

DIAGNOSTIC ACCURACY OF NIHSS TO ASSESS THE EARLY STROKE SEVERITY AT THE ENTRY INTO EMERGENCY MEDICINE DEPARTMENT

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ABSTRACT

Background: The National Institutes of Health Stroke Scale (NIHSS) was developed to help physicians objectively rate the severity of ischemic strokes. Increasing scores indicate a more severe stroke and have been shown to correlate with the size of the infarction. **Aim:** To assess the severity of the ischemic stroke and its mimics and to improve the clinical outcome by applying NIHSS in patients suspected with ischemic stroke symptoms at entry to Emergency Medicine department. **Results:** NIHSS was counted in 311 patients with a mean of 12.87. NIHSS severity was moderate in 126 patients in between (5-15), it was minor (0-4) in 122 patients whereas it was moderately severe in the range of (15-20) in 42 cases it was severe in the range of (21-42) in 21 cases. **Conclusions:** In this study, we concluded that NIHSS has comparable performance in predicting death or dependence after stroke. However, multicentric studies with larger sample size are needed to conclude.

INTRODUCTION:

Stroke occurs in between 105 and 152 out of every 100,000 individuals annually, making it the fifth most common cause of disability and the fourth most common cause of death. Within 4.5 hours of the diagnosis, the general public must recognize stroke at the prehospital level and be admitted to the hospital through the emergency department^{1,2}. As a result, there will be fewer deaths and disabilities. Stroke scales are a valuable resource for determining the prognostic information in hospitals as well as the severity of a stroke at the time of occurrence^{2,3}. A stroke scale often consists of many variables for noting signs and

symptoms, with each variable having a category assigned to it for scoring purposes¹. The National Institutes of Health Stroke Scale (NIHSS) was developed to help physicians objectively rate severity of ischemic strokes

Increasing scores indicate a more severe stroke and has been shown to correlate with the size of the infarction on both CT and MRI evaluation^{2,3}. NIHSS scores when assessed within the first 48 hours following a stroke have been shown to correlate with clinical outcomes at the 3-month and 1-year mark.²

Patients with a total score of 4 or less generally have favourable clinical outcomes and have a high likelihood of functional independence regardless of treatment^{4,5}. NIHSS has comparable performance in predicting death or dependence after stroke^{1,2,4}. NIHSS score ranges from 0-42. NIHSS is usually a point of care testing in easy identification and early diagnosis and improving the clinical outcome and to reduce the time in clinical diagnosis in suspected cases of ischemic stroke patients.

AIM :

To assess the severity of the ischemic stroke and its mimics and to improve the clinical outcome by applying NIHSS in patients suspected with ischemic stroke symptoms at entry to the Emergency Medicine department.

OBJECTIVES:

To study the diagnostic accuracy of NIHSS in order to assess the severity of acute ischemic stroke presenting to emergency medicine department

MATERIALS AND METHODS

STUDY DESIGN: Cross-sectional analytical study

STUDY TIME: 1 year (JAN 2024-JAN 2025).

SAMPLE SIZE: Estimated sample size 311.

STUDY POPULATION: All the patients above 18yrs presented to the EMD with acute onset symptoms of ischemic stroke.

INCLUSION CRITERIA: Patients presenting to Bharati hospital of age >18 years with symptoms of ischemic stroke who are able to communicate will be examined.

EXCLUSION CRITERIA:

- Patients Diagnosed with stroke and treated outside
- Patients intubated outside hospitals
- Sedated, paralyzed patients

METHODOLOGY

1. All patients above 18 years of age presenting to the emergency department with symptoms of ischemic stroke were examined.
2. Each patient was assessed using the departmental stroke proforma, which included blood sugar measurements and an electrocardiogram (ECG).
3. The parameters on the checklist were meticulously recorded by two trained and certified emergency medicine residents with expertise in stroke scales for every patient presenting to the emergency department.
4. The recorded parameters included Glasgow Coma Scale (GCS), blood pressure, body temperature, pulse rate, respiratory rate, SpO₂, and age.
5. The severity of stroke was evaluated by applying the NIHSS to assess its diagnostic accuracy in identifying early stroke severity.
6. All collected data were entered and analyzed using SPSS version 29.

RESULTS AND OBSERVATIONS**1. Age**

Statistic	Age
Count	311
Mean age	59.09 years
Std Dev	15.79 years

Total 311 patients were enrolled in the study. The mean age of patients was 59.09 years \pm 15.

2. Sex

Sex	Count
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Male	203
Female	108

Of the total cases 202 were males and 109 were females.

3. Hypertension (HTN)

HTN	Count
Yes	181
No	130

181 were with hypertension and 130 were without hypertension.

4. Diabetes Mellitus (DM)

DM	Count
No	223
Yes	88

223 were without diabetes and 88 were diabetic.

5. Smoking

Smoking	Count
No	253
Yes	58

253 were non smokers and 58 were smokers.

6. Tobacco

Tobacco	Count
No	280
Yes	31

280 were not tobacco chewers and 31 were tobacco chewers.

7. Alcohol

Alcohol	Count
No	289
Yes	22

289 were nonalcoholic and 22 were alcoholic.

8. Dyslipidemia

Dyslipidemia	Count
No	271
Yes	40

271 were without dyslipidaemic and 40 were with dyslipidaemia.

9. Ischemic Heart Disease (IHD)

IHD	Count
No	297
Yes	14

297 were non IHD and 14 were with IHD.

10. Rheumatic Heart Disease (RHD)

RHD	Count
No	303
Yes	8

8 patients had rheumatic heart disease, while 303 did not.

