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Original Research Article

A PROSPECTIVE STUDY ON RISK FACTORS, CLINICAL PROFILE AND ONE-MONTH OUTCOME IN ISCHEMIC STROKE PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Stroke is a major cause of morbidity and mortality worldwide, with ischemic stroke comprising 85% of cases. The burden of stroke in India is on rise due to the rising prevalence of vascular risk factors such as hypertension, diabetes, and smoking. Understanding clinical profile, risk factors and short-term outcome of ischemic stroke is crucial for improving stroke management and rehabilitation strategies. **Objective:** This study aims to evaluate the clinical profile, risk factors and one-month functional outcomes in ischemic stroke patients at a tertiary care hospital in India.

Materials and Methods: Total 54 patients with ischemic stroke, confirmed by neuroimaging, were included in this prospective observational study at Jagjivan Ram Hospital. Data on demographic characteristics, vascular risk factors and stroke severity (assessed using the National Institutes of Health Stroke Scale, NIHSS) were noted at baseline. Functional outcomes at one month were assessed using the modified Rankin Scale (mRS). Statistical analysis was performed to identify predictors of poor outcomes.

Results: The mean age was 62.07 ± 10.36 years, with a male predominance (64.8%). The most common risk factors were hypertension (75.93%), diabetes mellitus (59.26%), and smoking (29.63%). Hemiparesis (84.4%) and dysarthria (70.37%) were the most prevalent clinical presentations. Large artery atherosclerosis was the most common mechanism of ischemic stroke. The 30 day functional outcome was grade 0 for 50% of the thrombolysed patients and grade 1 for the remaining 50%. At one-month follow-up, 40.74% had poor outcomes (mRS≥3), and 3.7% had died. Higher NIHSS scores, atrial fibrillation, and large artery strokes were significantly associated with poor prognosis ($p < 0.05$).

Conclusion: Hypertension, diabetes, and smoking remain the leading modifiable risk factors for ischemic stroke. Stroke severity at presentation is a strong predictor of short-term functional outcomes. Early detection, aggressive risk factor control, and timely rehabilitation can improve prognosis. The functional outcome after 1 month is much better in the thrombolysed patients emphasizing the importance of timely management.

Keywords: Ischemic stroke, risk factors, clinical profile, stroke outcome, modified Rankin Scale, NIHSS.

INTRODUCTION

Stroke is a major global public health problem. According to the Global Burden of Diseases (GBD) study in 1990, stroke was the second leading cause of death worldwide. Subsequent efforts to update the GBD study reported nearly 5.87 million stroke deaths globally in 2010, as compared to 4.66 million in

1990. This indicated a 26 per cent increase in global stroke deaths during the past two decades. With the rising proportion of mortality, stroke still remains the second leading cause of death worldwide.[1]

Stroke is defined by the World Health Organization as a clinical syndrome consisting of rapidly developing clinical signs of focal (or global in case of coma) disturbance of cerebral function lasting more than 24 hours or leading to death with no apparent cause other than a vascular origin.[2] Stroke is classified broadly into three categories; ischemic stroke, hemorrhagic stroke and subarachnoid hemorrhage. Ischemic stroke occurs due to blockage of blood vessel which limits the blood supply to the brain whereas hemorrhagic stroke occurs due to rupture of blood vessel leading spillage of blood in the intracranial cavity.[3] It is estimated that approximately 85% are ischemic stroke, 12% are intra cerebral hemorrhages and 3% are subarachnoid hemorrhages.[4]

Ischemic stroke may be either due to thrombosis or embolism. It is often difficult to clinically distinguish between the two. Usually, Embolic strokes occur suddenly and the neurological deficit is maximum at the onset. Thrombotic strokes occur less abruptly and take longer time for the stroke to evolve. Thrombosis of vessels may lead to artery-to-artery embolism. Stenosis occurs most commonly due to atherosclerosis and plaque deposition.[5] The major risk factors include hypertension, diabetes, dyslipidemia, smoking, and cardiac diseases. Although stroke care has improved, the outcomes of acute ischemic stroke remain poor due to delayed hospital presentation, lack of awareness, and limited access to thrombolysis.[6]

Literature on ischemic stroke in India remains limited, with few studies analyzing the clinical profile, risk factors, and outcomes in a prospective manner. This study was thus conducted at a tertiary care center in India to evaluate these parameters, which can aid in improving stroke prevention strategies and management protocols.

MATERIALS AND METHODS

Study Design and Setting: This was a prospective, hospital-based observational study conducted at Jagjivan Ram Railway Hospital, Mumbai, over a period of two years (July 2022 – June 2024) with a follow up period of 1 month. The study was approved by the institutional ethical committee. Study was conducted as per declaration of Helsinki after taking written informed consent from all participants.

Inclusion Criteria: Adults aged >18 years diagnosed with ischemic stroke via CT/MRI.

