

Original Article

A PROSPECTIVE OBSERVATIONAL STUDY ON RISK FACTORS AND MANAGEMENT OF STROKE AT A TERTIARY CARE TEACHING HOSPITAL

MALIHA FATHIMA¹, SANJEEDA NAJEEB¹, SUMAIYA FATIMA¹, SYEDA MASEERA KHALID¹, SYEDA RANA NIKHAT², RAM CHANDAR RAO³

¹Pharm. D. MESCO College of Pharmacy, Hyderabad, Telangana, India, ²Department of Pharmacology, MESCO College of Pharmacy, Hyderabad, Telangana, India, ³Department of General Medicine, Osmania Medical College and Osmania General Hospital, Hyderabad, Telangana, India
Email: syedanikhath@yahoo.com

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ABSTRACT

Objectives: To determine the prevalence of stroke and its management with various risk factors, i.e. non-modifiable and modifiable at a tertiary care teaching hospital.

Methods: It is a prospective and observational study conducted over a period of six months including established cases of stroke. The study was carried out in 100 patients to evaluate risk factors and management of stroke. The data obtained with the designed data collection form were analyzed using Odds ratio and Chi-Square test.

Results: Ischemic stroke accounted for 70% of cases followed by Intracerebral Hemorrhage (20%) Subarachnoid hemorrhage (5%) and Transient Ischemic Attack (5%). Out of 100 patients, there were 74 male and 26 female patients, indicating males at higher risk. Majority of patients were between the age group 41-60 y. based on the Odds ratio hypertensive and alcoholics were more prone to stroke occurrence and recurrence. Chi-Square test performed for age and gender was not significant at significance level $P < 0.05$.

Conclusion: In this study, ischemic stroke was most prevalent. Hypertension was the major risk factor indicating strong evidence of stroke occurrence and recurrence. The factors having the major implication in the development of stroke were Hypertension, Alcoholism, Smoking, Diabetes Mellitus, Epilepsy, Coronary Artery Disease, Tobacco, and others. Proper management includes non-pharmacological (physiotherapy) along with pharmacological treatment (Osmotic diuretics were most commonly prescribed followed by hypolipidemics, cognition enhancers, anticoagulants, dual antihypertensive therapy).

Keywords: Ischemic stroke, Transient ischemic attack, Intracerebral hemorrhage, Subarachnoid hemorrhage, Hypertension, Alcoholism

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INTRODUCTION

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 h or leading to death with no apparent cause other than vascular origin [1]. Stroke is becoming an important cause of premature death and disability in low-income and middle-income countries like India. The estimated adjusted prevalence rate of stroke range 84-262/10,000 in rural and 334-424/10,000 in urban areas. The incidence rate is 119-145/10,000 based on recent population-based studies there is also a wide variation in case of fatality rates with the highest being 42% in Kolkata [2]. In China, 1.3 million people have a stroke each year and 75% live with varying degrees of disability as a result of stroke [3].

Age, gender, race, ethnicity, and heredity have been identified as markers of risk for stroke. Some of the common modifiable risk factors are High blood pressure, Tobacco use, Diabetes, High cholesterol, Atrial fibrillation or another heart disease, Transient ischemic attacks (TIAs), Cigarette Smoking, Alcohol, Migraine. Various lifestyle factors have been associated with increased risk of stroke. These include obesity, physical inactivity, diet, and acute trigger such as emotional stress.

Ischemic stroke (caused by blood clots), Hemorrhagic stroke (caused by ruptured blood vessels that cause brain bleeding) and Transient ischemic attack (TIA) (a "mini-stroke" is a transient episode of neurologic dysfunction caused by ischemia) are three main types of stroke [4].

An ischemic stroke is a sudden neurologic deficit that results from focal cerebral ischemia associated with permanent brain infarction (e. g., positive results on diffusion-weighted MRI).

