

Correlation Between Mobility and Functional Independence in Stroke Patients - An Observational Study

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Abstract: Background: Stroke (cerebrovascular accident [CVA]) is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. Functional Independence Measure (FIM) and Hospital Mobility Scale (HMS) are the tools used to measure independence and mobility in a hospital setting. The aim of this study was to investigate the number of impairments in the mobility and functional independence among subjects of acute-stroke and to evaluate the correlation between functional independence and Hospital Mobility Scale. Methodology: An observational study comprising of 50 participants with acute stroke and admitted in inpatient department of hospital were selected randomly. Informed consent was taken from the participants and then 2 scales are taken based on functional abilities of participants. Result: Pearson's correlation coefficient (r) was calculated in 50 samples with the functional independence measures and hospital mobility scale, where r was -0.729 , which shows high correlation between these two variables, with degree of freedom (49) and level of significance < 0.05 . Conclusion: The study concluded that there is high correlation between mobility and independence in acute stroke participants a suggests that mobility in acute stroke patients can improve functional independence.

Keywords: Stroke, Functional independence measure, Hospital mobility scale, Quality of life.

1. Introduction

Cerebrovascular accident (CVA) is the third most common cause of death worldwide, and one of the most common causes of disability in elderly population. Stroke (cerebrovascular accident [CVA]) is the sudden loss of neurological function caused by an interruption of the blood flow to the brain. Stroke results in a high rate of mortality and a high level of functional disability. Statistics show that high levels of functional disability resulting from stroke, which range from mild (35.8%) to medium (33.3%) and severe (30.9%).^[1-4]

Depending on the involved artery, the size and location of supplied cerebral area and the extent of resulted brain damage, patients might experience various complications. Postural disorders, sensory and motor deficits, hemiplegia or hemiparesis, cognition and comprehension difficulties, memory impairment, decreased selfcare and ADL abilities, emotional and mood disorders, sexual dysfunction, and decreased social participation are some typical consequences of stroke. These complications directly affect subject's role fulfilment, and finally lead to decreased patient's quality of life.^[5-7]

Assessment of mobility in hospitalized patients is essential for the establishment of physiotherapeutic treatment and for the monitoring of the patients' progress, especially among stroke patients, who can present some limitations on mobility during the acute phase. Mobility restriction during the acute

phase of a stroke can cause complications such as respiratory infections, deep venous thrombosis, and pressure ulcers. These complications increase mortality, length of hospitalization, and treatment cost, besides affecting the functional outcome after hospital discharge.^[8-11]

The Hospital Mobility Scale (HMS) is a scale developed to assess the mobility of stroke patients within the hospital environment. This is an instrument that is quick and easy to apply, that assesses mobility based on three core tasks (sitting, standing and gait), that does not require specific training, equipment or a standardized environment. This means that it could easily be included in clinical practice for the daily evaluation of the mobility level, enabling the physiotherapist to aim treatment at the higher levels of mobility. In addition, HMS includes the possibility of having the assistance of one or two other people during the phases of evaluation of sitting, standing and gait, which is frequently the reality of stroke patients.^[12]

Functional activities are the measure of motor skills because they relate to activities of daily living (ADLs). Evaluation of Activities of Daily Living (ADL) provides a useful estimate of functional independence in CVA patients. The FIM instrument is a widely used functional performance measure developed specifically for the inpatient acute rehabilitation population. It has been recommended by the Agency for Health Care Policy and Research Post-Stroke Rehabilitation panel as a measure of activities of daily living after stroke. The instrument's primary functions include the collection and

comparison of rehabilitation outcome data, the quantitative assessment of patient advancement, and the establishment of strategic treatment plans. ADL, which are the purpose of this test include: self-care, eating, grooming, bathing, dressing, toileting, swallowing, sphincter control, mobility, transfer, and locomotion. [13-16]

The central question addressed by this study is whether a relationship exists between a patient's mobility and their functional independence following an acute stroke. Our two statistical claims are: the Null Hypothesis states that there is no statistically significant correlation between mobility and functional independence in acute stroke patients, suggesting these two variables are unrelated during this phase; conversely, the Alternative Hypothesis posits that there is a statistically significant correlation between mobility and functional independence, indicating that as a patient's ability to move improves or declines, their capacity to perform Activities of Daily Living (ADLs) will likewise change.

The aim of the study was to quantify the correlation between functional independence and mobility for prognostic indicator by using functional independence measure (FIM) and hospital mobility scale (HMS).

2. Methodology

An observational study was conducted over a six-month period which recruited 50 participants with acute stroke from the medicine ward of a hospital in Gujarat, India. The sample was selected through a process of random sampling, carried out by physiotherapy interns. The study was approved by the ethics committees of the physiotherapy college and hospital. All participants provided written informed consent before data collection. Recruitment was limited to participants who met a selection criterion. Due to the nature of the study, blinding of participants was not feasible.