Exclusion Criteria: Patients with hemorrhagic stroke, transient ischemic attack (TIA), brain tumors, CNS infections, or post-traumatic brain injury.

Data Collection: 54 patients of acute ischemic stroke patients were included in the study. Their clinical presentation, vessel involvement, risk factors and their respective percentage were calculated. The data was then compared with the studies carried out worldwide and in the Indian subcontinent and noted for any differences in the association of risk factors.

A structured case proforma was used to collect data on: Demographic details (age, sex, socioeconomic status), Risk factors (hypertension, diabetes, dyslipidemia, smoking, alcohol use, history of stroke), Clinical presentation (hemiparesis, cranial nerve involvement, altered sensorium, speech disturbances), time of symptom onset, Imaging findings (CT/MRI localization of stroke), Mechanism of stroke, Stroke severity, Treatment modality and outcome measures (NIHSS at baseline and mRS at one-month follow-up).

Statistical Analysis: Data were analyzed using SPSS software (version 21.0). Continuous variables were expressed as mean ± standard deviation, and categorical data were presented as percentages. The chi-square test and independent t-test were used to compare variables. A p-value of <0.05 was considered statistically significant.

RESULTS

We enrolled a total of 54 patients, the age in our study participants ranged from 36 years to 83 years, with median of 63 years and mean of 62.07±10.36 years Majority (21/54 ,38.89%) were in the age group of 61-70 years, Hypertension was the most common comorbidity associated (41/54, 75.93%). Other baseline features are presented in table 1, 2 and figure1, 2. Majority of the enrolled patients in the study suffered from moderate stroke with a score of 5-15 (83.33%), 9.26% had moderate to severe stroke (score 16-20), while 5.56% cases had severe stroke (score: 21-42). (Table 2). Other baseline clinical features and findings are depicted in table. The mean time taken from symptom onset to hospital arrival was noted to be 44.30 ± 31.14 hours, with a median of 48 hours, and a range of 2 hours to 360 hours as depicted in Table 3. Only 2 patients arrived within the window period for thrombolysis. (I.e. within 4.5 hour of symptom onset)

Laboratory findings were noted, 77.78% patients had raised hsCRP, 68.52% patients had raised postprandial blood sugar, 37.04% patients had raised fasting blood sugar, 29.63% patients had raised HbA1c% in diabetes and 18.52% cases had urine sugar present while 5.56% cases each had raised serum creatinine and serum uric acid respectively. Echocardiographic abnormalities noted in study include, left ventricle (LV) dysfunction in 3 patients, LV hypertrophy (LVH) in 2 patients, while one patient each had mitral valve abnormality, aortic valve abnormality, mural thrombosis and septal defect. (Table 4)

Table 1: Baseline variable (n=54)

Variable	
Age, y, mean±SD	62.07 + 10.36
Age group (years)	
31-40 years	2 (3.70%)
41-50 years	5 (9.26%)
51-60 years	12 (22.22%)
61-70 years	21 (38.89%)
>70 years	14 (25.93%)
Gender of participants	
Male, n, %.	35 (64.81%)
Female, n, %	19 (35.19%)
Risk factors- comorbidities	
Hypertension (HTN)	41 (75.93%)
Diabetes mellitus (DM)	32 (59.26%)
Cardiac disease	12 (22.22%)
Dyslipidemia	4 (7.41%)
Obesity	2 (3.70%)
TIA	0 (0%)
Risk factors- Personal habits	
Smoking	16 (29.63%)
Alcohol	11 (20.37%)
Tobacco	13 (24.07%)
Risk factors -History status	
Personal history of CVA	8 (14.81%)
Family history of CVA	4 (7.41%)