A transient ischemic attack is focal brain ischemia that causes sudden, transient neurologic deficits and is not accompanied by permanent brain infarction. Intracerebral hemorrhage is focal bleeding from a blood vessel in the brain parenchyma. Subarachnoid hemorrhage is sudden bleeding into the subarachnoid space. The most common cause of spontaneous bleeding is a ruptured aneurysm [5].

The study represents an important resource to progress our understanding of the causes of stroke, both in estimating the contribution of known modifiable risk factors for stroke and in identifying and clarifying the role of new ones, such as genetics. The study was carried out to create awareness among the healthcare professionals and patients regarding its risk factors and management. The health professionals need to promote stroke awareness and provide education to caregivers at discharge and to both survivors and their caregivers after discharge. The objective of present study was to determine the prevalence of stroke and its management with various risk factors, i.e. non-modifiable and modifiable, at a tertiary care teaching hospital.

MATERIALS AND METHODS

Study design and study duration

A prospective observational study was conducted after taking Institutional review board approval (MCP/PD/PR/21) in General Medicine, Department of Osmania General Hospital, Hyderabad, India. The study was conducted for a period of six months (December 2016-May 2017) on 100 patients diagnosed with a stroke.

Inclusion criteria

Patients of either sex above 18 y of age diagnosed with stroke, RTA patients with hemorrhage.

Exclusion criteria

Pregnant women, HIV or AIDS patient, patients who refused to be the part of the study, patients unable to respond to verbal questions with no caretakers.

Data analysis

All the relevant and necessary data was collected from: patient's case notes, patients' prescription prescribed by a physician, laboratory report, interviewing the patient or patient caretaker and healthcare professionals. All the patients admitted at Osmania General Hospital were screened for stroke. Each subject's detailed history regarding age, sex, weight, socioeconomic status, rural or urban, history of hypertension, history of stroke and its treatment was given, social habits and any comorbid conditions were collected.

The selected patients were observed for signs and symptoms, the presence of hemorrhage if any, in the cerebrovascular region by CT Scan, motor functioning and improvement in the symptoms following the treatment.

Statistical analysis

Descriptive statistics were used for the representation of data. Odds Ratio was used to measure the strength of association between the risk factors and the occurrence of stroke. Chi-square test was used to determine the relationship between categorical variables.

RESULTS

Over a period of six months, a total of 100 patients were included in the study out of which 76 were males and 24 were females.

Incidence of stroke

The incidence of Ischemic stroke was 70%, accounting for the majority of the cases followed by Intracerebral hemorrhage (20%), Transient ischemic attack (5%), Sub-Arachnoid hemorrhage (5%). The incidence of ischemic stroke was more when compared to other types. The Ischemic stroke was found to be most prevalent in all the age groups. People in the age group 41-60 y are more prone to develop stroke (table 1). Males are more prone to develop all types of stroke when compared to females (table 2). Hypertension is the most common risk factor accounting for 75 cases followed by Alcoholism, Smoking, Diabetes Mellitus and other factors (table 3).

Management

Non-pharmacological management

Patients were asked to undergo regular physiotherapy sessions to remediate impairments and promote mobility, function, and quality of life.

Other non-pharmacological treatment includes frequent position changes and to engage in a passive or active range of motion exercises to strengthen stroke-impaired limbs.

Table 1: Categorization of patients based on age group

Age group	Ischemic stroke	Transient ischemic attack	Subarachnoid hemorrhage	Intracerebral hemorrhage
18-40 y	7	1	1	5
41-60 y	30	2	3	11
>60 y	31	2	1	4

Table 2: Categorization of patients based on gender

Gender	Ischemic stroke	Transient ischemic attack	Subarachnoid hemorrhage	Intracerebral hemorrhage
Total	70	5	5	20
Males	55(78.5%)	4(80%)	2(40%)	15(75%)
Females	15(21.42%)	1(20%)	3(60%)	5(25%)

