ASSOCIATION BETWEEN NIH STROKE SCALE SCORE AND FUNCTIONAL OUTCOME IN ACUTE ISCHEMIC STROKE

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ABSTRACT

Objective: To evaluate the association between baseline national institutes of health stroke scale score and functional outcome after acute ischemic stroke.

Study Design: Descriptive study.

Place and Duration of Study: Medical unit-IV, Jinnah Hospital, Lahore, from May 2009 to October 2009.

Patients and Methods: Patients who presented with stroke within 24 hours of onset of symptom and had a developing infarct on the CT-scan were further evaluated for neurological impairment using NIH stroke scale. The baseline NIHSS score was calculated using a proforma. Age of the patient, gender and time of presentation to the hospital was recorded. Follow-up was done on the 7th day of admission using Glasgow outcome scale (GOS).

Results: Total number of subjects was 150. Good outcome (GOS=1-2) was noticed in those subjects who had a low baseline NIHSS score (0-6) while poor outcome (GOS=3-5) was noticed in those subjects who had a higher baseline NIHSS score (>16) (*p* value< 0.05). In cases who had a moderate score (7-15); the ratio of good outcome to bad outcome was almost 70:30. Likewise good outcome (GOS=1-2) was noticed in those subjects who were younger (less than 45years) while poor outcome (GOS=3-5) was noticed in the elderly (more than 45years) (*p* value< 0.05). Similarly patients who presented within 12hrs of symptom onset had a good outcome compared to those who presented after 12hrs (*p* value< 0.05).

Conclusion: Baseline NIH Stroke Scale score is strongly associated with functional outcome after 1 week of acute ischemic stroke.

Keywords: Cerebrovascular accident, Stroke, Transient ischemic attack.

INTRODUCTION

Stroke was defined according to WHO criteria as rapidly developing symptoms and/or signs of focal and at times global loss of cerebral function with no apparent cause other than that of vascular disease. Stroke is grossly divided into either 1).Thrombotic. 2).Embolic. 3).Hemorrhagic type[1]. Cerebral infarction accounts for 80-85% of cases of stroke, which is a common neurological disorder[2].

Ischemic stroke represents a large global burden being the leading cause of physical disability and 3rd leading cause of death. Although rigorous epidemiological data from Pakistan are lacking, stroke is certainly the commonest reason for admission to a neurology ward in our part of the world as elsewhere[3].

The spectrum of neurological impairment following acute ischemic stroke is broad. The initial stroke severity predicts responses to treatment and outcomes after ischemic stroke[4]. Favorable outcome after stroke was independently associated with younger age, a lower NIHSS score, male gender[5].

No single outcome measure can describe or predict all dimensions of recovery and disability after acute stroke. Several scores have proven reliability and validity in stroke trials, including the national institute of health stroke scale (NIHSS), the modified Rankin scale(MRS), the barthel index(BI), the Glasgow outcome scale (GOS) and stroke impact scale (SIS). NIHSS is useful for early prognostication and serial assessment, whereas Barthel index is useful for planning rehabilitation strategies. The mRS and GOS provide summary measures of outcome and might be most relevant to clinicians and patients considering early intervention[6].

The NIHSS is a good predictor of patient's recovery after stroke. Assessing the patient's neurological impairment at first presentation of ischemic stroke can guide the physician

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regarding prognosis and management plan. Stroke severity as determined by the admission NIHSS score is the major independent predictor of disposition after hospitalization and treatment with rt-PA for acute stroke in a broad-based population[7].

The burden of stroke risk factors in Pakistan is enormous and its consequences do not only afflict the individual or his/her family but also society as a whole. Although data on stroke incidence and prevalence from Pakistan is scarce considering a high population, absolute number of stroke in our country would be in millions[8].

It is advisable for the patient to be admitted to a stroke unit in order to avoid complications, to complete the evaluation and to start secondary prevention and rehabilitation. Stroke units are an intervention in themselves, since they lower the mortality. Stroke units are an intervention that can potentially have positive repercussions on the majority of patients[9].

