



AN OBSERVATIONAL STUDY OF THE CLINICAL PROFILE AND RISK FACTORS IN PATIENTS OF STROKE ADMITTED IN A TERTIARY CARE HOSPITAL IN WESTERN MAHARASHTRA

Medicine

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ABSTRACT

INTRODUCTION: Stroke is the commonest neurological cause of morbidity & mortality all over the world, being the second most frequent cause of death after heart diseases and most frequent cause of permanent disability. There are a number of risk factors associated with stroke; hypertension, diabetes mellitus, tobacco use, anemia and hyperlipidemia being the most important ones. The socioeconomic burden to meet the costs of management of chronic debilitating diseases like stroke is enormous and therefore emphasis on preventive strategies of stroke is crucial as it alters the incidence, course & the prognosis of the disease. It is of the utmost significance to know the important risk factors associated with stroke in a particular community. This study was therefore conducted to find out the modifiable risk factors in the stroke patients of western Maharashtra.

AIMS AND OBJECTIVES: This observational study was conducted in department of medicine from February 2013 to June 2014 to study the clinical profile and risk factors in patients of stroke. Fifty stroke patients admitted in the medical ICU were studied. **RESULTS** Tobacco use (82%) was the commonest risk factor for stroke, closely followed by Hypertension (80%). Hyperhomocysteinemia (58%), Dyslipidemia (48%), and Obesity (46%) ranked 3rd, 4th and 5th respectively in the list. Contributions by metabolic syndrome, diabetes mellitus and alcohol was 36%, 30%, 30% and 12% respectively. Twenty six percent patients had left ventricular hypertrophy (LVH) and 12% had atrial fibrillation (AF). Severe carotid stenosis was present in 8% of patients, while moderate carotid stenosis in 10%.

CONCLUSION: A positive, statistically significant relationship between age, sex, hypertension, diabetes mellitus, tobacco use, obesity, metabolic syndrome, hyperhomocysteinemia and stroke was observed.

KEYWORDS

Stroke, Ischemic, Hemorrhagic, Risk Factors

INTRODUCTION

WHO defined stroke as "rapidly developed clinical signs of focal (or global) disturbance of cerebral function; lasting more than 24 hours of onset, leading to death or disability with no apparent cause than vascular origin".¹ Stroke is the commonest neurological cause of morbidity & mortality all over the world, being the second most frequent cause of death after heart diseases and most frequent cause of permanent disability.² A global systematic review of population-based stroke studies has documented that the incidence rate of stroke in low to middle income countries (LMICs) has increased from 56/100,000 person-years during 1970-1979 to 117/100,000 person-years during the period 2000-2008. This study has also reported a decrease in the stroke incidence from 163 per 100,000 person-years in 1970-1979 to 94 per 100,000 person-years during 2000-2008 in high-income countries (HICs) indicating approximately 42% decrease in stroke incidence in HICs and more than double increase in stroke incidence in LMICs, during the past four decades.³

According to the Global Burden of Diseases (GBD) study, stroke is the second leading cause of death worldwide. Subsequent efforts to update the GBD study reported nearly 6.167 million stroke deaths and 132.051 million disability adjusted life years (DALYs) globally in 2017, as compared to 4.362 million deaths and 98.876 million DALYs in 1990.^{2,4} This indicated a 26% 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. According to the estimates from the GBD study in 2001, over 85 per cent of the global burden of stroke was borne by low- and middle-income countries (LMICs).²

In cerebrovascular survey report for National Institute of Neurological Disorder and Stroke (NINDS), Kurtzke JF reported incidence of stroke from 182 to 342 per 100,000 populations in Asia.⁵ Most studies have recorded a larger number of ischemic (embolic/thrombotic) strokes (57.3% to 89.7%) as compared to hemorrhagic strokes (13.6% to 37.9%).⁶ While there have been reports of reduction in stroke incidence and mortality in developed countries, the opposite has been observed in LMICs.⁷ Also, the overall early stroke case fatality in LMICs is found

to be 25% higher than that seen in high-income countries in the past decade.⁸ As life expectancy increases, India will face enormous socioeconomic burden to meet the costs of management of chronic diseases such as stroke⁴ and hence, preventive approaches to the stroke play an important part as it alters the course & the prognosis of the diseases. There are number of risk factors associated with stroke. The Indian Council of Medical Research (ICMR), WHO and several other studies have found hypertension, diabetes mellitus, tobacco use, anemia and hyperlipidemia as the most important risk factors for ischemic stroke.^{9,10,11} On the other hand, cerebral venous sinus thrombosis (CVST), subacute tubercular meningitis leading to arteritis, autoimmune angiitis, coagulopathy and raised anticardiolipin antibodies (ANCA) are important risk factors for stroke in young.^{12,13,14}