The inclusion criteria of study included participants with either gender, age more than 18 years who were clinically diagnosed with stroke, first-ever stroke, stable clinical conditions in both level of consciousness and vital signs and admitted in medicine ward of hospital. Participants with visual impairment, any other associated neurological disease, severe cardiovascular or musculoskeletal disease, severe epileptic patients and patients who were admitted in intensive care unit were excluded. The participants who denied for participation in the study were also excluded.

Outcome Measures:

Mobility: The Hospital Mobility scale (HMS) is a simple scale which is used to measure task for mobility. Majorly three different tasks in which have 12 sub-tasks performing different activities. In which first task "Sitting on the edge of the bed, feet off ground" includes 2 points for each question which have 4 questions. Similarly, second task name "Standing" have 4 questions which include 1 point each likewise "Gait" third task have 1 point for each 4 questions. The HMS presented an accuracy of 84.5% measured using the area under the receiver operating characteristic curve (95% CI = 78.3-90.7; $P < .001$). The validation cohort the accuracy was 87.8% (95% CI = 81.9%-93.7%; $P < .001$).^[8]

Independence: The Functional Independence Measure (FIM)

is an 18-item measurement tool that explores an individual's physical, psychological and social function. FIM scores range from 1 to 7. The grading categories range from "total assistance with helper = 1" to "complete independence with no helper=7". Irrespective of the use of any assistive device, the person is considered complete independence. Inter-Rater Reliability of FIM has been established at an acceptable psychometric performance (Intraclass co-relation coefficients ranging from 0.86 to 0.88). The concurrent validity with Barthel Index (ICC > 0.83), Gosman-Hedstrom and Svenson have shown strong construct validity between items on Barthel Index and items on the FIM the measure functional limitations. [16,17]

Procedure:

Acute stroke patients admitted in medicine ward of hospital were comprehensively informed about the study's objectives and procedures, and written informed consent was secured from all participants. Following this, patients underwent thorough assessment and examination to ascertain their eligibility based on pre-defined selection criteria. A total of 50 participants were then randomly selected for inclusion in the study by a physiotherapy intern. For data collection, physiotherapy intern rated the FIM and HMS on basis of performance of patient. Finally, all collected data underwent analysis.

Statistical Analysis

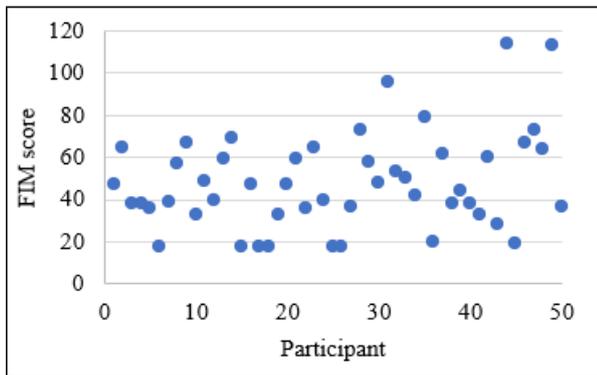
Data was analysed using Microsoft Excel. Mobility and functional independence were assessed and tabulated in Microsoft Excel. Bivariate correlation among the measures was calculated: with the degree of relation between the indicators assessed by using Karl Pearson's Correlation coefficient (r).

3. Results

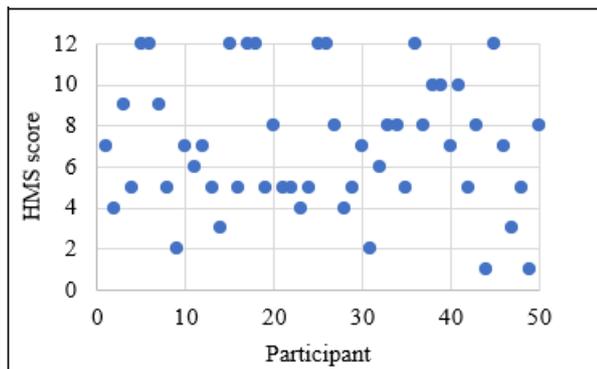
A total of 50 participants fulfilled the selection criteria were recruited for the study. Out of 50 participants, 34 were males and 14 were females. The age of patient ranged from 22 to 81 years with the average age of 56.56 ± 14.39 . Demographic and clinical data of participants is shown in Table 1. The average score of FIM for all the participants was 48.38 ± 22.64 with minimum score of 18 and maximum score of 114 out of 126 (Graph 1). The average score of HMS for all participants was 7.4 ± 3.13 with minimum score of 2 and maximum score of 12 out of 12 (Graph 2). Pearson's Correlation Coefficient (r) is calculated in 50 samples with the functional independence measures and hospital mobility scale. Coefficient (r) was -0.729 which shows there is high correlation between two variables, with degree of freedom (49) and level of significance < 0.05 . Therefore, there was negative correlation between HMS and FIM. As FIM score increases there is decrease in score of HMS and Vice versa. Graph 3 shows the correlation between mobility and functional independence.