Stroke patients consume a large part of health resources all over the world so accurate information about the incidence, risk factors, management and outcome is needed for planning medico-social services[10]. Accurate prediction of early outcome using NIH stroke scale has a number of important applications, such as providing secondary prevention strategies, supporting treatment decisions or designing randomized control trials[11].

Familiarity with these scales could improve clinician's interpretation of stroke research and their clinical decision making. NIHSS guide the physician regarding prognosis, treatment plan and disposition of the patient after hospital. It provides objective criteria for examination of the patients and their follow-ups. As stroke patients are much neglected in our part of the world, this would help to improve the general approach towards these patients. Early identification of patients in need of treatment, rehabilitation and nursing facility care will lead to more efficient use of health care resources and a better outcome. The rationale of this study was to assess the usefulness of NIH stroke scale in our general medical wards .

PATIENTS AND METHODS

This descriptive study was conducted in medical unit-IV, Jinnah Hospital, Lahore, from May 2009 to October 2009. Inclusion criteria were age 35-95 years, either sex, presenting within 24hrs of symptom onset and patients having ischemic findings on CT-scan. While those subjects who had a hemorrhage on CT-scan, presenting after 24 hours of symptom onset or having a past history of stroke were excluded from the study. The confounding variables were treatment variability, stroke type, anterior / posterior circulation stroke, institution bias, sample size and co morbidities.

About 150 patients were selected through non-probability purposive sampling. Patients presenting with the development of a new focal neurological deficit, within 24 hours of symptom onset were included through the medical emergency. The demographic profile (i.e. age, sex) and history regarding weakness, aphasia and unconsciousness, duration of symptoms and past history of stroke was taken using a structured questionnaire. They were further evaluated for neurological impairment using NIH stroke scale. CT-scan brain was carried out as early as possible. Those subjects who had a developing infarct (as shown by a hypo-dense lesion) on CT-scan were included in the study. Although diffusion-weighted MR imaging is more sensitive for detection of hyperacute ischemia but MRI is less widely available, is not cost effective and is much more limited by patient contraindications or intolerance. Widely available, unenhanced CT can be performed quickly, to help identify early signs of stroke, and rule out hemorrhage without administration of intravenous contrast material.

The baseline NIHSS score was calculated by examining the level of consciousness, best gaze, visual field, facial paresis, motor function of arms and legs, limb ataxia, sensation, language, dysarthria, and inattention.

- Range: 0-42
- Mild: 0-6 (can be discharged home)

Moderate: 7-15 (needs rehabilitation}

Severe: >16 (needs long term nursing facility care)

A score of >16 forecasts a high probability of death or severe disability whereas a score of <6 forecasts a good recovery.

Patients were given supportive treatment and follow up of the patient was done on 7th day of admission using Glasgow outcome scale.

1. Good recovery (fully independent life with or without minimal neurological deficit),

2. Moderately disabled (independent but has neurological / intellectual impairment),

3. Severely disabled (conscious but totally dependent on others to get through daily activities).

4. Vegetative survival (patient is apparently alive but perceives little or nothing).

5. Dead.

A score of 1-2 indicates good outcome whereas a score of 3-5 indicates poor outcome.

All the collected information was entered into SPSS version 11.0 and analyzed through its statistical program. Variables of interest were age, gender, duration of symptoms and baseline NIHSS score and functional outcome. Age, duration of symptoms and baseline NIHSS score were presented as mean and ± standard deviation. Gender and functional outcome was presented by calculating frequency and percentage. NIHSS score & GOS were cross tabulated with age interval, sex, and duration of symptoms to evaluate the associations in between them. Finally correlation of the functional outcome was done with the baseline NIHSS score. Chi-square was used to check the statistical significance. A p-value of <0.05 was considered significant.

