

A STUDY ON IN-HOSPITAL OUTCOME OF STROKE AND NIHSS SCORE AS A PREDICTOR OF VARIOUS PARAMETERS OF STROKE INCLUDING OUTCOME IN A TERTIARY CARE CENTRE

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Received : 22/05/2023
Received in revised form : 20/06/2023
Accepted : 03/07/2023

Keywords:

NIHSS score, stroke outcome, mortality.

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DOI: 10.47009/jamp.2023.5.4.42

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (4); 200-206



Abstract

Background: Stroke is the second largest contributor of mortality worldwide and the primary cause of disability among the elderly. Though India was ranked among the countries lacking sufficient stroke research data, some of the recent studies have elucidated the stroke pattern to considerable extent in our country. A study on various factors related directly or indirectly to stroke causation can help in effective management and prevention and use of a scoring tool that is easy to evaluate and can predict the outcome can help in change of course of treatment of stroke. So, this study aims to determine various parameters of stroke such as clinical presentation, risk factors, demography, calculation of NIHSS score and evaluating its effectiveness in predicting the outcome. **Materials and Methods:** This study is cross-sectional, observational, single centre study which included all patients of stroke fulfilling the inclusion criteria and admitted in the department of General Medicine, Dr. Susheela Tiwari Government Hospital associated with Government Medical College, Haldwani, Uttarakhand after taking approval from Institutional ethical committee. After taking informed and written consent, a detailed clinical history according to pre-set questionnaire and a detailed neurological examination of stroke patients was done. NIHSS score of the enrolled patients was first calculated at the time of admission and then at the time of discharge. **Result:** Total 124 eligible patients were taken. 78 were males and 46 were females with mean age 63.90±12.43. Limb weakness was the most common presenting symptom and systemic hypertension was the most common risk factor. Patients with alcohol consumption had significantly higher NIHSS score. Ischemic stroke was more common than haemorrhagic stroke. Mortality in haemorrhagic stroke patients was higher. Majority of the patients were discharged with home assistance. Risk of mortality significantly increased with higher NIHSS score. The NIHSS score in patients with posterior circulation stroke was higher than in anterior circulation stroke, with higher mortality in posterior circulation stroke. Similarly, NIHSS score, and mortality was more in infratentorial stroke than supratentorial stroke. Patients with moderate to severe NIHSS score had a longer duration of hospital stay. **Conclusion:** There are various modifiable factors which if controlled can prevent stroke or delay the occurrence or improve the outcome of stroke. NIHSS score and type of stroke is a valuable tool for predicting the mortality and morbidity in stroke patients. It is a simple tool which should be employed at each level of medical institutes which can help in prompt referral and thus better management of stroke.

INTRODUCTION

A stroke or cerebrovascular accident is defined as an abrupt onset of a neurologic deficit that is attributable to a focal vascular cause.^[1] Stroke can be classified

into two broad categories: Ischemic and Haemorrhagic stroke. Ischemic stroke is the most prominent and accounts for the most long-term disability.^[2] Haemorrhagic stroke is found to account for the highest risk of early death.^[3] Repeat stroke,

frequent seizures and immobilization have also been established to be common causes of late death.^[4]

Reducing the burden of stroke in the population requires identification of modifiable risk factors and demonstration of the efficacy of risk reduction efforts.^[5] There are many risk factors for stroke, including both modifiable and non-modifiable risk factors like short-term risks or triggers (e.g., infectious events, stress), intermediate-term risk factors (e.g., hypertension, dyslipidemia) and long-term risk factors (e.g., sex, race). It is believed that the average age of patients with stroke in developing countries is 15 years younger than that in developed countries.^[6] In India, nearly one-fifth of patients with first ever stroke admitted to hospitals are aged <40 years.^[7]

India is facing an increase in the prevalence of atherosclerotic risk factors like diabetes, hypertension and dyslipidemia.^[8] This has contributed to the increasing burden of diseases like coronary artery disease and stroke.

On admission of the patient, stroke severity is a potent determinant of practical outcomes in acute ischemic stroke.^[9,10] The usefulness of evaluation scales specific to diseases for understanding the pathological condition was mentioned by D'Olhaberriague et al.^[11] However, the scales currently used are diverse, ranging from evaluation characteristics to the time of use.