Table 3: Categorization based on risk factors

S. No.	Risk factors	No. of cases
1	Hypertension	75
2	Alcoholism	54
3	Smoking	43
4	Diabetes mellitus	30
5	Epilepsy	16
6	Tobacco chewer	12
7	Coronary artery disease	9
8	Respiratory tract infections	4
9	Electrolyte imbalance	3
10	Cardiomyopathy	2
11	Pulmonary disease	2
12	Meningitis	2
13	Atrial fibrillation	2
14	A migraine	1
15	Psychiatric illness	1
16	Cirrhosis of liver	1
17	Cancer	1
18	Acute kidney injury	1

Pharmacological management

The pattern of prescribed drug therapy is given in table 4. In TIA, Osmotic diuretics were most commonly prescribed (100%), followed by hypolipidemic (69%), antiplatelet (60%), dual antihypertensive therapy (55%), cognition enhancers (20%) (table 5). In Subarachnoid hemorrhage, Osmotic diuretics were most

commonly prescribed (100%), followed by hypolipidemics (100%), calcium channel blocker (80%), antianxiety (40%), cognition enhancers (40%) (table 6). In case of intracerebral hemorrhage as well, Osmotic diuretics were most commonly prescribed (90%), followed by hypolipidemics (65%), cognition enhancers (40%), antianxiety (35%), antiplatelet (20%), calcium channel blockers (10%) (table 7).

Table 4: Drug utilization pattern in ischemic stroke

S. No.	Class of drug prescribed	% of drug utilized
1	Hypolipidemic	92.8%
2	Osmotic diuretic	75.7%
3	Dual antihypertensive therapy	75%
4	Antiplatelets	71.4%
5	Cognition enhancers	31.4%
6	Anti-anxiety	17.14%

Table 5: Drug utilization pattern in transient ischemic attack

S. No.	Class of drug	% of drug utilized
1	Osmotic diuretic	100 %
2	Hypolipidemic	69%
3	Antiplatelet	60%
4	Dual antihypertensive therapy	55%
5	Cognition enhancers	20%

Table 6: Drug utilization pattern in subarachnoid hemorrhage

S. No.	Class of drug	% drug utilized
1.	Osmotic diuretic	100%
2.	Hypolipidemics	100%
3.	Calcium channel blocker	80%
4.	Antianxiety	40%
5.	Cognition enhancers	40%

Table 7: Drug utilization in intracerebral hemorrhage

S. No.	Class of drug	% of drug utilized
1	Osmotic diuretic	90%
2	Hypolipidemics	65%
3	Cognition enhancers	40%
4	Anti-anxiety	35%
5	Antiplatelets	20%
6	Calcium channel blocker	10%

Statistical analysis

Apart from descriptive statistics, odds ratio, confidence interval and the significance level were used to measure the strength of association between risk factor and the occurrence of stroke. Based upon odds ratio, hypertension and alcoholism have a

significant strength of association between risk factor and the occurrence of stroke (table 8). The chi-square statistic based on age is 5.5739 of p -value 0.472572 and the result is not significant at $*p < 0.05$ (table 9). The chi-square statistic based on gender is 3.8612 of p -value 0.276846 and the result is *not* significant at $*p < 0.05$ (table 10).

Table 8: Odds ratio for various risk factors

S. No.	Risk factors	Odds ratio	Confidence interval	Significance level
1	Hypertension	3	1.7645-5.1007	P=0.0001
2	Alcoholism	1.1739	0.7256-1.899	P=0.5136
3	smoker	0.7544	0.4653-1.2232	P=0.2530
4	Diabetes Mellitus	0.4286	0.2574-0.7135	P=0.0011
5	Epilepsy	0.1904	0.1043-0.3478	P<0.0001
6	Coronary artery disease	0.0989	0.0472-0.2071	P<0.001
7	Tobacco chewer	0.1364	0.702-0.2648	P<0.0001
8	Respiratory infections	0.0417	0.1448-0.1176	P<0.001
9	Electrolyte imbalance	0.309	0.0095-0.1008	P<0.0001
10	Cardiomyopathy	0.0204	0.0049-0.0580	P<0.0001
11	Pulmonary diseases	0.0204	0.0049-0.0580	P<0.0001
12	Meningitis	0.0204	0.0049-0.0580	P<0.0001
13	Migraine	0.0101	0.0014-0.0738	P<0.0001
14	Psychiatric Illness	0.0101	0.0014-0.0738	P<0.0001
15	Cirrhosis Of Liver	0.0101	0.0014-0.0738	P<0.0001
16	Cancer	0.0101	0.0014-0.0738	P<0.0001
17	Acute Kidney Injury	0.0204	0.0049-0.0580	P<0.0001
18	Atrial Fibrillation	0.0204	0.0049-0.0580	P<0.0001

