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Clinical Profile and Risk Factors of 104 Patients with Ischemic and Hemorrhagic Stroke and TIA Patients in a Tertiary Care Hospital in Rajasthan

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Abstract

Introduction: The prevalence of heart disease and stroke has increased by over 50 percent from 1990 to 2016 in India. The crude stroke prevalence in India is higher than developed countries. The traditional risk factors for coronary artery disease like smoking, alcohol, dyslipidemia, diabetes, etc. have been found to play lesser roles in stroke causation in various studies. However, stroke scales like NIHSS and mRS have been more predictive on stroke outcome.

Aim of Study: Our study aimed to study the clinical profile and risk factors of 104 patients of stroke attending our hospital from October 2017 to September 2018.

Materials and Methods: 104 patients of stroke admitted in Department of Neurology of Mahatma Gandhi Medical College were taken. Baseline NIHSS score and mRS score at discharge were calculated. Stroke patients were classified into hemorrhagic, ischemic and TIA groups based on clinical features and NCCT Head. Routine investigations like RBS, CBC, Serum creatinine, fasting lipid profile, HbA1c (in diabetics), Serum homocysteine were carried out. Patients suspected to have ischemic stroke were subjected to MRI Brain and CT angiography Brain and neck vessels. Stroke severity was grouped based on NIHSS and mRS scores. Data was analysed by the SPSS software.

Results: Of 104 stroke patients, 23% had hemorrhagic, 72% had ischemic and 5% had TIAs. Of 75 ischemic stroke patients, 64% were male, 36% were female; of 24 hemorrhagic stroke patients, 50% were male and same percent of female; of 5 TIAs, 40% were female and 60% female. Mean age of patients with hemorrhagic stroke was 57.1 yrs, in ischemic stroke was 60.6 yrs and TIAs was 63.8 yrs. Smokers constituted 61% of ischemic stroke group, 33% of hemorrhagic subgroup and 100% of TIAs. HDL levels were lower in ischemic stroke patients and TIAs. NIHSS scores were high in 20% of ischemic and 33% of hemorrhagic strokes. Functional independence on discharge seen in 48% ischemic, 33% hemorrhagic and 100% of TIAs. 78% of ischemic strokes were in MCA territory. LV Diastolic dysfunction seen in most of ischemic and hemorrhagic strokes and all of TIAS.

Conclusion: Ischemic stroke was far more common than hemorrhagic stroke. Middle cerebral artery was most commonly involved. NIHSS and mRS are useful predictors of stroke severity. Further studies required to confirm our observations.

Keywords: *Ischemic; Hemorrhagic Stroke; TIA Patients*

Introduction

The prevalence of heart disease and stroke has increased by over 50%from 1990 to 2016 in India. The total deaths and mortality attributed to these diseases has almost doubled in the last 25 years [1].

In a large study carried out in India the crude stroke prevalence in different parts of India varied from 44.29 to 559/100000 in past two decades. The cumulative incidence of stroke in India as per the study was from 105 to 152 per 100000 persons per year during time period. These values are higher as compared to high income countries [2].

The role of traditional risk factors for coronary artery disease like smoking, diabetes, hypertension and dyslipidemia are less convincing in stroke patients. Among the risk factors, smoking and hypertension are considered most important. The influence of diabetes on burden of stroke is more controversial. Whether dyslipidemia is a risk factor for stroke is still not clear [10].

The effects of the stroke are variable and depend largely on the area of brain damaged and the extent of the damage. Determining the arterial territory involved can provide a clue to the clinical presentation and may aid in outcome assessment.

The present study was performed to study the clinical profile and the risk factors associated with ischemic stroke and hemorrhagic stroke and to find out the relation between serum lipid levels and type of stroke. The arterial territory involved in each ischemic stroke and its link to the stroke outcome was tried to find out.

Materials and Methods

We enrolled 104 patients of stroke attending Mahatma Gandhi Hospital, Jaipur, Rajasthan between the period from October 2017 to September 2018. The diagnosis was made based on the clinical features in combination with brain imaging.

All patients of stroke were subjected to NCCT Head (plain) and of those patients with features of ischemic stroke were subjected to MRI Brain with CT angiography of brain and neck vessels.

Detailed history including substance abuse was taken.

