

In-Hospital Functional Outcome after Acute Ischemic Stroke

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ABSTRACT

Background: Stroke is the 2nd most common cause of death worldwide and the third most common cause of death in the developed world. Among the stroke subtypes, ischemic stroke is more common.

Aim: to determine the neurologic impairment after anterior circulation acute ischemic stroke at the time of admission and to determine the functional outcome on 7th day.

Methods: This descriptive cross sectional study was conducted in Department of Neurology, Sheikh Zayed Medical College, Rahim Yar Khan over a period of twenty months. Two hundred sixty patients of both sexes with acute ischemic stroke and fulfilling the selection criteria were included. Various known risk factors were noted. NIHSS score was measured at the time of admission and on the seventh day Barthel Index was calculated for functional recovery.

Results: Of the 260 patients enrolled in the study, 163(62.7%) were males and 97 (37.3%) were females, with age ranging from 20 years to 80 years and a mean age of 58.13±10.16 years. Neurological impairment at presentation was assessed by NIHSS. The score ranged between 3-26. The functional outcome was evaluated on the 7th day using Barthel index (BI), which ranged from 0 to 80. NIHSS score was found to be a good predictor of functional outcome in pts with ischemic stroke.

Conclusion: The NIHSS score is a good predictor of pt's recovery after stroke. Knowing the pt's neurological impairment & predicted outcome can guide physician regarding the prognosis and management plan.

Keywords: Stroke, Barthel Index, NIHSS, Recovery of function. CT scan

INTRODUCTION

Stroke is the second most common cause of death worldwide and the third most common cause of death in the developed world¹. Strokes cause over 5.5 million deaths annually and two thirds of these occur in the developing world. Among the stroke subtypes, ischemic stroke is more common, and 87% of all strokes worldwide are ischemic in origin². According to one report, the 30-day mortality for ischemic stroke was 8 to 12% for people 45 to 64 years of age³. In the Framingham Heart Study, among survivors of an ischemic stroke who were 65 years of age or older and were evaluated 6 months after the event, 50% had some evidence of hemiparesis, 30% were unable to walk without assistance, 19% had aphasia, and 26% were institutionalized⁴. According to WHO estimates in 2001, 86% of deaths related to stroke worldwide occurred in developing countries⁵, and both stroke and coronary heart disease occur about 10 years earlier, on average, than in the rest of the world⁶. Most of the data from Pakistan come from hospital-based case series⁷. The estimated annual incidence of stroke in Pakistan is 250 per 100,000 population, which is projected to an estimate of 350,000 new cases every year⁸. A recent study conducted in the urban slums of Karachi (the largest metropolitan city of Pakistan) estimated a 21.8% life-

time prevalence of stroke and/or transient ischaemic attack (TIA) in individuals aged 35 years and older⁹. Rigorous epidemiological and community-based stroke data from Pakistan are lacking⁷. The burden of stroke on the society is immense with emotional, financial and functional loss that is difficult to estimate.

The first few days after stroke are critical as patients may dramatically improve or worsen as various pathologic processes are affecting the final outcome¹⁰. In general, longer the delay in onset of recovery, poorer the prognosis. So immediate in-hospital outcome predicts the long term prognosis¹¹. Early and accurate outcome assessment is essential for evaluation, treatment planning, guidance of patients and relatives and in the search for new treatment strategies¹². With CT scan remaining the ideal modality for early diagnosis and is usually available, it is possible that risky and new therapies could be administered within few hours after onset of stroke^{13,14}.

Early prediction of stroke outcome might improve by developing a clinical scale¹⁵. Several such scales have been developed to quantify neurologic impairments following the ischemic stroke. The National Institute of Health Stroke Scale (NIHSS) is a quantitative measure of stroke-related neurologic deficit that has proven intra- and inter-rater reliability and has predictive validity for both early and long-term stroke outcome¹⁶. It is an attractive candidate predictor of post hospital disposition because it is widely accepted, is easy to learn, and can be performed rapidly on admission. The purpose of this study was to find out the usefulness of NIHSS as an

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early predictor of prognosis and functional outcome after acute ischemic stroke.

PATIENTS AND METHODS

This descriptive study was conducted at the Department of Neurology, Sheikh Zayed Hospital, Rahim Yar Khan. Patients fulfilling the inclusion and exclusion criteria were enrolled using non-probability convenience sampling. The study was performed between February 2013 to November 2014. Patients with acute ischemic stroke presenting within 24hrs after the onset of symptoms and confirmed by CT scan brain. Patients with non-ischemic stroke pathology, transient ischemic attack, posterior circulation stroke, multiple strokes, history of cranial surgery, severe head trauma and cerebrovascular malformations were excluded from the study.