Table 9: Chi-square test based on age group

Age group	Ischemic stroke	Transient ischemic attack	Subarachnoid hemorrhage	Intracerebral hemorrhage	Row total
18-40	8 (10.5) [0.60]	1 (0.75) [0.08]	1 (0.75) [0.08]	5 (3.00) [1.33]	15
41-60	31 (32.90) [0.12]	2 (2.35) [0.05]	3 (2.35) [0.18]	11 (9.40) [0.27]	47
>60	31 (26.60) [0.73]	2 (1.90) [0.01]	1 (1.90) [0.43]	4 (7.60) [1.71]	38
column totals	70	5	5	20	100

Table 10: Chi-square test based on gender

Gender	Ischemic stroke	Transient ischemic attack	Subarachnoid hemorrhage	Intracerebral hemorrhage	Row total
Male	55 (53.2) [0.06]	4 (3.80) [0.01]	2 (3.80) [0.85]	15 (15.20) [0.00]	76
Female	15 (16.80) [0.19]	1 (1.20) [0.03]	3 (1.20) [2.70]	5 (4.80) [0.01]	24
column totals	70	5	5	20	100

DISCUSSION

In present study evidence of stroke was observed in 100 patients, the incidence of ischemic stroke was found out to be the highest which was consistent with Chachu kuriakose *et al.* (2016) [6]. Hypertension, Diabetes mellitus, Coronary artery disease, cigarette smoking, tobacco chewer, epilepsy, etc., were all found to have a high risk for stroke occurrence.

The stroke cases that were collected in our study, accounted for 76 males and 24 females, which gives a clear idea that the occurrence of stroke is more common in males compared to females, which was in accordance with Laxman Wagle *et al.* (2017) [7]. This may be due to heavy alcohol consumption and cigarette smoking in males. It was also found that ischemic stroke is the most prevalent of all stroke types in both the genders.

Age is also considered as one of the risk factors in our study. The results that were obtained showed that patients in the age group of 41-60 y accounted a larger number followed by geriatrics, the age above 60 y. Again ischemic stroke was the most prevalent of all types of stroke.

The various risk factors were observed and their association with stroke was analyzed. There has not been a single study before that included so many risk factors which are the major strength of our study.

The most prevalent risk factor in the present study was found to be hypertension, out of 100 patients, 75 patients were hypertensive, which was in accordance with Sahbanathul missriya *et al.*, (2017) [8]. Thus, maintaining BP within normal range was found to be helpful to prevent stroke occurrence and recurrence. This was found consistent with Parveen *et al.*, (2003) [9], which reported that overall lowering BP was associated with significant reduction in all types of stroke. It was reported from previous studies that recurrent stroke was reduced when BP was controlled at <120/80 mm of Hg, conducted by Gary *et al.* (2003) [10]. Our results also imply for BP that "lower is better" as a goal in reducing stroke recurrence risk, which was found to be consistent with the study of Gary *et al.* (2003) [10].

The patients who were given dual antihypertensive therapy were at lower risk of developing stroke and patients newly diagnosed with stroke were managed better when compared to monotherapy. Our study found to be consistent with studies conducted by Parveen *et al.* (2003) [9] wherein they reported that reduction in stroke events was simply related to the magnitude of BP reduction an assertion supported by PROGRESS trial, in which Dual therapy was superior to monotherapy in lowering both BP and Stroke risk.

