

Original Article

The Prognosis In Ischemic Stroke Using NIHSS

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Abstract

Introduction : Stroke is a focal neurological deficit of sudden onset which lasts for more than 24 hours and has a vascular cause. Various prognostic indices have been used to predict the prognosis of patients with acute ischemic stroke.

Aim : The study was done to predict the prognosis of patients in ischemic stroke based on the National Institute of Health Stroke Scale (NIHSS) score on admission.

Materials and Methods : It is a prospective observational study done in Neurology teaching hospital with 100 patients

Results : The mean NIHSS score in patients with better outcome was 4.6 (\pm 2.2) and the mean NIHSS score in patients with poor outcome was 14.16 (\pm 7.96). The difference was statistically significant ($p=0.000$).

Conclusion : The baseline neurological status as measured by the National Institute of Health Stroke Scale score predicts the functional status at one month after acute ischemic stroke.

Key Words: Ischemic stroke, baseline NIHSS score

Introduction

The World Health Organization defines stroke as "rapidly developing clinical symptoms and/or signs of focal, and at times global, loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin". Most of the strokes are ischemic [87%] followed by intracerebral haemorrhage [10%] and subarachnoid haemorrhage [3%]². Stroke is one of the leading cause of disability with devastating consequences. The rehabilitation of patients with stroke makes necessary the expenditure of considerable resources for a long duration. As a result, identifying factors that predict functional recovery after stroke has been the subject of much research. Various prognostic indices have been used to predict survival, length of hospital stay, functional, and neurological status. One of the factors most widely accepted and prognostically-helpful with class I level of evidence is baseline neurological status as measured by the National Institute of Health Stroke Scale (NIHSS)³.

Aim

To predict the prognosis in patients with acute ischemic stroke based on National Institute of Health Stroke Scale score on admission.

Methodology

It is a prospective observational study done in a Neurology Teaching Hospital. There were 100 patients admitted with the diagnosis of acute ischemic stroke in

different wards, who were included in the study. The baseline neurological status was assessed using the NIHSS score as soon as the patient arrived in the emergency department or got admitted by the neurology resident/consultant. The diagnosis of an acute ischemic stroke was done clinically and confirmed with CT/MRI scan of the brain. These patients were treated conservatively with medical management. The patients were followed up after one month of onset of stroke in the outpatient department. Those patients who did not come for follow up were not included. The functional independence of the patients was calculated using the Modified Rankin scale.

Stroke outcome

The most frequently used scale to assess outcome is the Modified Rankin scale (MRS)⁴. It measures functional independence and is defined as the MRS score of 3, 4, or 5⁵.

NIHSS Score

The NIHSS is considered to be valid, reliable, and reproducible⁶⁻⁸ which is most widely and commonly used. The scale (Table 1) consists of eleven clinical items adding up to a total score of 0 to 42. The baseline neurological status is classified as follows⁹:

- Normal/near normal examination (0)
- Minor stroke (1-4)
- Moderate stroke (5-14)
- Moderate-severe stroke (15-20)
- Severe stroke (>20)

Studies have established that the NIHSS scores on admission are associated with chronic functional outcome¹⁰ and with stroke severity¹¹.

1 a-Level of consciousness[LOC]-Arousal status	-alert -drowsy -obtunded[stupor] -comatose	0 1 2 3
1b-LOC-questions-month age	-answers both questions -answers only one question -does not answers any one question	0 1 2
1c-LOC-commands-opens /closes eyes open /closes the hands	-follows both commands correctly -follows only one command correctly -neither of he commands are followed	0 1 2
2-Eye movements-Horizontal eye movements	-normal -mild gaze palsy -complete gaze paralysis	0 1 2
3-Visual field-sees objects in four quadrants	-normal -partial hemianopia[upper or lower] -complete hemianopia[both upper and lower] -bilateral hemianopia[total blindness]	0 1 2 3
4-Facial-facial movements	normal minor paralysis partial paralysis complete paralysis	0 1 2 3
5 a-Motor-left arm	-normal-no drift -drift—drift downwards but not to bed before 5 seconds -drift to bed within 5 sec -movement, but not against gravity -complete paralysis-no movement at all.	0 1 2 3 4
5 b-Motor-right arm	-normal-no drift -drift—drift downwards but not to bed before 5 seconds -drift to bed within 5 sec -movement, but not against gravity -complete paralysis-no movement at all.	0 1 2 3 4
6 a-Motor-left leg	-normal-no drift -drift—drift downwards but not to bed before 5 seconds -drift to bed within 5 sec -movement, but not against gravity -complete paralysis-no movement at all.	0 1 2 3 4
6 b-Motor-right leg	-normal-no drift -drift—drift downwards but not to bed before 5 seconds -drift to bed within 5 sec -movement, but not against gravity -complete paralysis-no movement	0 1 2 3 4
7-Limb ataxia	absent present in one limb present in two or more limbs	0 1 2
8-Sensory	Normal or no sensory loss mild-moderate sensory loss severe to total sensory loss	0 1 2