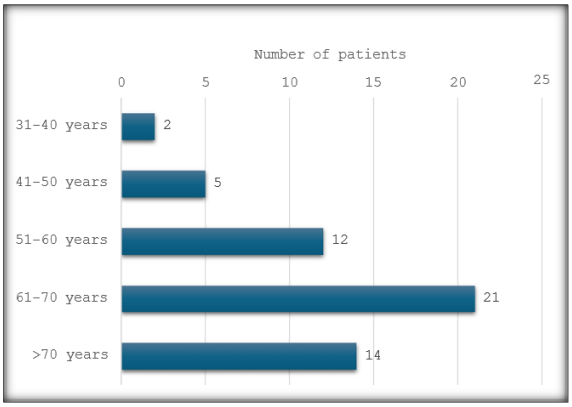

Figure 1: Age distribution in study

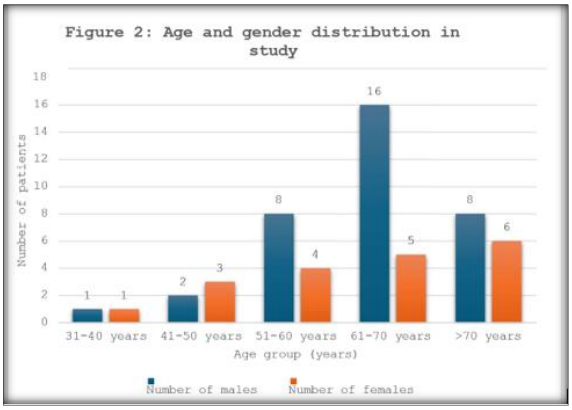

Figure 2: Age and gender distribution in study

Table 2: Clinical features, findings and NIHSS score noted at baseline

Clinical features noted in study	
Limb weakness	45 (83.33%)
Dysarthria	38 (70.37%)
Altered sensorium	18 (33.33%)
Headache	5 (9.26%)
Imbalance	4 (7.41%)
Vomiting	3 (5.56%)
Seizures	3 (5.56%)
Loss of consciousness	1 (1.85%)
Motor function assessment noted in study	
Monoparesis	2 (4.44%)
Hemiparesis	38 (84.44%)
Hemiplegia	3 (6.67%)
Quadriparesis	1 (2.22%)
Quadriplegia	1 (2.22%)
NIHSS status noted in study	
0 = no stroke	0 (0%)
1-4 = mild stroke	1 (1.85%)
5-15 = moderate stroke	45 (83.33%)
16-20 = Moderate to severe stroke	5 (9.26%)
21-42 = Severe stroke	3 (5.56%)

Table 3: Mean time taken from symptom onset to hospital arrival

Parameters assessed (in hours)	Calculated values
Mean time since symptoms onset	44.30 ± 31.14
Median time since symptoms onset	48
Minimum time since symptoms onset	2
Maximum time since symptoms onset	360

Table 4: Key laboratory, echocardiographic and holter findings noted in the study

Key blood and urine laboratory findings noted in study	
Raised serum creatinine	3 (5.56%)
Raised hsCRP	42 (77.78%)
Raised serum uric acid	3 (5.56%)
Raised fasting blood sugar	20 (37.04%)
Raised postprandial blood sugar	37 (68.52%)
Raised HbA1c% in diabetes range	16 (29.63%)
Urine sugar present	10 (18.52%)
2D-echocardiography findings noted in study	
LV systolic dysfunction (LVEF <40%)	3 (5.56%)
LVH	2 (3.7%)
Mitral valve abnormality	1 (1.85%)
Aortic valve abnormality	1 (1.85%)
Mural thrombosis	1 (1.85%)
Septal defect	1 (1.85%)
On Holter study, 3 patients had atrial fibrillation	

Abnormalities in computed tomography (CT) imaging was noted in a total of 6 /54 patients on initial presentation, of which four had mild hypodensities in left MCA territory, one had hypodensities in left fronto-parietal region, while one patient had ill-defined hypodensities in left ganglio-capsular region. The key affected areas of the brain on MRA included parietal region (40.74%), temporal (25.93%), ganglio-capsular region (24.07%), frontal (18.52%) and occipital (9.26%). The left side was affected most on MRA, in 61.11% cases. Right side was affected in 31.48% while bilateral areas being affected in 7.41%. (Table 5 and figure 3). Other details of the MRA brain are listed below in table 5.

Table 5: MRA brain findings noted in study according to region and side involved

Findings	Number (% of cases)
MRA brain findings noted in study (region involved)	
Parietal	22 (40.74%)
Temporal	14 (25.93%)
Ganglio-capsular region	13 (24.07%)
Frontal	10 (18.52%)
Occipital	5 (9.26%)
Cerebellum	4 (7.41%)
Internal capsule	4 (7.41%)
Basal ganglia	3 (5.56%)
Thalamo-capsular	3 (5.56%)
Corona radiata	2 (3.70%)
Subcortical	2 (3.70%)
Pons	1 (1.85%)
MRA brain findings noted in study (side involved)	
Bilateral	4 (7.41%)
Right	17 (31.48%)
Left	33 (61.11%)

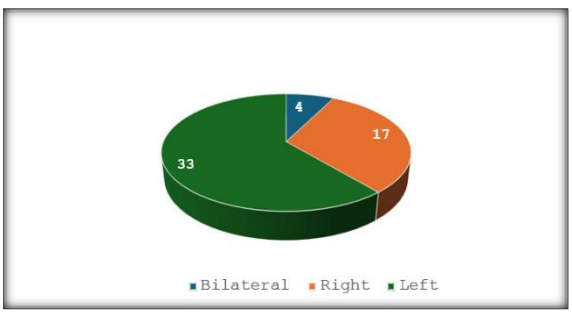

Figure 3: Side of involvement based on MRA Brain findings

Most patients in the study had involvement of MCA (n=43, 79.63%). 3 patients had PICA involvement, 2 patients each had PCA and multivessel involvement. One patient each had SCA, ICA and small penetrating branches involvement. (Table 6). Mechanism of stroke in each of the patients is as mentioned in Table 7. All patients were given antiplatelet treatment, 8 patients (14.81%) were given anticoagulation while 2 patients who arrived within window period underwent thrombolysis. Other patients arrived far beyond the window period and thus weren't considered for thrombolysis. 7 out of 54 patients were eligible for mechanical thrombectomy as per the eligibility criteria and were given an option