Stroke severity was evaluated on admission using the NIHSS score.

Evaluation of patients were done by investigations like 2DEcho, ECG, CBC, LFT, RFT, Serum electrolytes, Serum homocysteine, RBS and HbA1c.

The patients' functional status was assessed by the modified Rankin scale (mRS) done on admission, on discharge from hospital.

Statistical methods

The collected data were coded, tabulated, and statistically analysed using IBM SPSS statistics (Statistical package for social sciences) software version 22.0.

Descriptive statistics were done for quantitative data as minimum and maximum of the range, as well as mean +/- standard deviation for quantitative non-parametric data, while it was done for qualitative data as number and percentages.

Inferential analyses were done for quantitative variables using independent t test. In qualitative data, inferential analyses for independent variables were done using Chi square test for differences between proportions.

The level of significance was taken at p value </= 0.05 as significant otherwise as non-significant. The correlation between different types of stroke with outcome and severity at presentation was calculated.

Results

Demographic profile and risk factors

Of 104 patients of stroke, 24 had hemorrhagic, 75 had ischemic and 5 had TIAs. Out of all hemorrhagic strokes, 50% were male and 50% were female. 64% of ischemic stroke were male and 36% were female. 2 females and 3 males had TIAs.

Mean age of male patients with hemorrhagic, ischemic and TIA patients was 54.5 yrs, 59.6 yrs and 71.3 yrs. Mean age of female patients in these groups was 60 yrs, 62.3 yrs and 52.5 yrs.

Smokers constituted 61% of ischemic patients, 33% of hemorrhagic patients and 100% of TIAs. Only 1 patient of ischemic stroke was alcoholic, 10 patients of hemorrhagic stroke were alcoholic and 2 TIAs were alcoholic. 14 out of 75 ischemic stroke patients were diabetic whereas only 2 TIAs and 1 ischemic stroke patient was diabetic.

Parameter	Hemorrhagic	Ischemic	
Total number (n)	24	75	5
Male	12	27	2
Female	12	48	3
Age (M) (in yrs)	54.5 +/- 14.8	59.6 +/- 13.9	71.3 +/- 7.5
Age (F) (in yrs)	60 +/- 12.8	62.3 +/- 9.3	52.5 +/- 3.5
Smokers	8	46	5
Alcoholics	1	10	2
Diabetics	1	14	2

Table 1: *Demographic profile in stroke patients.*

Distribution of lipids in different groups of stroke patients

Mean LDL levels in Ischemic and TIA patients was below 100 mg/dl and in hemorrhagic patients was 108.17 mg/dl. HDL levels were below 45 mg/dl in ischemic and TIA patients and above 45 mg/dl in hemorrhagic patients. Triglyceride levels were lower than 150 mg/dl in all groups. Values for VLDL were below 30 mg/dl in all groups, that is within normal limits.

	Hemorrhagic	Ischemic	TIA
LDL	108.17 +/- 24.8	96.8 +/- 29.27	76.8 +/- 32.45
HDL	47.7 +/- 15.31	38.8 +/- 10.04	42.4 +/- 8.84
TG	129.45 +/- 77.85	129.36 +/- 60.94	93.8 +/- 17.83
VLDL	26.79 +/- 13.67	26.91 +/- 16.33	18.60 +/- 3.64

Table 2: *Lipid profile in different groups of stroke patients.*

Distribution of NIHSS and mRS in different groups of stroke patients

NIHSS less than 8 was seen in 37% hemorrhagic patients, 43% ischemic patients and 100% of TIAs. NIHSS scores more than 17 seen in 33% hemorrhagic, 20% ischemic stroke patients. mRS scores suggestive of functional independence seen in 33% of hemorrhagic and 48% of ischemic stroke patients. Functional disability on discharge was seen in 64% hemorrhagic and 80% of ischemic stroke patients.

Groups	NIHSS	Number
Hemorrhagic	< 8	9
	8 - 16	7
	>/= 17	8
Ischemic	< 8	32
	8 - 16	28
	>/= 17	15
TIA	< 8	5

Table 3: *Distribution of NIHSS on admission in different groups.*

Groups	Number
Hemorrhagic 1 - 2 3 - 5	8 16
Ischemic 1 - 2 3 - 5	36 39
TIAs 0 - 2	5

Table 4: *Distribution of mRS on discharge in different groups.*

Distribution of ischemic stroke based on arterial territory involved

Of all anterior circulation strokes, 10 involved ACA territory of which 2 were bilateral, 7 were on right and 1 on left. Rest were in MCA territory of which 33 were on right, 23 on left and 3 were bilateral. 19 stroke patients had posterior circulation stroke with 9 in right PCA, 5 in left PCA, 1 was bilateral and 4 involved the brainstem.

