A clinico – radiological study of ischemic stroke in a tertiary care hospital in North Telangana

Bharathkanth Reddy M[1], Ranjith Kumar P[2]

[1]Senior Resident, [2]Assistant Professor, Department of General Medicine, Prathima Institute of Medical Sciences, Nagunur, Karimnagar, Telangana, India.

Address for Correspondence: Dr. Ranjith Kumar P, Assistant Professor, Department of General Medicine, Prathima Institute of Medical Sciences, Karimnagar, Telangana, India.

Email: ranjithpolusani@gmail.com

ABSTRACT

Introduction : Stroke is the second leading cause of mortality worldwide. Patients present with varied clinical presentations.

Objective : To evaluate the clinical profile and radiological profile of ischemic stroke patients. To assess the outcome in relation to various clinical and radiological presentations using National Institutes of Health Stroke Scale (NIHSS).

Materials & Methods : This is a hospital based prospective cross sectional study done in Prathima Institute of Medical Sciences during the period from February 2016 to July 2016 which comprised of 150 patients.

Results : Stroke is most common as the age advances. Risk factor association is the main cause for development of stroke.

Conclusion: NIHSS is helpful in identifying persons with stroke from those suspected to have stroke. Knowledge about identifying and reading radiological investigations will help in assessing the severity of stroke.

Keywords: Stroke Scale, Computed tomography scan, Ischemic heart disease.

INTRODUCTION

Acute stroke is defined as focal neurological dysfunction ofabrupt onset, which can be attributable to a vascular cause. Ischemic stroke is the second only to coronary artery disease as the major cause of mortality. The major risk factors for stroke in the western world include hyperlipidemia, hypertension, diabetes mellitus and smoking. Knowledge about these risk factors led to interventions and preventive measures that reduced the incidence of stroke during the last two decades.

The functional outcome after stroke is most commonly measured byNational Institutes of Health Stroke Scale (NIHSS), modified Rankin scale (mRS) and Barthel index (BI) .

NIHSS is Standardized stroke severity scale to describe neurological deficits in acute stroke patients allows.So NIHSS was tested in patients presenting with stroke in ED was found to be useful not only in diagnosing stroke but also to stratify patients so that outcome could be predicted and also to select those patients who will benefit from acute intervention.

MATERIALS AND METHODS: The study was conducted in Prathima Institute of Medical Sciences for a period of six months. 150 consecutive patients admitted with ischemic stroke are included in this study.

New onsetof stroke (or) first stroke, age >18years and CT/MRI showing acute infarct cases were included. Presence of hemorrhagic stroke, age <18years and history of previous stroke cases were excluded.

All the patients diagnosed to have ischemic stroke were thoroughly examined and evaluated in detail as per the pre designed questionnaire for this study after obtaining informed written consent.A detailed history regarding the risk factor profile in the patients including systemic hypertension, smoking, alcoholism, dyslipidemia, diabetes mellitus, coronary artery disease, rheumatic heart disease and family history were noted for each patient.NIHSS was applied on all patients suspected to have stroke, patients were selected, and two scores for each patient, one on admission and another at the time of discharge were obtained.

RESULTS

Present study shows that as the age increases there is a chance of increased risk of stroke. Stroke is most common in 5th and 6th decade (54.6%). Mean age±SD for men = 56.52±12.06, mean age±SD for women=60.60±12.81. t(df=148)= -2.0, p=0.047.

Present study showed that men have a greater risk of developing stroke at a younger age compared to women.

In the present study, 84(56%) patients were males and 66(44%) were females. There was a male preponderance with male to female ratio of 1.3:1.Out of 150 study participants, 147(98%) were thrombotic strokes and 3(2%) were embolic strokes.

Hypertension is the major risk factor comprising 55.3% followed by alcohol dependence 47.4%, smoking 45.4%, diabetes mellitus 18.7%, and dyslipidemia 13.3%. Weakness is the most common symptom comprising 82.6% followed by speech disturbances 46.6%. Hemiparesis is the most common clinical sign comprising 86.6% followed by facial paresis 42%, dysarthria 34.6%, and aphasia 12%. [Table 1]

Hyperlipidemia accounted for 20(13.3%) cases in the present study followed by IHD and RHD in 5(3.3%) cases and 3(2%) cases respectively. Family history and transient ischemic attacks are not noted in the present study. With the available data, 18(12%) patients did not have any risk factors for acute stroke.