RESULTS

Total subjects were 150. Mean age was 63.53 ± 14.615. 14% of the subjects were less than 45years old and 86% were more than 45years old. Total males were 75; total females were 75 Mean baseline NIHSS score was 18.20 ± 9.175. Mean duration of symptoms was 11.21 ± 5.988 hours. Stroke severity was categorized according to the baseline NIHSS score. Twelve percent of the subjects had a mild deficit; baseline NIHSS score of 0-6, 28.7% had a moderate deficit; baseline NIHSS score of 7-15, and 59.3% had a severe deficit; baseline NIHSS score of > 16.

Good outcome was observed in 32.7% of the subjects while poor outcome was observed in 67.3% of the subjects.

Baseline NIHSS score was compared with the functional outcome. Good outcome was noticed in 18 while poor outcome in none out of the total 18 subjects who had a mild deficit (score 0-6). Likewise good outcome was noticed in 31 and poor outcome in 12 out of the total 43 subjects who had a moderate deficit (score 7-15). In 89 patients who had a severe deficit (score >16); all had poor outcome while none had a good outcome. Chi-square test was applied to compare baseline score with functional outcome: (Chi-square= 1.1352 $p < 0.05$). (Table-1)

There was a significant association between NIH stroke scale and functional outcome.

Age was compared with the functional outcome, out of those patients who had a good outcome 28.6% were less than 45years old while 71.4% were more than 45 years old. Among the ones who had a poor outcome 6.9% were less than 45years old while 93.1% were more than 45yrs old. (Chi-square = 12.83 p <0.05) (Table - 2).

Gender was compared with the functional outcome. 55.1% the males of had a good outcome while 47.5% had a poor outcome. Among females 44.9% had good outcome while 52.5% had poor outcome. (Chi-square=.758 $p <$ .384)

Time of presentation was compared with the functional outcome. In those who had a good outcome 93.9% presented within 12hrs. While out of those who had a poor outcome 43.6% presented within 12hrs and 56.4% presented after 12 hours. (Chi-square = 34.80 P < .05). (Table-3)

DISCUSSION

Good outcome (GOS=1-2) was noticed in those subjects who had a low baseline NIHSS score (0-6) while poor outcome (GOS=3-5) was noticed in those subjects who had a higher baseline NIHSS score (>16). In cases who had a moderate score (7-15); the ratio of good outcome to bad outcome was almost 70:30.

In our study most of the subjects (86%) were more than 45 years of age. The mean age was 64. Shabbir B et al[12] conducted a study on the elderly patients presenting with stroke and concluded that stroke is a disease of the elderly imposing major impact on their mortality rates, age being a major risk factor.

In our study we found out that older age had a higher baseline NIHSS score and a poor outcome as compared to the younger age that had a low score at presentation and a better outcome. Fayyaz M et al[13] performed a study on functional outcome of ischemic stroke in diabetics. Total number of subjects was 132. Patients <40 years were few in number with good recovery in both diabetics as well as non-diabetics. Diabetics of 40-60 years were found to have significantly high number of deaths and

Table-1: **Comparison of baseline national institute of health stroke scale score and functional outcome.**

		Functional outcome		Total	*p*-value
		Good outcome (1-2)	Poor outcome (3-5)		
Baseline national institute of health stroke scale score	Mild (0-6)	18 36.7%	0 .0%	18 12%	0.000
	Moderate (7-15)	31 63.3%	12 11.9%	43 28.7%	
	Severe (>16)	0 .0%	89 88.1%	89 59.3%	
Total		49 100%	101 100%	150 100%	

Table-2: Comparison of age of the patient and functional outcome.

	Functional outcome		Total	*p*-value
	Good outcome (1-2)	Poor outcome (3-5)		
Age of the patienr <45 years	14 28.8%	7 6.9%	21 14%	0.000
Age of the patient >45 years	35 71.4%	94 93.1%	129 86%	
Total	49 100%	101 100%	150 100%	

Table-3: Comparison of duration of symptoms (hours) and functional outcome.