Location of stroke		Right	Left	Bilateral
Anterior circulation	ACA territory	7	1	2
	MCA territory	33	23	3
Posterior circulation	PCA territory	9	5	1
	Brainstem	4		

Table 5: *Distribution of ischemic strokes based on arterial territory involved.*

2DEcho findings in different groups of stroke patients

2 hemorrhagic patients, 5 ischemic patients and 1 TIA had enlargement of left ventricle. Left ventricular function was depressed in 12 ischemic stroke patients, 1 patient each in hemorrhagic and TIA groups. Left ventricular hypertrophy was seen in 13 patients of ischemic stroke, 6 hemorrhagic and 2 TIAs. Regional wall motion abnormalities were seen in 9 ischemic strokes and only 1 hemorrhagic stroke. Diastolic dysfunction was a much more common occurrence as found in 50 patients of ischemic, 17 patients of hemorrhagic and all 5 TIA patients. Global hypokinesia could be seen in 1 hemorrhagic and 3 ischemic stroke patients.

Group	LV size (enlarged)	LV function (depressed)	LVH (present)	RWMA (present)	Diastolic dysfunction	Global hypokinesia
Hemorrhagic	2	1	6	1	17	1
Ischemic	5	12	13	9	50	3
TIA	1	1	2	0	5	0

Table 6: *Echocardiographic findings in stroke subgroups.*

Discussion

In our study, mean age of patients with hemorrhagic stroke was 57.1 yrs, of ischemic stroke was 60.6 yrs and of TIAs was 63.8 yrs. As found in a study by Praveen Kumar., *et al.* in Coimbatore where the mean age of stroke patients was 59 yrs [4]. In yet another study, the age group with most common incidence of hemorrhagic stroke was 50 - 60 yrs [5]. The high prevalence in this age group has been attributed to sedentary life style in older population [6].

Incidence of ischemic stroke and TIAs were more in males as compared to females whereas the sex incidence in hemorrhagic stroke is equal. In the same study by Baidya., *et al.* it was seen that prevalence of hemorrhagic stroke was more in males [5]. The prevalence of stroke in male gender is supported by a study by Kuriakose., *et al.* which has been attributed to cigarette smoking, alcohol consumption and lack of protective effects of estrogens [6]. Same observations were seen in another study [7].

Of 104 stroke patients, incidence of ischemic stroke was more than 3 times that of hemorrhagic stroke. This has been supported by other studies and has been ascribed to advanced age, male gender, sedentary lifestyle, hypertension, obesity, prevalence of familial risk factors, etc [6].

Smoking habit was found in two thirds of ischemic strokes, in one third of hemorrhagic strokes and all of TIAs. This higher incidence of ischemic stroke in smokers is due to cerebral thrombosis due to imbalance between brain vascular coagulation and abnormal fibrinolysis as well as disturbed endothelial function. This was also found in a study by Vaidya CV., *et al.* where hypertension and smoking were found to be important risk factors for stroke occurrence [8]. In our study alcoholism was comparatively less common although found in stroke patients. This maybe due to social taboos, higher cost of alcohol and hiding true facts. This was matched well with the same study where the risk factors in descending order were dyslipidemia, smoking, diabetes and alcohol excess [8].

Diabetes as a risk factor was seen in about one fifth of ischemic strokes, two thirds of TIAs and just five percent of hemorrhagic strokes. This incidence of diabetes is supported by another similar study. In a study by Patne., *et al.* [7], this percentage was 14.63% which is slightly lesser compared to our study. This may be an indicator of higher diabetes prevalence or increasing incidence of diabetes in Indian population.