Table 1: Demographic and clinical data of participants

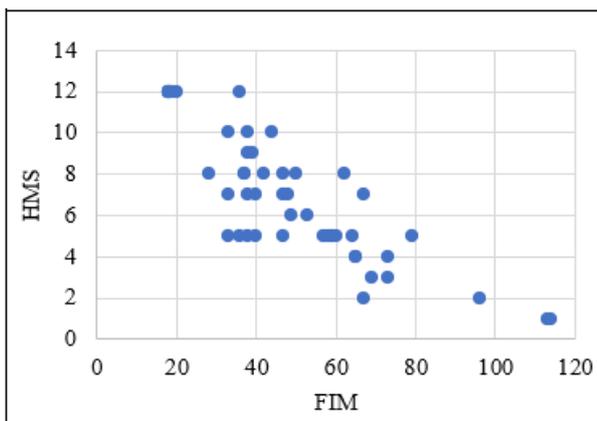
| Variables | Mean(M) | Standard Deviation (SD) | Range |
|---------------|---------|-------------------------|--------|
| Gender (M/ F) | 34/14 | | |
| Age | 56.56 | 14.39 | 22-81 |
| FIM | 48.38 | 22.64 | 18-114 |
| HMS | 7.4 | 3.13 | 1-12 |



Graph 1: Graphical representation of FIM SCORE



Graph 2: Graphical representation of HMS SCORE



Graph 3: Graphical representation of correlation between Hospital mobility Scale and Functional Independence Measure. Y Axis: Hospital Mobility Scale. X Axis: Functional Independence scale. $r = -0.729$.

4. Discussion

The central question guiding the present observational study is the ability for healthcare professionals to achieve early prediction of mobility outcomes and potential compromise in independence following a stroke. This focus is critical because immobility in the acute setting represents a major clinical concern, known to dramatically increase the risk of severe secondary complications, including deep vein thrombosis, aspiration pneumonia, and pressure injuries. By investigating the relationship between specific mobility metrics and measures of functional independence, this research aims to provide a reliable framework for risk stratification and the prompt allocation of resources necessary to mitigate these risks and optimize patient recovery.

The present study's demographic data, comprising 50 stroke patients (36 males, 14 females, age range 22–81 years), provides a crucial context for interpreting functional status in the acute care setting. The average Functional Independence Measure (FIM) score of 48.38 ± 22.64 (with a minimum of 18 out of 126) signifies that the inpatient cohort, on average, experienced moderate to severe functional dependence immediately post-stroke. Critically, this finding is reinforced by the high negative correlation ($r = -0.729$) observed between the FIM and the Hospital Mobility Scale (HMS) (mean score 7.4 ± 3.13). This statistically robust relationship powerfully suggests that better early mobility performance (higher HMS score) is a strong and reliable predictor of greater overall functional independence (higher FIM score).

Thus, the alternative hypothesis (H_1) is supported, indicating that there is a statistically significant correlation between FIM and HMS in acute stroke patients. Patients who are more mobile during hospitalization are likely to achieve higher levels of functional independence, suggesting that HMS can serve as a useful early indicator of recovery potential.

The results of this study match with findings of Simondson, Goldie, and Greenwood (2003) Concurrent validity was assessed with respect to four other well-validated measures: Motor Assessment Scale (MAS), Functional Ambulation Classification system (FAC), Functional Independence Measure (FIM), and Barthel Index (BI). The measures selected for comparison contained items similar to those in the Mobility Scale for Acute Stroke Patients (MSAS). The MSAS showed high concurrent validity ($r > 0.80$) with tools like the FIM and BI. Key mobility tasks such as sit-to-stand, walking, and transfers were closely linked to independent functioning. These findings emphasize that enhanced mobility contributes directly to greater independence in acute stroke survivors.^[18]

Similar to the findings of this study, survivors of stroke often experience a significant decrease in community mobility (CM) compared to individuals without neurological injury, highlighting the close relationship between mobility and independence.^[19]

The results of this study corroborate with the findings of Smith and Baer (1999), who investigated the mobility outcomes of an inpatient population of stroke patients grouped according to the Oxfordshire Community Stroke Project classification, where they found that functional activities such as top-half dressing, lower-half dressing, stepping transfers, and home visits have been set to coincide with 1-minute sit, 10-second stand, 10-step walk, and 10-meter walk, respectively.^[20]

5. Conclusion

The findings of the study conclude that both functional independence and mobility are significantly affected in the stroke population, with a strong correlation observed between the two. Understanding this relationship enables clinicians to develop targeted rehabilitation strategies aimed at improving mobility, enhancing ambulation, and ultimately increasing the quality of life for stroke survivors.

6. Limitations

This study has several limitations. The small, single-center sample limits generalizability. Key confounding variables such as stroke severity, cognitive status, and comorbidities were not controlled. Variability in assessment timing may affect reliability. Additionally, the study focuses only on the acute phase, with no follow-up on long-term outcomes.

7. Future Recommendations

Further research with larger, multi-center, and longitudinal designs is needed to establish causality and assess long-term outcomes. Future studies should control for confounding factors, evaluate targeted mobility interventions, and incorporate patient-reported outcomes to strengthen clinical applicability and guide comprehensive stroke care.

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