Table 1: Showing signs and symptoms in the present study

Signs	Number	Percentage
Altered level of consciousness	3	2%
Speech disturbances (Dysarthria/aphasia)	70	46.6%
Unsteadiness of gait	8	5.3%
Weakness	124	82.6%
Headache	3	2%
Vomiting	1	0.6%
Convulsions	1	0.6%
Vertigo/giddiness	2	1.3%

Signs	Number	Percentage
Hemi paresis	130	86.6%
Facial paresis	63	42%
Aphasia	18	12%
Dysarthria	52	34.6%
Diplopia	3	2%
Monoparesis	2	1.33%
Sensory deficit	3	2%

In the present study left hemisphere lesions (53.3%) were more common than right hemisphere lesions (33.3%). Bilateral acute infarct, brain stem and cerebellar lesions were found in 2.6%, 5.3% and 5.3% respectively.

In the present study the patients diagnosed to have stroke using National institutes of health stroke scale (NIHSS) were further divided into mild, moderate and severe stroke based on baseline NIHSS SCORE. Patients with score less than five had mild stroke while those with score 5-14 and >15 were said to have moderate and severe stroke respectively.

There is a statistically significant positive correlation [rs=0.198, p=0.015] between age of the patient and NIHSS score at admission. As the age increases, severity of stroke is increasing in the present study.

Among 51 mild stroke patients, 40(78.4%) patients were male and 11(21.6%) patients were female. Among 65 moderate stroke patients, 30(46.2%) patients were male and 35(53.8%) patients were female. Among 34 severe stroke patients, 14(41.2%) patients were males and 20(58.8%) patients were females.

There is a statistically significant difference (p<0.001) noted between the sex wise distribution of stroke according to NIHSS score at admission. Females tend to have severe forms of stroke compared to males in the present study.

Out of 150 study participants, 131(87.3%) patients were survived. Among 131 patients, 50 had mild stroke, 59 had moderate stroke and 22 had severe stroke. Among 50 mild stroke patients, 44(88%) required less than 14days of hospital stay and 6(12%) required more than 14days of hospital stay. Among 59 moderate stroke patients, 50(84.7%) required less than 14days of hospital stay and 9(15.3%) required more than 14 days of hospital stay. Among 22 severe stroke patients, 14(63.6%) required less than 14 days of hospital stay and 8(36.4%) required more than 14 days of hospital stay.

There is a statistically significant difference (p=0.03) noted between the stroke severity and duration of hospital stay.

Infarct volume was measured qualitatively intomild (lacunar infarcts), moderate (multiple lacunar infarcts, brainstem involvement, cerebellum involvement, 1/3 of large artery territory) and severe (>2/3 of large artery territory, bi hemispheric involvement, midline shift).

Out of 150 study participants, majority of them are having moderate infarct volume 78(52%) followed by mild and severe infarct volume i.e., 41(27.3%) and 31(20.7%) respectively. Among 41 mild infarct volume patients, 20(48.8%) had mild

NIHSS score, 19(46.3%) had moderate NIHSS score and 2(4.9%) had severe NIHSS score at admission. Among 78 moderate infarct volume patients, 29(37.2%) had mild NIHSS score, 41(52.6%) had moderate NIHSS score and 8(10.3%) had severe NIHSS score at admission. Among 31 severe infarct volume patients, 2(6.5%) had mild NIHSS score, 5(16.1%) had moderate score and 24(77.4%) had severe NIHSS score at admission.

There is a statistically significant difference (p<0.001) noted between the initial infarct volume and NIHSS score at admission.

Among 41 mild infarct volume patients, 28(68.3%) were discharged from hospital independently (having NIHSS score of <5), 11(26.8%) were discharged with assistance (having NIHSS score of 5-14) and 2(4.9%) died. Among 78 moderateinfarct volume patients, 43(55.1%) were discharged from hospital independently, 28(35.9%) were discharged with assistance, 2(2.6%) were required longterm hospital stay and nursing facility and 5(6.4%) were died. Among 31 severe infarct volume patients, 2(6.5%) were discharged from hospital independently, 7(22.6%) were discharged with assistance, 10(32.2%) were required longterm hospital stay and nursing facility and 12(38.7%) were died.

There is a statistically significant difference(p<0.001) notedbetween the NIHSS score at discharge and initial infarct volume.

Among 150 study participants, 131 patients survived and 19 patients died. Out of 19, majority of deaths occurred in severe group 14(73.7%) followed by moderate and mild group i.e., 4(21.1%) and 1(5.3%) respectively.

There is a statistically significant difference(p<0.001) noted between outcome and stroke severity at admission using NIHSS score.

Out of 19 patients, 17 patients died less than 2 weeks of duration of hospital stay and 2 patients died more than 2 weeks of duration of hospital stay. Out of 17, 12(85.7%) had initial NIHSS score of more than 15.

Though there is no significant difference noted, majority of deaths were noted in less than 2 weeks of hospital stay in the severe stroke group.

DISCUSSION

In the present study highest number of patients was found in 51-60, 61-70 years of age group.Mean age ± SD for men = 56±12.06 and mean age ± SD for women= 60.60±12.81. t(df=148)= -2.0, p=0.047.