Alcoholism is another important risk factor having a high incidence in our study, out of 100 patients, 54 were alcoholic among which majority were heavy drinkers which indicated an increased risk of all stroke types. Our study was found to be in accordance with Larsson *et al.* (2016) [11], which reported that heavy alcohol consumption was associated with an increased risk of all stroke types but with a stronger association with hemorrhagic type.

Smoking is the third most prevalent risk factor accounting for 43 patients out of 100 patients. It was found that chronic cigarette smokers were at a higher risk of developing stroke compared to non-smokers, this was in accordance with Robert *et al.* (1986) [12].

where they found out that cigarette smokers had 2-3 times the risk of thromboembolic or hemorrhagic stroke, after controlling for age, DBP, CHD and other risk factors. In our study, we also found out that former smokers are also at a risk of developing stroke.

About 30 patients out of 100 were found to have DM, indicating that it is another risk factor associated with both stroke occurrence and recurrence. Kothari *et al.* (2002) [13], people with type II DM are at elevated risk of stroke compared with those without DM.

In the present study, patients with an increase in cholesterol levels were significantly associated with stroke. It was also found that HDL was protective against stroke which was inconsistent with Thomas *et al.* (2003) [14], which states, HDL may be protective against stroke, whereas, elevated levels of LDL, TC may pose as a risk factor for the development of stroke.

Restroke was observed in 26 patients out of 100. Mostly, in patients with elevated BP and also in patients with more than one comorbidity. Alcoholism and cigarette smoking also play an important role in developing restroke.

It was found that proper management at the proper time can be life-saving. In delayed hospital admission, thrombolytic therapy is not effectively reported by Tapas Kumar *et al.* (2016)[2].

Osmotic diuretics were most commonly prescribed, followed by hypolipidemics, cognition enhancers, anticoagulants, etc. Osmotic diuretics were administered in almost all patients and were found to be beneficial in reducing ICP, thus helping to prevent further worsening of the condition.

Based on the comorbid conditions the required treatment was provided and was found to be beneficial. Physiotherapy sessions were conducted in patients whose overall condition has been stabilized and it was found to be beneficial in improving the mobility of the patient.

CONCLUSION

The present study has focused on risk factors and management of stroke, ischemic stroke was found to be more prevalent. The risk factors play an important role in the development and progression of the disease. Among non-modifiable risk factors, males of age group 41-60 y were more prone to stroke occurrence and stroke recurrence was more prevalent in the age group above 60 y. Among the modifiable risk factors, Hypertension accounted for 75% of the cases clearly indicating strong evidence of elevated BP levels with stroke occurrence and recurrence.

The following factors had an implication in the development of stroke in following order:

Hypertension>Alcoholism>Smoker>DiabetesMellitus>Epilepsy>CAD>Tobacco>Respiratory Infections>Electrolyte Imbalance> Pulmonary Diseases = Meningitis = Cardiomyopathy = Atrial Fibrillation = Acute Kidney Injury>Migraine = Psychiatric Illness = Cirrhosis of Liver = Cancer

The goal of therapy should be to treat co-morbid conditions which will help to lessen the risk for the development of restroke. Proper management includes non-pharmacological interventions along with pharmacological treatment.

AUTHORS CONTRIBUTIONS

It was a collective work of all the authors. Maliha Fathima (Pharm. D), Sanjeeda Najeeb (Pharm. D), Sumaiya Fatima (Pharm. D), Syeda Maseera Khalid (Pharm. D) were responsible for literature review, data collection, data entry, data analysis, manuscript writing. Ms. Syeda Rana Nikhat contributed for data analysis, manuscript writing along with other authors and responsible for communication.

LIMITATIONS

The limitation of our study includes small sample size and short duration of the study.

CONFLICT OF INTERESTS

The authors declare no competing financial interest

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