Any preventive strategy essentially involves lifestyle modification and management of modifiable risk factors; therefore, it is of utmost significance to know the important risk factors associated with stroke in a particular community. This study was conducted to find out the modifiable risk factors that can be modified by intervention, thereby reducing the possibility of stroke. Reliable information on major risk factors of cerebrovascular accident (stroke) in a defined population would help plan preventive strategies in that particular area.

AIMS AND OBJECTIVES:

To study the clinical profile and risk factors in patients of stroke

MATERIAL AND METHODS

This observational study was conducted in department of medicine from February 2013 to June 2014. Fifty stroke patients admitted in the medical ICU were studied. These patients were evaluated according to a preset proforma.

Inclusion Criteria:

All patients above 18 years of age of either sex who were clinically diagnosed as stroke and consented to be included in the study.

Exclusion Criteria:

Patients in whom CT Scan or MRI brain revealed pathology other than

stroke like, tuberculomas, tumor, epidural or subdural hematoma and multiple sclerosis and also patients with neurological deficit secondary to trauma.

The diagnosis of different stroke subtypes was made, based on clinical examination and ancillary investigations. Ischemic stroke was diagnosed when a focal deficit was present and infarct was found on neuroimaging. Also, a normal CT scan with absent bleeding was considered to be an ischemic stroke. A detail history was taken regarding the onset and progression of neurological deficit with special emphasis on risk factors of cerebral infarction like hypertension, diabetes mellitus, ischemic heart disease, previous strokes or TIAs, valvular heart disease, alcohol use, smoking and obesity. In female patients detailed obstetrical, menstrual history and history of contraceptive pills was taken. Previous records were scrutinized when available.

All patients underwent routine investigations including but not limited to hemogram, urine routine, bleeding time, clotting time, prothrombin time (INR), blood urea and serum creatinine, blood sugar random and fasting, serum electrolytes, X-ray chest and Electrocardiogram (ECG), Lipid profile, serum homocysteine (Hcy) level, echocardiography and Carotid Doppler study. Other relevant investigations were carried out on case to case basis.

OBSERVATIONS AND RESULTS

In present study, out of fifty patients included in the study, 30 (60%) were male and 20 (40%) were female (Table 2). Out of 50 patients, 35 had ischemic stroke, 10 had hemorrhagic stroke, three patients had cortical venous sinus thrombosis (CTVS) and two patients suffered from subarachnoid hemorrhage (SAH). Twenty (40%) patients were of 61 to 70 years of age group. Out of thirty-five patients of ischemic stroke, most (16) were from 61 to 70 years age-group. In 10 patients of hemorrhagic stroke, there was no predominance of any age group. Two patients who had subarachnoid hemorrhage were 61 to 70 years old. Three patients of CVST were from 51 to 70 years of age group. Five (two male and three female) patients (10%) were below the age of 40 years. In this group, three patients had ischemic stroke and two hemorrhagic. Two had hypertension as a risk factor. Table 2 shows age and sex wise distribution of stroke patients.

Hypertension was present in 40 patients (80%), 21 of these were newly detected and only 10 of 19 known hypertensives were on regular treatment. Seventy percent of hypertensives had ischemic stroke while 22.5% suffered from hemorrhagic stroke. Out of three CVST patients, one patient had hypertension, while all patients of SAH were hypertensive. Hypertension is a statistically significant risk factor for ischemic stroke ($p < 0.05$).

In present study, 15 patients (30%) were diabetic. Ten (66.6%) patients had ischemic stroke, 20% hemorrhagic and two patients had CVST. Only seven of the diabetics were on regular treatment and two were newly detected. Forty-four percent of stroke victims were tobacco chewer and 40% were smoker (30% current and 10% past). Overall prevalence of tobacco use was 82% when both, tobacco chewers and smokers were combined. Out of 10 patients of hemorrhagic stroke (80%) were tobacco user. Out of 35 patients of ischemic stroke 29 (82.8%) were tobacco user. Both patients of SAH and two out of three patients of CVST were tobacco user. Tobacco use is a statistically significant risk factor for strokes of all types ($p > 0.001$). Twelve percent patients consumed alcohol, whether current or past. The difference of alcohol consumption was not found to be a significant risk factor ($p > 0.05$).