9-Language/aphasia	Normal mild-moderate severe mute	0 1 2 3
10-Dysarthria/slurred speech	None mild—moderate slurred speech severe slurred speech	0 1 2
11-Neglect	No abnormality mild abnormality-either visual or tactile-partial neglect profound abnormality-visual and tactile—complete neglect	0 1 2

Table 1 - The NIH Stroke Scale

Results

The total number of patients included in the study was 100. The age range of the patients was from 18 to 89 years (Mean was 61.46 ± 16.3). Male patients numbered 58(58%) and female patients numbered 42 (42%). (Fig 1)

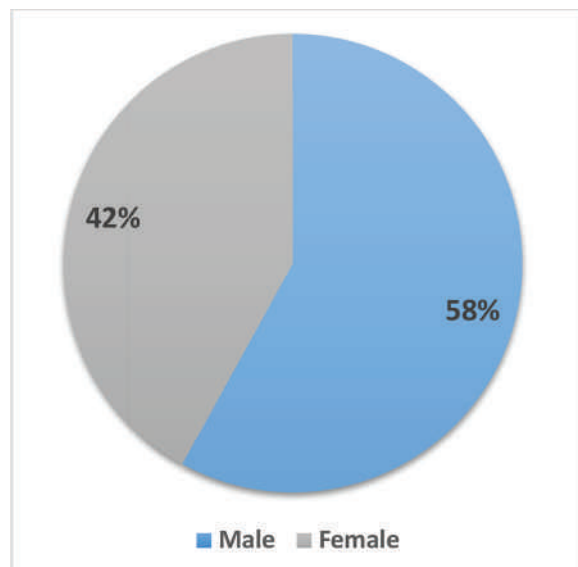


Fig 1 : Gender distribution of the patients.

The frequencies and percentages of various comorbidities in the patients were as shown in the following table (Table 2).

Comorbidities	Frequency (n=100)	Percentage
Diabetes	54	54
Hypertension	67	67
Atrial fibrillation	15	15
Ischemic heart disease	11	11
No comorbidities	4	4

Table 2 - Comorbidities in the patients with ischemic stroke.

The mean NIHSS score was 12.87 (± 8.1). The distribution of the NIHSS score among the patients is shown in Fig 2.

Mild (<5)-16%
 Moderate (5-14)-52%
 Moderately- severe[15-20]-14%
 Severe[>20]-18%

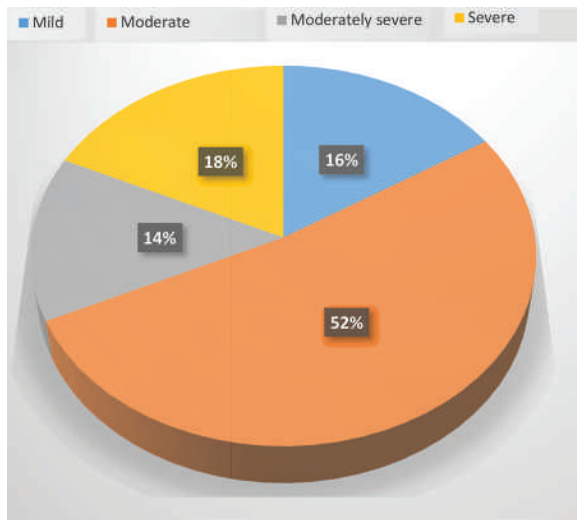


Fig 2 : The NIHSS score of the patients

The functional outcome of the patients at one month was measured with the Modified Rankin Scale (MRS). The mean MRS score was 3.58 (± 1.5). The distribution of the Modified Rankin Scale scores among the patients is as shown in the following Fig 3.