The National Institutes of Health Stroke Scale (NIHSS) is a valid assessment tool for the initial severity of stroke on admission and helps to predict the mortality in acute stroke.^[12,13] It is a nonlinear conventional scale highly suggestive of initial functional recovery and long-term clinical consequences.^[12] It comprises of 15 items, with each having responses graded on scale of 0 to 4. The overall score ranges from 0-42 points with higher scores specifying pronounced neurological deficits.^[13] NIHSS score has been found to be helpful both in the diagnosis of stroke and in stratifying patients, so that outcome could be predicted and early intervention can be done.^[14]

The present study was done to study various risk factors, patterns, associated conditions, demography, outcome as well as NIHSS score as a diagnostic tool and prognosis indicator in a tertiary care centre of Kumaon region of Uttarakhand. The objectives were to study the clinical profile, sociodemographic profile and to study the outcome in admitted stroke patients as assessed by NIHSS score. This study helped to broaden our knowledge about stroke pattern in this particular region.

MATERIALS AND METHODS

After obtaining approval from the Institutional Ethical Committee, the present cross-sectional, observational study was carried out in the department of General Medicine, Dr. Susheela Tiwari Government Hospital and associated Government

Medical College, Haldwani, Uttarakhand. This study was conducted from January 2021 to September 2022.

Study population

All stroke patients admitted in department of general medicine, Dr. Susheela Tiwari hospital, Haldwani, fulfilling our inclusion and exclusion criteria. The study included all stroke patients of age group more than 16 years, Sudden onset neurologic deficit of >24 hours (such as hemiparesis, hemiplegia, hemianaesthesia, speech dysfunction, vertigo, hemianopia etc.), confirmed by radio imaging and Patients who gave consent. The study excluded subjects with age less than 16 years, Sudden onset of weakness due to other causes such as history of head injury, known hypercoagulable states, eclampsia, CNS infections, subarachnoid hemorrhage, migraine, intracranial tumor, patient on anticoagulants and having bleeding diathesis, previous history of stroke, Patients negative on radio imaging and patients/guardians refusing consent.

Methodology

After obtaining written and informed consent, detailed history regarding sociodemographic details like age, gender, residence, occupation, education; relevant history about the course of illness, profile of stroke, any associated risk factors like systemic hypertension, diabetes mellitus, addiction, drug history, etc was taken. A detailed clinical history according to pre-set questionnaire and a detailed neurological examination of patients was done. NIHSS score of the enrolled patients was first calculated at the time of admission and then at the time of discharge. Relevant investigations including Complete Blood Count, Liver Function, Renal Function, Fasting Blood Sugar, Serum Electrolytes, Lipid Profile, ECG, Coagulation Profile, Chest X Ray, CT Scan Head/ MRI Brain were done.

Statistical analysis

Data was described in terms of range, mean \pm standard deviation (SD), frequencies (number of cases), and relative frequencies (percentages) as appropriate. A comparison of quantitative variables between the study group was done using the Student t-test. For comparing categorical data, the Chi square (X²) test was performed. A probability value (p-value) less than 0.05 was considered statistically significant. The data entry was done in the Microsoft EXCEL spreadsheet. All statistical calculations were done using SPSS 21 (Statistical Package for the Social Science) version statistical program for Microsoft Windows.

RESULTS

In the study group of 124 patients, majority of the study population (27.40%) belonged to the age group of 51-60. There were 78 males and 46 females. Systemic hypertension was the most common risk factor and type 2 diabetes mellitus was the second most common risk factor. Addiction of

smoking/tobacco use was present in 47 patients and alcohol consumption in 30 patients, 29 patients had dyslipidemia and 11 had atrial fibrillation. 43.55%

patients had history of drug intake for one or more chronic illness.