260 patients admitted in neurology department through outpatients and emergency and fulfilling the selection criteria were taken. Patients were given the recommended treatment for ischemic stroke during hospital stay. National Institute of Health Stroke Scale (NIHSS) score on day 1 and Barthel Index score on day 7 was measured according to the prescribed scale. Neurological impairment of patients after acute ischemic stroke was measured by National Institute of Health Stroke Scale. It consists of 11 graded items measuring multiple aspects of the neurological examination. A score of >25 denotes very severe neurological impairment, a score between 16 and 25 severe impairment, a score between 5 and 15- moderately severe impairment and a score of less than 5 as mild impairment. Functional outcome was measured by using Barthel Index. Barthel index provides a functional assessment of ten activities of daily living which included feeding, bathing, grooming, bowels, bladder, toilet use and mobility on level and stairs. The maximum score of 100 indicates full independence, a score of 90 and above indicates patients who have near full functional independence and at most need assistance with one or two daily activities. Patients who die were given a score of zero. Confounding variables like history of diabetes, hypertension and heart disease were controlled through matching. Informed consent of patients or relatives were taken.

Data was analyzed using SPSS version 17. The variables identified were age, sex, occupation, presenting complaints, previous illness. These variables were analyzed using simple descriptive statistics. Mean and standard deviation were calculated for numeric variables like age, NIHSS score and Barthel Index score. Percentage was calculated for variables like sex and presenting complaints. Patients falling into different score ranges were also presented as percentage. NIHSS score and Barthel Index score was measured according to

the prescribed proforma. Regression analysis was performed with the NIHSS score on day one and Barthel index score on the 7th day, The significance level was set to <0.05.

RESULTS

Among the enrolled patients 163(62.7%) were males and 97(37.3%) were females (Table 1) with ages ranging from 20 years to 80 years and a mean age of 58.13±10.16 years 132 patients (50.7%) had left sided ischemic injury in the territory of anterior circulation and 128 patients (49.3%) had right-sided ischemic injury. The mean NIHSS score at presentation was 12.67±6.3, which ranged from 3 to 26 (Table 2). Patients’ functional outcome was measured using Barthel index on the 7th day, with a score of ‘0’ assigned to those patients who died and a score of ‘100’ to the patients with full recovery. In this study, Barthel index on the 7th day ranged from 0 to 80 with a mean of 49.20±19.98 (Table-3). Patients with hypertension and diabetes mellitus were also identified. Sixty nine (26.7%) patients were found to be hypertensive (Table-6) and 45 (17.3%) had diabetes mellitus. Using Pearson’s correlation between NIHSS and Barthel Index, there was a significant negative correlation between them with correlation coefficient -0.894. This showed that increase in the score of NIHSS (disability) decreased the score of Barthel index (functional outcome). Two-tailed significance was p=0.0001. In regression model NIHSS score was plotted against Barthel Index score. Using the linear regression method a straight line was obtained which accurately predicted the value of Barthel index and thus functional outcome. Results showed that 80% of the change in Barthel Index score was attributable to change in NIHSS score. The results were significant at p=0.0001 (Table 4, Fig. 1).

Age factor was also found to have a significant effect on functional outcome in patients with ischemic stroke (p=0.030). Elderly patients had poor outcome as compared with patients in the lower age group. Factors like gender of the patient, presence of hypertension, heart disease and the side of the brain affected were not found to have significant effect on the functional outcome.

Table 1: Distribution of cases by gender

Gender	n	%age
Male	163	62.7
Female	97	37.3

Table 2: Distribution of cases by NIHSS score range

N	n	%age
<5 (Mild)	28	10.7
5-15 (Moderate severe)	138	53.3
16-25 (Severe)	83	32.0
> 25 (Very severe)	11	4.0
Mean ± SD	12.6 ± 6.3	

Fig. 1: Regression model

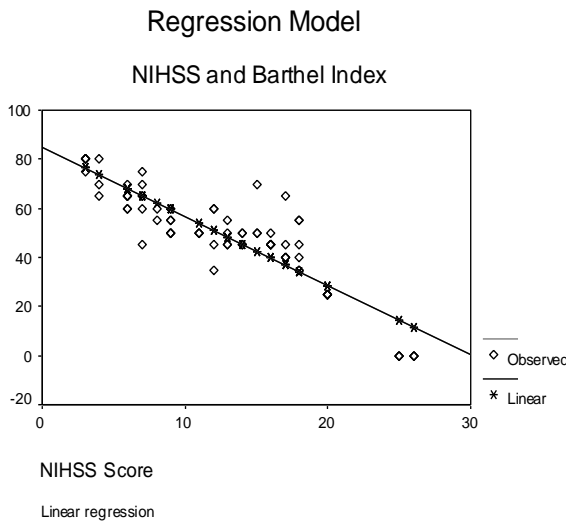


Table 3: Distribution of cases by barthel index score range

Barthel index score range	n	%age
0	21	8.0
21-30	17	6.7
31-40	52	20.0
41-50	65	25.3
51-60	31	12.0
61-70	45	17.3
71-80	29	10.7
Mean ± SD	49.20 ± 19.98	

Table 4: Regression

Variables	Coefficient R ²	P-Value	N
1-NIHSS Score (Independent)	0.80	0.0001*	260
2-Barthel Index Score (dependent)			

*Value significant at 0.05

DISCUSSION

Stroke is a common neurologic disease and is a major cause of morbidity and mortality.^{1, 17} many of the patients are left with variable degree of permanent neurological impairment. This requires long-term care of such patients to prevent further complications. There are many risk factors that have been identified which may predispose a subject to a catastrophic event like stroke¹⁸. The patients with acute event may show dramatic improvement or worsening of their functional status over a period of time.