Present study showed that men have a greater risk of developing stroke at a younger age compared to women. As the age increases occurrence of stroke is more in women compared to men.

Hypertension (HTN) is the most important modifiable risk factor for stroke regardless of gender. Estimated prevalence of HTN is 25-40% of population. In 36 years of follow up of the Framingham study, 56% of stroke incidence in men and 66% in women were attributed directly to HTN[1]. Dhanraj et al from Chennai found HTN in 46% of 115 patients with ischemic stroke[2].

In the present study hypertension present in 83(55.3%) of 150 study participants, diabetes present in 28(18.7%) of 150 study participants. Both the sexes are equally affected with hypertension and diabetes in the present study.

Smoking and alcohol addictions are more frequently found in men.There is a statistically significant difference (p<0.001) noted in men and women with regard to addictions. Association of all these factors plays an important role in development of stroke at a younger age in men compared to women.

In the present study hyperlipidemia accounted for 20(13.3%) patients followed by IHD and RHD in 5(3.3%) patients and 3(2%) patients respectively. Family history and transient ischemic attacks are not noted in the present study. With the available data, 18(12%) patients did not have any risk factors for acute stroke.

Four population-based stroke epidemiology studies which were conducted ac¬cording to the 'WHO-STEPS Stroke protocol' during the first decade of the 21st century in Mumbai[3], Trivandrum[4], Kolkata[5] and Bangalore[6] areas. Mumbaiand Trivandrumreg-istries showed that the mean age of patients with stroke was 66 and 67 years respectively. In contrast, in the Bangalore study the mean age was 54.5 years. [Table 2]

Table 2: Comparison of association of risk factors in different studies

Risk Factors	Smith et al (2005) (%)	Trivandrum Stroke Registry (2009) (%)	Present Study
Hypertension	87.0	85.0	55.3
Diabetes	50.0	50.0	18.7
Smoking	35.2	26.8	45.4
Alcohol	-	-	47.4
hyperlipidemia	22.95	26.0	13.3

Most of the patients presented to hospital with weakness (82.6%), followed by speech disturbances (46.6%), unsteadiness of gait (5.3%), headache (2%)and altered level of consciousness (2%). Vomitingand convulsions accounted for 0.6% each.

In the present study each patient was given a score using NIHSS at the time of admission.NIHSS score at the time of admission is ranging from 1-35. The median (IQR) of NIHSS score at the time of admission was 8 (3 to 13). Among 150 study participants 51(34%) had mild stroke, 65(43.3%) had moderate stroke and 34(22.7%) had severe stroke. Among 51 mild stroke patients, 40(78.4%) patients were male and 11(21.6%) patients were female. Among 65 moderate stroke patients, 30(46.2%) patients were male and 35(53.8%) patients were female. Among 34 severe stroke patients, 14(41.2%) patients were males and 20(58.8%) patients were females.

There is a statistically significant difference (p<0.001) noted between the sex wise distribution of stroke according to NIHSS score at admission. Females tend to have severe forms of stroke compared to males in the present study.

There is a statistically significant positive correlation [rs=0.198, p=0.015] between age of the patient and NIHSS score at admission. As the age increases, severity of stroke is increasing in the present study.

Duration of hospital stay is directly related to severity of stroke. There is a statistically significant difference (p=0.03) noted between the stroke severity and duration of hospital stay.

Out of 150, 8 (5.3%) patients reached to hospital within 3hours of onset of symptoms. NIHSS score at the time of admission is ranging from 4-10. The median (IQR) of NIHSS score of the thrombolysed patients was 6 (5 to 8.5). Patients were given intravenous thrombolytic therapy with rt-PA within 3-4.5 hours of time. Early neurological deterioration or improvement was defined as an increase or decrease of >4 points on the NIHSS score after 48 hours from baseline assessment[7]. Complete recovery was defined as a decrease in the total NIHSS score to <3 at 48 hours[8]. An intracranial hemorrhage was considered as symptomatic (SICH) if the patient had clinical deterioration causing an increase of >4 points on the NIHSS and if the hemorrhage was likely to be the cause of neurological deterioration. Major neurological improvement was seen within 24 hours of time in 5 patients. 3 patients were improved after 1 week. Repeat CT was done for all the patients after 24 hours to rule out intra cerebral hemorrhage (ICH). There is no evidence of ICH.

In 2014 the total number of patients received IV thrombolysis nationwide was 6,000 (0.4%)(Dalal et al 2008, Sridharan et al 2009, Das et al 2007, Pandian and Sudhan et al 2013).