of mechanical thrombectomy but was not performed due to negative consent by those patients. One patient underwent decompression craniectomy 7 days after stroke onset in view of rising intracerebral pressure. (Table 8). Modified Rankin Scale (mRS) status was noted in study at 1 month. Most patients in the study had mRS grade 2 or 3 (n=21, 38.89% and n=16, 29.63%) disease respectively at 1-month follow-up. 8 patients (14.81%) had grade 1 disease while 3 patients each had grade 0 or grade 4 disease. One patient (mRs – 6) succumbed within 30 days of stroke onset due to sepsis secondary to aspiration pneumonia, a complication of stroke. (Table 9) The 30 day functional outcome was grade 0 for 50% of the thrombolysed patients and grade 1 for the remaining 50%. The functional outcome after one month for the remaining non thrombolysed patients was grade 2 for majority of patients accounting to 38.89%.

Table 6: Arterial distribution status noted in study

Artery involved	Number of cases	% cases
ICA	1	1.85%
MCA	43	79.63%
ACA	0	0.00%
PCA	2	3.70%
PICA	3	5.56%
SCA	1	1.85%
Small penetrating branches	1	1.85%
Multivessel involvement	2	3.70%

Table 7: Mechanism of Stroke

Mechanism of stroke	Number of patients
Large artery atherosclerosis	26 (48.14%)
Small artery occlusion	11(20.37%)
Cardo embolic	8 (14.83%)
Other determined etiology	6 (11.11%)
Other undetermined etiology	3 (5.55%)

Table 8: Treatment administered in study participants

Treatment administered	Number of cases	% cases
Antiplatelet	54	100.00%
Anticoagulation	8	14.81%
Thrombolysis	2	3.70%

Table 9: Modified Rankin Scale (mRS) status noted in study at 1 month

mRS Grade	Number of cases	% cases
Grade 0	3	5.56%
Grade 1	8	14.81%
Grade 2	21	38.89%
Grade 3	16	29.63%
Grade 4	3	5.56%
Grade 5	2	3.70%
Grade 6	1	1.85%

DISCUSSION

The research included a total of 54 patients. The average age was observed to be 62.07 + 10.36 years, with a median age of 63 years. The age range spans from 36 to 83 years. Out of the patients included in the research, 21 (38.89%) fall into the age bracket of 61- 70 years, 14 (25.93%) patients are beyond 70 years old, and 12 patients (22.22%) were between 51-60 years.

In the study by Itagi et al., the mean age was 58.49±13.97 years.[7] This is very similar to that noted in our study. The most common age group was 61 to 70 years (27.00%), a finding similar to our study. It was interesting to note that 3.7% patients diagnosed with ischemic stroke were noted to be between 31-40 years of age, and 9.26% patients between 41-50 years. Some researchers have reported an increase in the occurrence of ischemic stroke in the age group between 30 and 45 years. A clinical study performed by Khan JA et al. reported incidence of stroke was higher in patients (26%) between 15 and 45 years of age.[8] Furthermore, a case series study by Vohra et al. reported that 34% of their stroke patients were under the age of 50 years.[9]

1. Risk Factor Profile

Our study found hypertension (75.93%), diabetes (59.26%) and smoking (29.33%) as the most common risk factors, consistent with previous Indian studies. These findings underscore the need for strict blood pressure and glycemic control.

2. Clinical Presentation and Stroke Severity

The high prevalence of limb weakness (83.33%) and dysarthria (70.37%) aligns with other studies. The predominance of MCA infarcts (79.63%) further confirms this.

3. Treatment Gaps and Outcomes

Only 3.7% of patients received thrombolysis, highlighting delayed hospital presentation. The high disability rate (56.5% at one month) emphasizes the need for early rehabilitation programs and better public awareness of stroke symptoms.

CONCLUSION

This study highlights the high burden of modifiable risk factors in ischemic stroke patients. Despite advances in treatment, stroke-related disability remains high, emphasizing the need for early intervention, secondary prevention, and rehabilitation programs.

Key Takeaways

1. Hypertension and diabetes are the leading risk factors.
2. MCA infarcts are most common.
3. Functional outcomes are better in the thrombolysed patients.
4. Delayed hospital arrival limits thrombolysis use.
5. Better public awareness and early rehabilitation are crucial.

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