mean ± SD)	p-value
18–50	52	88.5 ± 13.8	106.4 ± 12.7	124.2 ± 14.5	35.7 ± 12.4	0.002***
≥50	56	84.1 ± 15.2	98.8 ± 14.1	113.6 ± 16.2	29.5 ± 11.8	0.002***

***Repeated measures of the ANOVA test were used for both age groups separately.

The Pearson correlation test showed that the two variables are strongly correlated in an inverse relationship (r = -0.42, p=0.004), which means that older patients exhibited a lower rate of recovery. Also, the improvement of the FIM score had a negative correlation with the length of hospital stay (r = -0.36, p=0.003) (Table 5).

Table 5: Correlation Between Age, Length of Hospital Stay, and Functional Recovery

Variables	Pearson Correlation (r)	p-value
Age vs. FIM Improvement	-0.42	0.004****
Hospital Stay vs. FIM Improvement	-0.36	0.003****

****(Pearson's correlation co-efficient, r, statistical analysis).

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DISCUSSION

The purpose of this study was to assess how effectively stroke patients recover their functional status with reference to the increase in the Functional Independence Measure (FIM) scores comparing at hospital admission and discharge. The present research, in particular, has considered the impacts of hospitalized physical therapy, age, and other variables related to patients on functional recovery. It was concerned with discovering the variables that were capable of enhancing the recovery from the stroke. The post-stroke functioning may be classified into motor and cognitive function domains, and these domains can be considered as primary predictors of recovery using FIM as a broad concept [13]. In order to measure the extent of improvement achieved with rehabilitation sessions, the study noted the functional recovery of ischemic stroke patients at three important points, i.e., hospitalization, discharge, and three months post the incidence of stroke. Our research found significant overall functional recovery in time, with the mean of FIM scores at admission being 86.3 and 102.7, with significant further improvement of 118.9 at discharge and three months respectively ($p<0.001$). It is relevant to note a past study that was conducted on 1700 patients, and it was revealed that the functional recovery of patients undergoing intensive rehabilitation, as long as sessions are regular, is good [14]. Patients with mild strokes had an FIM score of 102 ± 2 after 35 days in the rehabilitation unit. Patients admitted within 2 weeks of a major stroke had a plateau FIM score of 72 ± 6 after 43 ± 3 days on the rehabilitation unit, compared to the 2–4-week group (FIM = 57 ± 5 after 53 ± 4 days) and the 4–6-week group (FIM = 54 ± 10 after 40 ± 6 days) [15]. Evidence on factors influencing the disability caused by stroke events has shown that age plays a pivotal part in recovery, as they were actively involved in more frequent rehabilitative sessions and were more motivated [16]. However, as much as early start of rehabilitation is found to be significantly effective for recovery, high-intensity rehab sessions are established to be counter-productive among stroke patients [17]. The age-specific stratified analysis conducted in our study revealed that younger patients (18–50 years) exhibited significantly greater functional improvement than their older counterparts (≥50 years) ($p=0.002$). The inverse relationship between age and functional recovery ($r = -0.42$, $p=0.004$) is one of our study's main outcomes. A cohort study conducted on stroke patients employed linear regression to conclude that younger patients exhibited greater and quicker functional gains as compared to the older patients when exposed to post-stroke rehabilitation [18]. In contrast to this reporting, a study concluded that baseline independence among stroke patients has a superior edge in predicting the functional prognosis over age [19]. Additionally, our study found a negative correlation ($r = -0.36$, $p=0.003$) between the length of hospital stay and functional improvement, indicating that longer hospital stays may be linked to worse recovery outcomes. According to a series of studies conducted by Ohta *et al.* early discharge coupled with outpatient rehabilitation produces better long-term motor recovery than extended hospital stays [20]. Stroke recovery is continuous but a complicated process determined by several intrinsic and extrinsic factors, but the extent of motor and cognitive impairments after stroke is the main determinant of intervention, rehabilitation, and recovery [21]. Therefore, the necessity of age-appropriate and patient-specific rehabilitation plans that include rigorous treatment and extended follow-ups in order to optimize the functional improvements is emphasized. Multiple features contribute to the reliability and clinical significance of our current study. These include a follow-up over a period of three months, measurement of functional recovery by FIM for standardized and validated assessment. The most significant strength of the analysis is the stratified analysis by age that provides valuable information on the heterogeneity of the rehabilitation process after stroke. Moreover, anticipatory variables of the hospitalization time might help to customize the rehabilitation plan. Despite the informative findings, our study has certain limitations. This study could have an impact on the generalizability of the findings due to the low sample size and analytical cross-sectional design, which was conducted in a single facility. Further, the long-term (after three months) follow-up was not incorporated, and this limits the chances of evaluating the long-term functional gains. The purpose of this study was to assess how effectively stroke patients recover their functional status with reference to the increase in the Functional Independence Measure (FIM) scores comparing at hospital admission and discharge. The present research, in particular, has considered the impacts of hospitalized physical therapy, age, and other variables related to patients on functional recovery. It was concerned with discovering the variables that were capable of enhancing the recovery from the stroke. 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CONCLUSIONS

This study concludes that there was a high level of functional recovery among stroke patients who reported to the Department of Neurology, Services Hospital, based on the Functional Independence Measure during hospitalization, discharge, and the three months after stroke, and whereby the younger age, shorter length of stay, and high baseline FIM scores are independent variables of good outcome.

Authors Contribution

Conceptualization: SN
Methodology: SN, QB, MAA
Formal analysis: SN
Writing review and editing: QB, MAA

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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