Table 1: Age group, gender and risk factors

		n	%
Age groups	40-50 years	25	20.2%
	51-60 years	34	27.4%
	61-70 years	27	21.8%
	71-80 years	27	21.8%
	> 80 years	11	8.9%
Gender	Male	78	62.9%
	Female	46	37.1%
Risk factors	No risk factor	10	8.06%
	Systemic Hypertension	73	58.90%
	Type 2 DM	51	41.10%
	Dyslipidemia	29	23.40%
	Alcoholic	30	24.19%
	Smoker/ Tobacco use	47	37.90%
	Atrial fibrillation	11	8.87%
Drug History	None	70	56.5%
	Anti-hypertensives	39	31.5%
	Oral Hypoglycaemic drugs	22	17.7%
	Insulin	6	4.8%
	Statins	3	2.4%

The commonest presenting symptom in both the genders was limb weakness in 102 patients with 65 males and 37 females followed by altered level of consciousness which was present in 82 patients. Seizures were present in 23 patients, followed by slurred speech in 20 and vomiting in 19 patients.

Table 2: Gender wise distribution of study population according to symptoms at the time of presentation

Symptoms	Male		Female		Total	
	n	%	n	%	n	%
Limb weakness	65	52.4%	37	29.8%	102	82.3%
Altered Consciousness	53	42.7%	29	23.4%	82	66.1%
Seizures	16	12.9%	7	5.7%	23	18.6%
Slurred speech	12	9.7%	8	6.5%	20	16.1%
Vomiting	8	6.5%	11	8.9%	19	15.3%
Dizziness	1	0.8%	2	1.6%	3	2.4%
Headache	2	1.6%	1	0.8%	3	2.4%
Urinary and fecal incontinence	1	0.8%	1	0.8%	2	1.6%
Sudden loss of vision	1	0.8%	0	0.0%	1	0.8%
X2 value = 5.97, p-value= 0.650*						

The most common presenting neurological deficit was weakness (n-102), in which right sided weakness was present in 56 patients, left sided weakness in 43 patients, 2 patients presented with right brachial monoparesis and 1 presented with left brachial monoparesis. Speech disorders were present in 31 patients, out of which 20 had slurred speech and 11 had global aphasia. Cranial nerve involvement was present in 22 patients, out of which 14 patients had left and 8 patients had right facial nerve involvement.

Table 3: Signs among study population

Signs		N	%
Weakness n-102, 82.25%	Rt hemiparesis/ hemiplegia	56	45.2%
	Lt hemiparesis/ hemiplegia	43	34.7%
	Rt brachial monoparesis	2	1.6%
	Lt brachial monoparesis	1	0.8%
Speech disorder n-31, 25%	Slurred speech	20	16.1%
	Global aphasia	11	8.9%
Cranial nerve involvement n-22, 17.74%	Lt 7th nerve	14	11.3%
	Rt 7th nerve	8	6.5%

Out of the 124 patients, 38 patients were discharged-I (independent), 61 were discharged with home assistance, and 25 patients expired. Mortality in haemorrhagic stroke was 33.33% which is 12.05% more as compared to 15.38% in ischemic stroke. 38.46% patients of ischemic stroke were discharged-I as compared to 9.09% in haemorrhagic stroke.

Table 4: Association of outcome with Types of stroke

Outcome	Types of stroke		Total
	Ischemic	Haemorrhagic	
Discharge-I (independent)	35	3	38
	92.0%	7.89%	30.7%
Discharge with home assistance	42	19	61
	68.9%	31.15%	49.2%
Expired	14	11	25
	56.0%	44%	20.2%
Total	91	33	124
	73.4%	26.61%	100.0%

X2 value = 11.33, p-value=0.003*

Mean NIHSS score in patients with anterior circulation stroke was 12.03 ± 4.27 and in posterior circulation stroke was 16.62 ± 6.74 . There was significant correlation between NIHSS score and outcome in both Anterior and Posterior circulation stroke.

Mean NIHSS score in supratentorial haemorrhagic stroke patients who were discharged was 15.59 ± 2.90 and in expired patients was 24.5 ± 5.28 showing that there was a significant correlation (p-value <0.001*) between NIHSS score at admission with outcome in supratentorial strokes. Mean NIHSS score in infratentorial haemorrhagic stroke patients who were discharged was 17.8 ± 7.53 which was relatively higher as compared to supratentorial stroke.