The functional outcome is influenced by various factors^{10, 19} present at the time of onset of this catastrophic event. The need of early prediction regarding what the patient's functional outcome will be; is of increasing importance for improving the quality of life. The early assessment is also essential for evaluation, treatment planning as well as guidance of patients and relatives¹².

A large series of trials have shown that it is appropriate to consider the use of neurologic

impairment scales as primary end points²⁰. Neurologic scales can provide greater statistical power than disability or handicap scales and, like disability and handicap scales, have proven reliability and validity.

The National Institutes of Health Stroke Scale (NIHSS) has been widely favored in acute stroke trials. The National Institutes of Health Stroke Scale (NIHSS) is widely used to assess the severity of acute ischemic stroke.^{15, 16} The NIHSS is robust for use by non neurologists and nurses and also to scale patients retrospectively from chart records²¹.

Today, the NIHSS score is used routinely to assess stroke severity in most stroke centers. The National Institutes of Health Stroke Scale (NIHSS) is a clinical assessment and research tool that provides reliable information that is useful for quantifying neurological injuries and predicting outcomes after stroke when performed in a consistent manner^{22, 23}. The NIHSS is typically a component of pre-randomization and post-treatment assessment of clinical trial participants and generally takes less than 10 minutes to complete at the bedside. It provides a reliable, reproducible, and validated measure of stroke severity²⁴. Also, the NIHSS score and its components can predict cortical strokes before neuroimaging is available²⁵.

This study was designed to evaluate the clinical scale NIHSS that would help early prediction of stroke recovery, as accurate assessment of prognosis in the first hours of stroke is desirable for better patient management.

The data of the study shows that the baseline NIHSS score is a good predictor of outcome after stroke. The changes in the NIHSS score were most powerful than any other factor in predicting an outcome after stroke. Patients with high scores on NIH scale have low Barthel index scores showing poor functional recovery. Patients having low scores at NIH scale have good functional recovery, evident by their high BI scores.

In 2004 Ahmad et al showed that NIH scale was a good predictor of hospital outcome.¹⁵ Mean age of patients was 59.9 in that study while it was 58.13±10.16 in this study. NIHSS score range was between 2 to 28 with a mean of 15.28. In our study it was from 3 to 26 with a mean of 12.6±6.3. Barthel index was between 0 and 80 with a mean of 27.9 in the study of Ahmad et al. In this study it was from 0 to 80 with a mean of 49.20±19.98. Schlegel et al also showed that NIHSS was good at predicting outcome in hospital as well as 3 months later when he compared the scale with other outcome scales¹⁶.

Young et al in 2005 combined the results of acute stroke trials utilizing NIHSS as outcome measure. He showed that NIHSS improved the statistical power of the trial and it can be used as a

powerful marker in stroke trials both as outcome measure and as primary end point measure^{21,26}.

Data collection from a single academic hospital setting was a study limitation as results from more settings will give a better idea of usefulness of the scale. The other limitation was that the functional outcome was recorded on day 7 after the ischemic event, though disability of stroke patients can change over a longer period. However, results from previous studies suggest that baseline NIHSS score is highly predictive of 3 months outcome determined by any neurological impairment scale.

Clinicians and researchers recognize the shortcomings of the neurologic examination and related scales in forecasting prognosis. Other ways are needed to improve the ability to predict outcomes and to monitor responses to treatment. Compared to expensive imaging techniques available, the rating scales are a cost effective means. Potential uses for the results deduced from the study include early decision making on aggressiveness of care, discharge planning and rehabilitation, which is of particular relevance in the current health care climate where there are extreme pressures to shorten length of stay, limit the number of tests and commence discharge planning soon after the pt's admission.

As described in few past studies, age factor at the time of stroke has also been found to have an influence on predicting the functional outcome in stroke patients. Other factors like side of the brain involved, hypertension and heart disease were not important in predicting outcome.

CONCLUSION

Stroke is a common condition encountered in the medical emergency. This leaves the patients with variable degree of neurological impairment. NIHSS score is an independent, valuable and inexpensive method of detecting the extent of disability and at the same time predicting the functional outcome in stroke patient after the acute event. Early prediction of prognosis and the extent of recovery may help the physician not only counseling the family members but also in planning the management of such patients. Routine use of NIH Stroke Scale in emergency settings is valuable as it can be learned and practiced easily.

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