In this study, twenty-four (48%) out of 50 patients had dyslipidemia and out of these, 66.6% suffered ischemic and 25% suffered hemorrhagic stroke. The difference was statistically not significant. Twenty-nine patients had Hyperhomocysteinemia (HHcy); out of these 79.4% patients suffered from ischemic stroke and 10.6% had hemorrhagic stroke. All the three patients of CVST had HHcy. Four out of five (80%) young stroke patients had HHcy. This difference was statistically significant ($p < 0.05$). Forty-six percent patients had obesity. Fifty-seven percent of patients with ischemic stroke had raised WHR, while 20% of hemorrhagic had the same. Obesity was statistically significant risk factor for ischemic stroke ($p < 0.05$). Metabolic syndrome (MetS) was identified in 18 patients. Seventy-two-point two percent of patients with MetS had ischemic stroke and only 22% had hemorrhagic stroke. Presence of MetS was

statistically significant risk factor ($p < 0.05$). The prevalence of different risk factors with stroke is shown in Table 3 and prevalence of risk factors for stroke in young is shown in Table 4.

Tobacco use (82%) was the commonest risk factor for stroke in our study, closely followed by Hypertension (80%). Hyperhomocysteinemia (58%), Dyslipidemia (48%), and Obesity (46%) ranked 3rd, 4th and 5th respectively in the list. Contribution by metabolic syndrome, diabetes mellitus and alcohol was 36%, 30% and 12% respectively. Twenty-six percent patients had left ventricular hypertrophy (LVH) and 12% had atrial fibrillation (AF).

DISCUSSION

As per the World Health Organization (WHO), stroke is the third largest killer in India after coronary artery disease and all types of cancers.¹⁵ Current treatment for patients with established stroke is relatively ineffective and role of neuroprotective medication is not established. About 70% of stroke survivors remain vocationally impaired and more than 30% require assistance with activities for daily living. Risk factors identification and effective intervention offers a real hope of reducing stroke morbidity and mortality. Certain risk factors have been consistently identified as significant predictor of stroke, while some are less consistent.

Type of stroke:

In our study, 70% of patients were of ischemic stroke and 20% had hemorrhagic one. This finding is comparable to Das SK et al and Feigin VL et al, Dalal PM et al, Arjundas D et al and Sridharan SE et al.^{16,17,18} Percentage of patients with subarachnoid hemorrhage was nearly comparable to study by Arjundas V et al (3%), Sridharan SE et al (4.8%) and Feigin VL et al (0.8%-7.0%).^{15,17,18}

Risk Factors:

Age & Sex: Mean age of patients in our study was 59.5 +/- 14.21 years with females having higher age than males. This is comparable with that of studies by Dalal PM et al and Sridharan SE et al but not with that of Feigin VL et al who found much higher average age (70 years in males and 75 in females).^{8,18,19} In our study, the ratio of male to female was 1.5 which is consistent with other studies by Arjundas V et al, Das R et al and Sridharan SE et al (in rural population).^{15,17,20} However, in urban areas incidence of CVA was found higher in females (Das R et al, Sridharan SE et al). While it was nearly equal in Dalal PM et al's study.^{8,20} The lower incidence of CVA in females may be because of circulating estrogen before menopause that has protective effect against atherosclerosis.

Hypertension

Hypertension was found in 26 male and 14 female stroke patients; that is, out of 50 stroke patients in the present study, 80% had hypertension, which is nearly comparable with study by Feigin VL et al (84.8%), Dalal PM et al (82.8%) Sridharan SE et al (83.2%) and Das SK et al (79%). This was high when compared to study by Millionis et al (47%) and Arjundas D et al (51%). The value is statistically significant ($p < 0.05$). Maximum incidence was found in age group 61-70 and 51-60 years showing older the patient, higher the association of stroke with hypertension.^{8,15,16,18}

Diabetes Mellitus:

Total number of stroke patients with diabetes mellitus were 15 (30%), which was comparable with Millionis HJ et al (28%).²¹ In study by Sridharan SE et al and Arjundas D et al, 50% and 49.8% of stroke patients had diabetes which was high when compared with our studies. Out of 15 diabetics, 66.7% had ischemic stroke, while 20% had hemorrhagic stroke. The result obtained were statistically significant ($p < 0.05$).