	Functional outcome		Total	*p*-value
	Good outcome (1-2)	Poor outcome (3-5)		
Duration of symptoms <12 hours	46 93.9%	44 43.6%	90 60%	0.000
Duration of symptoms >12 hours	3 6.1%	57 56.4%	60 40%	
Total	49 100%	101 100%	150 100%	

disability than non-diabetics. Similar results were seen in patients more than 60 years old. Increasing age was associated with poor outcome in both groups.

The ratio of males to females was comparable i.e. 1:1 in our study. In another hospital based study conducted by khan S N et al[14] the male to female ratio of patients presenting with stroke was 1.05:1.We found out that females had a poorer outcome as compared to the males. Women may not be offered acute ischemic stroke treatment as frequently as men; and female stroke survivors have worst outcomes[15].

In our study the mean baseline NIHSS score was 18.20. Minimum score recorded was 2 and maximum was 39. Most of the subjects (59.3%) had severe deficit at presentation (baseline NIHSS score>16) and hence a poor outcome on 7th day of admission as found out by Glasgow outcome scale.

Adams HP Jr et al[16] compared the baseline NIHSS score and the TOAST score subtype as predictors of outcome at 7 days and 3 months after ischemic stroke. Data was collected from 1281 patients. Neurological impairment at baseline was quantified using the NIHSS. Outcomes were assessed at 7 days and 3 months using the Barthel index and Glasgow outcome scale. An outcome was rated as excellent if GOS was 1 and the BI was 19 or 20. The NIHSS score strongly predicts the likelihood of a patient's recovery after stroke. A score of >or=16 forecasts a high probability of death or severe disability whereas a score of <or=6 forecasts a good recovery.

Ahmed R et al[17] conducted a study on stroke scale score and early prediction of outcome after stroke. Total 50 subjects were enrolled. Neurological impairment at presentation was assessed by NIHSS. The score ranged between 2 and 28. The functional outcome was evaluated on the 7th day using Barthel index, which ranged from 0-80. NIHSS score was found to be a good predictor of functional outcome in patients with ischemic stroke.

Sato S et al[18] performed a study on 310 subjects having ischemic stroke. A low baseline NIHSS score was independently predictive of a favorable outcome in both patients with posterior circulation (PC) and anterior circulation (AC) stroke. The optimal cutoff scores of the baseline NIHSS for the favorable outcome were <or=5 for patients with PC stroke (sensitivity, 84%; specificity, 81%) and >or=8 for patients with AC stroke (sensitivity, 80%; specificity, 82%).

Liu X et al[19] performed a study on prediction of functional outcome in ischemic stroke patients in northwest china. He found out that 56.2% patients had a good outcome and 43.8% had a poor outcome. The poor outcome was associated with old age, having stroke history, and higher NIHSS total score.

Bruno A et al[20] found out in his study that baseline median NIHSS score for the entire TOAST cohort was 7, and it improved by 4 points among 603 patients with very favorable outcome(VFO; both GOS 1 and modified BI 19-20 at 3 months) and by 2 points among 638 patients without a VFO.

In our study those patients who presented earlier had a lower baseline NIHSS score and a better outcome as compared to those who presented late; had a higher baseline NIHSS score and a worst outcome. Ali A21 conducting a study on Stroke-related complications due to delay in seeking medical help found out that a higher rate of complications was observed in patients presenting with a delay of 12 hours or more.

There were certain limitations of the study. NIH standardized training of the doctors was missing. Moreover since the same physician was following the case he/she might be biased in interpretation of the results. In addition there were some items which require patient's cooperation and were difficult to perform in an unconscious patient. e.g. sensory system.

Currently time is brain, so brain attack should be dealt the same way as heart attack. NIH stroke scale should be applied on priority basis in all the patients presenting to the emergency department with a focal

neurological deficit. This would help to categorize the patients who should receive thrombolytic treatment and who needs only rehabilitation. Stroke units should be build in our hospitals where trained doctors and nurses should perform the neurological examination of patients using stroke scale.

CONCLUSION

Baseline NIH stroke scale score is strongly associated with functional outcome after one week of acute ischemic stroke. Increasing age and delayed presentation to the hospital may be associated with a poor outcome.

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