The volume of acute infarction on neuroimaging studies may be used to estimate stroke outcome[9]. Infarct volume was measured qualitatively and divided into mild (lacunar infarcts), moderate (multiple lacunar infarcts, brainstem involvement, cerebellum involvement, involvement of 1/3 of large artery territory) and severe (>2/3 of large artery territory involvement, bi hemispheric involvement, midline shift) in the present study.

There is a statistically significant difference (p<0.001) noted between the initial infarct volume and NIHSS score at admission.

Initial infarct volume is best correlates with stroke outcome. Stroke severity was best correlated with NIHSS score at admission and infarct volume. Early changes in the stroke score between admission and 24 hours did correlate with the degree of improvement seen at 7 to 10 days.

NIHSS score at the time of discharge is ranging from 0-22. The median (IQR) of NIHSS score at the time of discharge was 4 (1 to 10). Among 150 study participants, 131 patients survived and 19 patients died. Out of 19, 1(5.3%) patient had mild NIHSS score at admission, 4(21.1%) patients had moderate score at admission and 14(73.7%) had severe score at admission. The median (IQR) of NIHSS score of patients who died was 19 (13 to 20).

There is a statistically significant difference(p<0.001) noted between outcome and stroke severity at admission using NIHSS score.

In the present study 13 patients showed hyperdense middle cerebral artery sign (HMCAS) on baseline NCCT. Out of 13, 9 patients (69%) died. NIHSS score at the time of admission is ranging from 8-35. The HMCAS is a marker of thrombus in the middle cerebral artery (MCA). The specificity of the HMCAS for MCA occlusion approaches 100%, whereas its sensitivity is low. False-positive HMCASs have been noted in asymptomatic patients with a high hematocrit or calcified atherosclerotic disease, but in these cases the HMCAS is usually bilateral. Previous studies have suggested that the HMCAS is a common finding when CT is performed within a few hours from the onset of symptoms. The HMCAS has been associated with severe neurological deficit, extensive brain damage, and poor clinical outcome.

Mortality percentage in severe stroke group (NIHSS =15) is upto 41.2%, whereas in mild to moderate stroke group (NIHSS <15) is upto 4.3%. Among the 131 patients survived, 108 patients required a mean hospital stay of 7-10 days. Twenty three patients required acute hospital stay more than 2 weeks.

Out of 19 patients, 17 patients died within 2 weeks of hospital stay and 2 patients died after 2 weeks of hospital stay. Out of 17, 12(85.7%) had initial NIHSS score of more than 15.

Though there is no significant difference noted, majority of deaths were noted in less than 2 weeks of hospital stay in the severe stroke group. This may be due to expansion of cerebral edema and increased ICP. Patients should be monitored closely for any signs of major neurological improvement or deterioration.

The NIH Stroke Scale is a convenient, rapidly applied scale for neurological assessment that correlates with other measures of stroke outcome, such as infarct size on CT[10,11].

The relationship of NIHSS score with final outcome varies according to the time elapsed from stroke onset[12,13], in part because early stroke-related deficits tend to be unstable, and because many patients experience gradual recovery. Thus, the NIHSS score associated with a specific disability outcome shifts to lower values over time. One study found that the best predictor of poor prognosis at 24 hours was an NIHSS of >22, and the best predictor at 7 to 10 days was an NIHSS score of >16.

The median (IQR) of NIHSS score at the time of admission was 8 (3 to 13). The median (IQR) of NIHSS score at the time of discharge was 4 (1 to 10). Scores at discharge consists of only 131 patients, 19 patients were excluded who died. Our results indicate that significant recovery, as assessed by the NIH Stroke Scale, occurs early after acute stroke in patients treated with conventional therapy. Outcome was best predicted by the risk factor association and infarct volume on CT.

Limitations of the study

Since the study is limited for 6 months, only 150 patients with ischemic stroke were enrolled in the study.Patients were followed only during the hospital stay. Subsequent follow-ups were not feasible.

CONCLUSION

Awareness regarding the clinical features of stroke should be propagated. Early recognition of symptoms leads to early hospitalization, treatment and interventions. Knowledge about identifying and reading radiological investigations will help in assessing the severity of stroke.NIHSS is helpful in identifying persons with stroke from those suspected to have stroke. NIHSS is useful in patient assessment and stratification for further course of management.

Stroke severity was best correlated with NIHSS score and infarct volume. The NIHSS score on the day of admission and volume of infarct on CT predicts the outcome of stroke and thus prognosis of stroke.

The NIHSS score on the day of admission is useful in selecting patients for whom early intervention (intravenous thrombolysis) will be beneficial those who comes in window period (3-4.5 hours). Most of the patients with stroke recover satisfactorily with conventional treatment and NIHSS score at the time of discharge reflects these changes. Early recognition of risk factors and specifically treating them can lead to prevention of stroke and its permanent disability.

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