Table 5: Association of Mean NIHSS score at admission with Types of stroke

	Mean NIHSS score at admission		t test	p-value
	Discharged	Expired		
Anterior circulation	9.89 ± 4.27	26.90 ± 3.73	11.9	<0.001
Posterior circulation	13 ± 4.80	22.67 ± 5.03	2.7145	0.035
t-test value	1.565	1.32		
p-value	0.122	0.211		
Supratentorial	15.59 ± 2.90	24.5 ± 5.28	5.701	<0.001*
Infratentorial	17.8 ± 7.53	27.00 ± 0.00	N/A	N/A
t test	1.023	N/A		
p-value	0.318	N/A		

72 patients with moderate to severe NIHSS score had 0-5 days of hospital stay, followed by 38 patients having 6-10 days of hospital stay. All the 9 patients with mild NIHSS score had 0-5 days of hospital stay. Only 2 patients had a hospital stay of more than 16 days.

Table 6: Association of duration of Hospital stay with NIHSS score

Duration of Hospital stay	NIHSS score			Total
	< 6 (Mild)	6-14 (Moderate)	> 14 (Severe)	
0-5 days	9	39	33	81
	100.0%	65.0%	60.00%	65.3%
6-10 days	0	20	18	38
	0.0%	33.3%	32.70%	30.6%
11-15 days	0	1	2	3
	0.0%	1.7%	3.60%	2.4%
16-20 days	0	0	1	1
	0.0%	0.0%	1.80%	0.8%
> 20 days	0	0	1	1
	0.0%	0.0%	1.80%	0.8%
Total	9	60	55	124
	100.00%	100.0%	100.00%	100.0%

X2 value = 8.08, p-value = 0.426*

The severity of NIHSS score was compared with the outcome of stroke. 100% of the patients with mild NIHSS score were discharged-I. All the patients who expired (n=25) had severe NIHSS score with mean of 25.08 ± 4.45 . 61 patients had moderate to severe NIHSS score and required varying level of home assistance.

Table 7: Association of outcome with NIHSS score

Outcome	NIHSS score			Total
	< 6 (Mild)	6-14 (Moderate)	> 14 (Severe)	
Discharge-I (independent)	9	28	1	38
	100.0%	46.7%	1.8%	30.6%
Discharge with Home assistance	0	32	29	61
	0.0%	53.3%	52.7%	49.2%
Expired	0	0	25	25
	0.0%	0.0%	45.5%	20.2%

Total	9	60	55	124
	100.0%	100.0%	100.0%	100.0%

X2 value = 70.206, p-value = 0.001*

Mean NIHSS at admission	Discharged-I (independent)	Discharged with home assistance	Expired
	7.84±3.30	13.656±4.53	25.08±4.45
f ratio =129.37, p-value < 0.001*			

DISCUSSION

Sociodemographic profile

The age distribution in our study showed that the majority of the study population (27.40%) belonged to the age group of 51-60 years, which was similar to the study done by Sreen A et al.^[16] The youngest patient of our study was 40 years old, and the oldest was 92 years old although in various studies like that of Singhal AB et al.^[17] Adams HP et al.^[18] there were patients in less than 40 years age group also. Mean age of our study population was 63.90±12.43 which was comparable with the study conducted by Sanjeeth et al.^[14] Luthra M et al.^[19] and Zafar F et al.^[20] Mean age in male population was 62.33±12.09 and mean age in female population was 66.56±12.67 which was comparable to the study conducted by Marti V et al.^[21] There were 62.90% males and 37.10% females. Percentage of male population was higher in our study which is also seen in other similar studies by Vaidya CV et al.^[22] and Luthra M et al.^[19] The predominance of stroke in male patients can be attributed to the higher number of risk factors like smoking and alcohol consumption in males which are relatively less in females.

Clinical profile

The most common presenting symptom in both genders was limb weakness in 102 patients, followed by altered level of consciousness in 82 patients. These results were similar to the study done by Kotkunde ST et al.^[23] Other documented symptoms were seizures (18.55%) and vomiting in 15.32% patients. Dizziness, headache, urinary and fecal incontinence, and sudden loss of vision were found in less than 3% of patients. It was observed that right hemiparesis/hemiplegia (n-56) was the most common neurological deficit, followed by left hemiparesis/ hemiplegia (n-43) which was comparable to the study of Bogousslavsky et al.^[24] 2 cases of right brachial monoparesis and 1 case of left brachial monoparesis were also encountered, in which radio-imaging findings were left MCA lacunar infarct and right MCA lacunar infarct, respectively. 2.14% patients had monoparesis which was relatable to the study of Alstadhaug KB et al.^[25]

Speech disorders were present in 31 patients. Dysarthria was present in 20 patients and global aphasia in 11. They were seen in both left (n-7) and right hemisphere (n-20) strokes which was also reported by Sreen A et al.^[16] In our study, 66.13% patients had altered level of consciousness and so speech could not be assessed in them. 22 patients had cranial nerve involvement out of which 14 had left

facial nerve involvement and 8 had right facial nerve involvement.