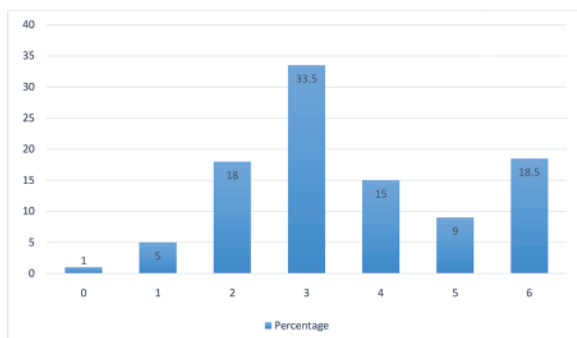


Fig 3 : The Modified Rankin Scale scores of the patients.

The statistical significance of the impact of NIHSS on outcomes of patients at one month based on the MRS score are shown in the following table (Table 3).

	Good Outcome	Bad Outcome	p-Value (t-test)
Mean NIHSS	4.6 ± 2.2	14.16 ± 7.96	0.000

Table 3 - Statistical significance of impact of NIHSS on outcome.

The statistical significance of the categories of stroke-severities based on NIHSS scores are as shown in the following Table 4.

Stroke Severity (NIHSS Scores)	Good Outcome	Bad Outcome	p-value (Chi-square test)
Mild (<5)	12	7	0.000
Moderate (5-14)	11	36	
Moderately Severe (15-20)	0	16	
Severe (>20)	0	18	

Table 4 - Statistical significance of NIHSS sub-divisions on outcome

Discussion

The mean NIHSS score was 12.87 in this study. This score indicates moderate stroke severity at stroke onset. Mild stroke severity (NIHSS less than 5) was present in 16% of the patients, moderate stroke severity (NIHSS 5-14) was present in majority (52%) of the patients, moderately severe stroke severity (NIHSS 15-20) was present in 14% of the patients and severe stroke severity (NIHSS more than 20) was present in 18% of the patients (Fig 2). The mean MRS score at one month post discharge was 3.58, which means that the patients are dependent to the caregiver in such a way that they are in between requiring some help but able to walk without assistance and unable to walk without assistance and unable to attend to own bodily-needs without assistance. The majority of patients had the MRS score of 3 (33.5%) (Fig 3). This score includes patients who require some help with their activities but able to walk without any assistance. Fully independent patients (MRS 0-2) and fully dependent patients (MRS 4 and 5) both amounted to 24% each (Fig 3). Thirty seven patients (18.5%, MRS score 6) died within one month of onset of stroke. It can be seen in Table 2 that the mean NIHSS score is strongly associated with functional outcome based on MRS scoring at one month. In addition, it can be seen in Table 3 that none of the patients with moderately severe and severe strokes according to the NIHSS score had good outcome. This table also shows that the less the NIHSS score, the better the outcome and the associations are strongly statistically significant. In our study, the mean NIHSS score associated with good outcome is 4.6 and that associated with bad outcome is 14.16. The figures are almost similar and do serve as cut-off points to predict the prognosis as the chances of becoming dependent or independent were statistically significant (Table 2). Although the NIHSS is the most widely used scoring system in patients with stroke and is highly predictive of chronic outcome, it has a potential weakness with respect to uneven scoring of lesion-specific neurologic deficits. The scale is highly weighted toward anterior circulation deficits, including cortical signs and motor function, while posterior circulation deficits, including cranial nerve signs and ataxia, receive fewer points. Thus, NIHSS may not appropriately evaluate the spectrum of posterior circulation-related signs. The study is supported by a study conducted by Denis Sablot et al which concluded that low and high NIHSS are effective positive predictive values for good and poor outcomes¹². This study is further supported by a study conducted by Gajurel BP et al which concluded that the baseline neurological status as measured by the

National Institute of Health Stroke Scale score predicts the functional status at one month after acute ischemic stroke¹³. The study conducted by Adams et al concluded that the NIHSS score strongly predicts the likelihood of a patient's recovery after stroke and score of ≥ 16 forecasts a high probability of death or severe disability whereas a score of ≤ 6 forecasts a good recovery¹⁴.

Conclusion

The baseline neurological status as measured by the NIHSS score predicts the functional status at one month after acute ischemic stroke. The lower the NIHSS score, the chances of becoming dependent is lower and the higher NIHSS score, the chances of becoming dependent is higher.

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