Most of the diabetic stroke patients (14 out of 15) had hypertension. The relationship between diabetes and hypertension is complex. A synergistic effect exists between the two; leading to a final common pathway for vasculopathy causing stroke.²² Also nine out of 15 diabetic stroke patients had dyslipidemia. Other coexisting risk factors were hyperhomocysteinemia and tobacco consumption in any form.

Dyslipidemia:

Forty-eight percent of cases had dyslipidemia. Out of these, 66.6% suffered ischemic and 25% suffered hemorrhagic stroke. In present study, 17 out of 24 dyslipidemia cases had low levels of HDL-C and only six patients had high LDL-C values. Isolated low serum HDL-C

increases the risk of cerebral infarction but not of intracerebral hemorrhage (Arjundas D et al and Shahar et al). Association between high LDL-C and stroke has not been found except one study by Shahar E et al.^{17,23}

Tobacco Use:

Smoking is one of most potent risk factors for atherosclerosis, which can be modified and when reduced, can clearly decrease risk of stroke. In our study, total of 41 (82%) patients gave history of tobacco consumption in any form like chewing, snuffing or smoking. This was found to be statistically significant. They had other coexisting risk factors like hypertension (13), diabetes (4), dyslipidemia (10), and significant carotid artery stenosis (5). Forty percent of hemorrhagic stroke patients and 25.75% of ischemic stroke patients were smokers. Remaining tobacco users consumed other forms of tobacco like gutkha, khaini and mishri. Results obtained are higher when compared with Sridharan SE et al (26.8%), Mannami T et al (40.1%) and Das R et al (40%); probably because all forms of tobacco consumption were included in the current study.^{15,20,24}

Alcohol:

Twelve cases (24%) of stroke cases consumed alcohol whether current and past. In this study, no patient of hemorrhagic stroke gave history of alcohol consumption, while eleven patients out of 35 (31.42%) of ischemic stroke gave history of alcohol use. The effect of alcohol consumption on stroke is not statistically significant ($p > 0.05$) in a study by Anne I. Christensen et al and moderate alcohol intake was associated with reduced risk of stroke.²²

Obesity:

Twenty-three (46%) patients had obesity on the basis of WHR. Fifty-seven point one (57.1%) patients with ischemic stroke had raised WHR, in comparison to 20% with hemorrhagic one. WHR has been more strongly associated with cardiovascular risk factors such as hypertension, hyperglycemia, hypertriglyceridemia etc. Suk SH et al in the Northern Manhattan stroke study found that the abdominal obesity is an independent, potent risk factor for ischemic stroke in all race-ethnic groups. It is a stronger risk factor than BMI and has a greater effect among younger persons.²⁵

Metabolic Syndrome:

Metabolic Syndrome (MetS) was present in 18 (36%) patients. Of these, 72% had ischemic stroke while 22% suffered hemorrhagic stroke. The difference is statistically significant ($p < 0.05$) and hence, MetS is considered a strong independent risk factor for ischemic stroke. Prevalence of MetS was 37% in ischemic stroke which is nearly comparable with Millionis WT et al (46%) and Boden-Albala et al (44%) but lower than that found by Ashtari et al (62%).^{21,26,27} Each component of metabolic syndrome contributes to the increased risk of IHD and non-embolic stroke.²¹

Hyperhomocysteinemia

was seen in 58% of stroke patients. The result is statistically significant. The prevalence of HHcy reported in various studies has ranged from 25.83% to 100% and hence needs further studies.^{28,29,30}

SUMMARY AND CONCLUSION

For Primary prevention of stroke, identification and modification of risk factor in stroke prone patients is of immense public health importance. Strokes of vascular etiology were studied regarding risk factors. The different subtypes of stroke were Ischemic 70%, Hemorrhagic 20%, Subarachnoid hemorrhage 4%, Cortical venous sinus thrombosis 6%.

Maximum number of patients belonged to 51-60 years age group. Males have a higher incidence of CVA. A positive relationship between age, sex, hypertension, diabetes mellitus, tobacco use, obesity, metabolic syndrome (MetS) and Hyperhomocysteinemia and stroke was observed and that was statistically significant.