Risk factors

The most common modifiable risk factor in both genders in our study was systemic hypertension (n-73) which was similar to Zafar F et al.^[20] and Marti V et al.^[21] Type 2 diabetes mellitus (n-51) was the second most common risk factor, relatable to study of Zafar F et al.^[20] Addiction of smoking or tobacco was present in 37.90% patients, which was comparable to the study of Russel James BW et al.^[3] (35.9%) and higher than in the study by Zafar F et al.^[20] Alcohol consumption in our study was present in 24.19% patients. We observed that there was a significant difference in NIHSS score of patients who consumed alcohol than those who did not, hence the severity was more in patients with history of alcohol consumption as also seen in study by Luthra M et al.^[19] 23.40% patients had dyslipidemia comparable to the studies by Kaur G et al.^[26] and Dash D et al.^[27] (26.1%). 10.48 % patients had atrial fibrillation comparable to the study by Kaur P et al.^[28] Only 8.06% patients in the study population had no observed risk factors.

Types of stroke

Upon radio-imaging, 73.39% (n-91) patients were found to have ischemic stroke similar to the studies of Vaidya CV et al.^[22] and Lisk DR et al.^[29] with 91.20% patients having anterior circulation stroke and 8.80% having posterior circulation stroke. The most common type of stroke was anterior circulation ischemic stroke(n-53). In haemorrhagic stroke (26.61%), supratentorial stroke (21.77%) was more common than infratentorial stroke (4.84%) which is also seen in the study by Kaur G et al.^[26]

We found a significant (p-value 0.003*) correlation between the type of stroke and the outcome of the disease as also seen in the study by Zhuo Y et al.^[30] Mean NIHSS score in patients with anterior circulation stroke was 12.03±4.27 (discharged=9.89 ± 4.27; expired=26.90 ± 3.73).

Mean NIHSS score in patients with posterior circulation stroke was 16.62±6.74 (discharged= 13 ± 4.80; expired=22.67 ± 5.03). NIHSS score was a predictor of favourable outcome in both anterior and posterior circulation infarct as seen in study done by Sato S et al.^[31]

NIHSS score in patients with posterior circulation stroke was higher than in anterior circulation stroke, with higher mortality in posterior circulation stroke. Similarly, NIHSS score and mortality was more in infratentorial stroke than supratentorial stroke.

Hospital stay

Mean duration of hospital stay was 4.75 ± 3.22 relatable to study of Qawasmeh MA et al.^[32]

NIHSS score

NIHSS score was found to be a good predictor of in-hospital outcome in our study as seen in studies done by Tsing MC et al.^[33] Mean NIHSS score at admission in discharge-I patients was 7.84 ± 3.30 , discharge with home assistance group was 13.656 ± 4.53 and in expired patients was 25.08 ± 4.45 which are similar to study done by Sablot D et al.^[34] 100% of the patients with mild NIHSS score were discharged-I and also had a shorter duration of hospital stay, 49.20% had moderate to severe NIHSS score and required varying level of home assistance. Similar study done for correlation of outcome with severity of NIHSS score by Shrestha S et al.^[35] had similar results. We observed that in-hospital mortality was only seen in patients with severe NIHSS score similar to the study done by Adams HP et al.^[18] Median NIHSS score at admission was 12 which is comparable to median 13.5 reported by Shrestha S et al.^[35]

CONCLUSION

Risk factors like systemic hypertension and alcohol consumption should be well controlled for prevention and better outcome of stroke. NIHSS score is a valuable predictor of outcome and mortality in acute stroke patients and should be used in all stroke patients. Type of stroke plays a significant part in the outcome. Our study corroborated with other studies done at different times at different places. This study thus adds to the already existing literature about NIHSS score and its usefulness in predicting mortality and morbidity in acute stroke patients.

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