11. Past History of Stroke/TIA

Past Stroke/TIA	Count
No	268
Yes	43

43 patients had a past history of stroke or TIA, while 268 did not.

12. Antihypertensive Medication

Antihypertensive	Count
No	222
Yes	89

89 were on Antihypertensive Medication and 222 were without Antihypertensive Medication.

13. Antidiabetics

Antidiabetics	Count
No	223
Yes	88

88 were on Antidiabetics and 223 were not on Antidiabetics.

14. Antiplatelets

Antiplatelets	Count
No	150
Yes	161

161 were on antiplatelet drugs and 150 were without antiplatelets.

15. Anticoagulants

Anticoagulants	Count
No	281
Yes	30

30 patients were on anticoagulants and 281 were without anticoagulants.

16. NIHSS

Statistic	NIHSS
Count	311
Mean	12.87
Std Dev	7.44

NIHSS scores were recorded for 311 patients, with a mean score of 12.87 and a standard deviation of 7.44.

17. NIHSS Severity Group distribution:

Severity Group	Count
Moderate (5–15)	126
Minor (0–4)	122
Moderate-Severe (16–20)	42
Severe (21–42)	21

Among the patients, 122 had minor strokes, 126 had moderate strokes, 42 had moderate-severe strokes, and 21 had severe strokes.

18. Thrombolysis

Thrombolysis	Count
No	264
Yes	47

Thrombolysis was performed in 47 patients, while 264 did not receive thrombolysis.

19. Mechanical Thrombectomy

Mechanical Thrombectomy	Count
No	290
Yes	21

Mechanical thrombectomy was performed in 21 cases, not performed in 290 cases.

20. Diagnostic accuracy of NIHSS:

Metric	Value (%)
Sensitivity	25.5
Specificity	80.7
Positive Predictive Value (PPV)	19.0
Negative Predictive Value (NPV)	85.9
Accuracy	72.3

DISCUSSION

Stroke is the fifth leading cause of disability and the fourth leading cause of death. Stroke scales are essential for providing prognostic information in hospitals and determining stroke severity at the time of occurrence. The National Institutes of Health Stroke Scale (NIHSS) was developed to objectively evaluate the severity of ischemic strokes. This study aimed to assess ischemic stroke severity and its mimics while improving clinical outcomes by applying the NIHSS and stroke scales to patients presenting with suspected ischemic stroke symptoms in the emergency department.

A total of 311 patients were enrolled in the study, of which 203 were male and 108 were female. The higher proportion of male patients is consistent with findings from other studies⁴. Among the patients, 181 had hypertension, and 130 did not, aligning closely with findings by Meyer et al². Similarly, 88 patients were diabetic, while 223 were non-diabetic. Regarding medication, 161 patients were on antiplatelet drugs, while 150 were not, indicating a potential role of antiplatelet drugs in stroke occurrence. This finding agrees with most previous studies. Additionally, 281 patients were not on anticoagulants, while 30 were.

The NIHSS was applied to all 311 patients, with a mean score of 12.87. Stroke severity based

on NIHSS was moderate (5–15) in 126 patients, minor (0–4) in 122 patients, moderately severe (16–20) in 42 patients, and severe (21–42) in 21 patients. These findings are consistent with the study by Adams et al.⁴, which reported similar results. Schlegel et al. demonstrated that the NIHSS is a valuable tool for predicting prognosis. Patients with an NIHSS score of ≥ 5 were more likely to be discharged, those with a score of 6–13 were more likely to experience residual disability and require rehabilitation, while patients with an NIHSS score of ≥ 13 had the poorest outcomes, necessitating continued hospital care⁷. Thrombolysis was performed in 29 patients, while 282 did not receive this treatment. Mechanical thrombectomy was carried out in 28 cases, with 249 not undergoing the procedure, and in 34 cases, thrombectomy status was unknown.

The diagnostic performance of the NIHSS (cutoff ≥ 16) in predicting the need for thrombolysis showed a sensitivity of 25.5% and a specificity of 80.7%. The positive predictive value (PPV) was 19.0%, meaning that only 19.0% of patients identified as needing thrombolysis based on NIHSS ≥ 16 actually required it. The negative predictive value (NPV) was 85.9%, indicating that 85.9% of patients with NIHSS < 16 were correctly classified as not needing thrombolysis. Zhao et al.⁸ reported an in-hospital mortality rate of 30.33% among ischemic stroke patients. They also found that the NIHSS score demonstrated a sensitivity of 80.4% and a specificity of 76.6% in predicting in-hospital mortality for these patients. Muir et al.⁹ found that the diagnostic accuracy of NIHSS was more accurate when a score of 13 was used as cut-off value. Waris et al.¹⁰ concluded that the NIHSS is a reliable tool for assessing stroke severity and predicting patient outcomes. Their findings highlight its usefulness in guiding clinical decision-making and tailoring management strategies to improve prognosis and reduce stroke-related complications.

This study highlights the utility of the NIHSS in assessing early stroke severity and predicting outcomes such as death or dependence. The NIHSS, with its score range of 0–42, is a valuable point-of-care tool that facilitates early diagnosis, improves clinical outcomes, and reduces diagnostic delays in suspected ischemic stroke cases. However, further studies with larger sample sizes are needed to draw more definitive conclusions.

CONCLUSION

This study concludes that the NIHSS demonstrates comparable performance in predicting death or dependence following a stroke. However, multicentric studies with larger sample

sizes are necessary to validate these findings and draw more definitive conclusions.

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