Hypertension was commonest risk factor for CVA. Prior to stroke, hypertension was undetected in half of subjects and the remaining were on irregular treatment. Prevalence of MetS was 36% in total stroke cases and 72.2% in ischemic stroke. MetS is a potentially modifiable risk factor for ischemic stroke. Prevalence of Hyperhomocysteinemia was 58% in our total stroke population. It is statistically significant. Risk factor identification and effective

intervention offers a real hope of reducing stroke morbidity and mortality.

TABLE 1: WHO CLASSIFICATION OF STROKE

TYPE	CAUSE	BASIS OF DIAGNOSIS
Ischemic stroke	Sudden occlusion of arteries supplying the brain, due either to a thrombus formed: · Directly at the site of occlusion (thrombotic ischemic stroke), or · In another part of the circulation, which follows the blood stream until obstructs arteries in the brain (embolic ischemic stroke)	Neuro-imaging. It may not be possible to decide clinically or radiologically whether it is a thrombotic or embolic ischemic stroke
Intracerebral Hemorrhage	Bleeding from one of the brain's arteries into the brain tissue. More prevalent in developing countries possibly due to diet, physical activity, insufficient treatment of raised blood pressure and genetic predisposition.	Neuroimaging
Subarachnoid Hemorrhage	Arterial bleeding in the space between the two meninges, pia mater and arachnoid. . Typical symptoms are sudden onset of very severe headache and usually impaired consciousness.	Neuroimaging, or Lumbar puncture.

TABLE NO 2: AGE & SEX WISE DISTRIBUTION OF STROKE PATIENTS

Age	Hemorrhagic	Ischemic	SAH	CVST	Total
<40	2 (20%)	3 (8.6%)	....	....	5 (10%)
41 to 50	1 (10%)	6 (17.1%)	....	....	7 (14%)
51 to 60	3 (30.0%)	3 (8.6%)	....	1 (33.33%)	7% (14%)
61 to 70	....	16 (45.7%)	2 (100%)	2 (66.67%)	20% (40%)
71 to 80	4 (40%)	6 (17.1%)	....	....	10 (20%)
>80	....	1 (2.9%)	....	....	1 (2%)
Total	10	35	2	3	50
Sex	Hemorrhagic	Ischemic	SAH	CVST	Total
Male	6 (60%)	21 (60%)	1 (50%)	2 (66.7%)	30 (60%)
Female	4 (40%)	14 (40%)	1 (50%)	1 (35%)	20 (40%)
Total	10	35	2	3	50

TABLE 3- PREVALENCE OF RISK FACTORS IN STROKE

RISK FACTOR	HEMORRHAGIC	ISCHEMIC	SAH	CVST	TOTAL
DIABETES	3 (20%)	10 (66.7%)	0	2 (13.3%)	15 (30%)
HYPERTENSION	9 (22.5%)	28 (70%)	2 (5%)	1 (2.5%)	40 (80%)
DYSLIPIDEMIA	6 (25%)	16 (66.6%)	1 (4.2%)	1 (4.2%)	24 (48%)
HYPERHcy	3 (10.3%)	23 (79.4%)	--	3 (10.3%)	29 (58%)
MetS	4 (22.2%)	13 (72.2%)	1 (5.6%)	--	18 (36%)
RAISED WHR	2 (20%)	20 (57.1%)	--	1 (33.3%)	23 (46%)
TOBACCO USE	8 (80%)	29 (82.8%)	2 (100%)	2 (66.6%)	41 (82%)
ALCOHOL	--	11 (31.4%)	1 (50%)	--	12 (24%)

Abbreviations-HyperHcy- Hyperhomocysteinemia, MetS- Metabolic Syndrome, WHR- Waist Hip Ratio

TABLE 4: RISK FACTORS IN PATIENTS OF YOUNG STROKE

VARIABLE	FREQUENCY (N=5)
Sex (Male/Female)	2/3
Ischemic/ Hemorrhagic	3/2
Hypertension	2
Diabetes Mellitus	1
Dyslipidemia	1

Smoking	2
Alcohol	1
Hyperhomocysteinemia	4
CCA-IMT> 1 mm	0
aPLA Syndrome	1
Protein S deficiency	1

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