Dyslipidemia with relation to individual components e.g. LDL, HDL were studied against the type of stroke. Surprisingly, mean LDL levels in hemorrhagic patients was above 100 mg/dl and other strokes was below 100 mg/dl. Mean HDL levels in ischemic stroke and TIAs was below 45 mg/dl and hemorrhagic stroke was above this value. Mean TG levels in all groups was below 150 mg/dl. Thus, dyslipidemia was present in ischemic and TIA group with relation to HDL levels only. In a study by Grace M., *et al.* [9], it was observed that majority of hemorrhagic strokes had high HDL cholesterol (> 40 mg/dl) same as in our study. Also, high LDL cholesterol was associated with increased bleeding risk as found in our study. Same as found by us, triglycerides had no link to the type of stroke. However, ischemic stroke was associated with high LDL which was not seen in our study group. Gnanamoorthy., *et al.* also had similar findings with regards to ischemic stroke, and that TG levels were not related to stroke type [10]. This may be attributed to the lower income group being admitted in our hospital.

NIHSS scores of < 8 in 43%of ischemic and 37.5% of hemorrhagic stroke patients and all TIAs. NIHSS scores of moderate severity were seen in 37% of ischemic stroke patients and 29% of hemorrhagic strokes. 20% of ischemic and 32% of hemorrhagic strokes had high NIHSS scores. This can be explained by larger volume infarcts and bleed being referred to Neurosurgery department for decompressive hemicraniectomy. This also suggests that hemorrhagic strokes were more severe at presentation as compared to ischemic stroke.

Functional independence at discharge which was predicted by the mRS scores was seen in 48% of ischemic strokes, in 33% of hemorrhagic and in all TIAs. These values are close to the proportion of strokes presenting with mild severity NIHSS scores on admission, thus corresponding to other studies with these scores [11].

Stroke by arterial territories in ischemic stroke patients in our study group suggested incidence of anterior circulation infarcts to be four times as compared to posterior circulation stroke. This was supported by a study by Mehndiratta., *et al* [12].

Of all ischemic strokes, 13% were of anterior cerebral artery territory of which 9% were on right side. This is contrast to study by Kumar Venkatesh., *et al.* where there was no preference towards laterality in ACA and PCA infarcts [13]. 78% of all ischemic strokes were of MCA territory and subcortical strokes were almost twice as cortical supporting the higher prevalence of small vessel disease compared to

large artery atherosclerosis. This observation regarding incidence of MCA infarcts is same as in a study by Venkatesh., *et al.* [13] as most common territory but the figures are more than 1.5 times that are found in their study. This can be explained by small vessel disease more commonly found in this population as compared to large vessel disease and surgical referral of larger infarcts. Most MCA territory infarcts were right sided as compared to left and bilateral involvement again same as found by Venkatesh., *et al* [13]. Of 19% PCA territory infarcts, right sided were two times as common as left sided infarcts. So, we found an increased prevalence of right sided infarcts as compared to left sided ones. The higher incidence of right hemispheric strokes may be due to increased severity of left hemispheric strokes being referred early to neurosurgery, more patients leaving against medical advise due to poorer responsiveness, etc.

Of all posterior circulation strokes, 15 were in PCA territory and 4 were in the brainstem. This was suggestive of distal infarcts location being more common than proximal as found by Mehndiratta., *et al* [12].

LV diastolic dysfunction was seen in 67% of ischemic strokes as compared to another who found it in 23%. While in hemorrhagic stroke patients this accounted for 71% which was 56% in other studies [14]. While this may be explained by long standing hypertension in our study group but it is evident that hemorrhagic strokes had more frequent incidence of hypertension. Devarapu C., *et al.* had similar findings in hemorrhagic stroke patients [15].

Regional wall motion abnormalities were seen in 12% of ischemic stroke patients, a finding close to 11% found in Find AF randomized trial [16]. Reduced ejection fraction had a higher incidence (16%) in ischemic strokes as compared to just 6% in Find AF trial. Differences in demography and methodology of 2D Echo can be held accountable for this discrepancy [17].

Conclusion

Thus, we found that ischemic stroke was far more common than hemorrhagic stroke. Smokers were more likely to have ischemic stroke. Diabetes and dyslipidemia were not found to be significant in stroke occurrence. Ischemic strokes were most common in middle cerebral artery territory. LV diastolic dysfunction was found to be strongly associated with stroke. NIHSS and mRS scores were found to be predictive of stroke severity. Further studies in this regard will throw light on these observations.

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