A Study on Risk Factors of Stroke

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Abstract:
Context: Non communicable diseases (NCDs) prevalence is increasing in India day by day. Stroke is one of the NCDs which is commonly encountered in hospitals. It may be due to an inadequate blood supply to part of the brain as a result of low blood flow, thrombosis or embolism, or spontaneous haemorrhage into the brain substance or spontaneous haemorrhage over brain substance.
Aims: To determine the risk factors of stroke and its relation with the type of stroke.
Materials and method: It is a Cross-sectional study done on 200 cases of stroke and 200 control groups. Controls are chosen by simple random sampling.
Statistical analysis: Data was analyzed using SPSS version 16. Analysis was done using Chi-square test, t- test and Fisher exact test.
Ethical issue: Ethical approval was taken from the institutional ethics committee before starting the study.
Results: Stroke is more common in males and among people above 60 years of age. Non- employed and government employee had high risk of stroke. Smoking, hypertension and alcohol consumption are important risk factors of stroke in this study. Haemorrhagic stroke is more common than infarct and with more chance of mortality. Smoking and hypertension is common among haemorrhagic stroke patients but diabetes mellitus and hyperlipidemia is common among infarct patients.
Conclusion: Modifiable risk factors are common in stroke patients.
Keywords: Non communicable diseases, Stroke, thrombosis, haemorrhage

I. Introduction

Stroke is a global health problem. It is the second commonest cause of death and fourth leading cause of disability worldwide [1]. Stroke is no longer a disease of the developed world. Low and middle income countries account for 85.5% of total stroke deaths worldwide and the number of disability adjusted life years in these countries was approximately seven times that in high income countries [2].There is a paucity of the population based data about the coexistent proportions of risk factors for stroke in South Asians. Three traditions have contributed to the emergence of the stroke epidemic in India: demographic, life style and socioeconomic [3, 4, 5]. The demographic shift is characterized by increased life expectancy, lifestyle by a shift in food consumption and less physical activity and socioeconomic status with raising living standards by urban elite who adopt western lifestyles [6]. This study was undertaken to evaluate various risk factors in the epidemiology of stroke and ascertain the prevalence of the same for a more comprehensive understanding towards the epidemic of stroke.

II. Materials And Methods

Total of 200 patients with stroke (cases) and 200 patients without stroke (control) of both sexes above 18 years attending Regional Institute of Medical Sciences (RIMS) out patient's department and emergency services and patients admitted in Medicine ward from October 2013 to September 2015were enrolled in the study. Patients having signs and symptoms resolved within 24 hours (to exclude TIA), history of trauma, tumor of brain, sepsis, patients with psychological disorders, past attack of stroke and who failed to give consent were excluded from the study.

Diagnosis of stroke was based on a detailed history, clinical examination and relevant laboratory investigations. To remove bias, controls were selected by simple random method. Questionnaire included data on demographic details including age, sex, ethnicity, social class. Data on prestroke vascular risk factors was obtained from medical record or self reported history by the patient, including that of atrial fibrillation, hypertension, diabetes mellitus, migraine, TIA, dietary habits, alcohol, tobacco use and smoking, heart disease, dyslipidemia, etc. Stroke were classified as subarachnoid haemorrhage (SAH), intracranial haemorrhage (ICH), ischaemic stroke by the help of radiological imaging methods and patients clinical findings.

All routine investigations including blood sugar level (fasting and post prandial by GOD PAP method by RANDOX auto analyzer),lipid profile (fasting), Echocardiogram [left ventricular hypertrophy(LVH) and LV dysfunction],electrocardiogram(ECG) to see LVH and left axis deviation ,serum electrolytes,CT scan of brain

(using the PHILIPS brilliance 64 slice CT scan) and Chest X-ray PA view were taken.

2.1 ADA criteria 2013 for Diabetes:
1. Fasting plasma glucose >126 mg/dl (7.0mmol/dl), after no calorie intake for at least 8 hours
2. Postprandial plasma glucose> 200mg/dl (11.1 mmol/dl), after 2 hours of 75mg of oral glucose

2.2 ATP III 2004 Classification of LDL, HDL and Total cholesterol:
LDL cholesterol
<100   Optimal
100-129   Near Optimal
130-159   Borderline high
160-189   High
>190   Very high
Total Cholesterol
<200   Desirable
200-239   Borderline high
>240   High
HDL cholesterol
<40   Low
>60   High

2.3 JNC criteria 7, 2003 for Hypertension (Htn):
Systolic (mm Hg)   Diastolic (mm Hg)
Normal   <120   <80
Pre hypertensive   120-139   80-89
Stage 1 Htn   140-159   90-99
Stage 2 Htn   >160   >100
Isolated systolic   >140   <90

2.4 Alcohol consumption:
1)   Ex-drinker – left ≥ 1 year
2)   Current drinker-light (<10 g/day)
3)   Current drinker-medium (10-30g/day)
4)   Current drinker-heavy (>30g/day)
5)   Binge drinking (70g within 24 hours of stroke)

2.5 Smoking: Number of smoking pack-year (1pack year= 20 cig/day for 1 year)
Unknown
Non-smoker (ever)
Non-smoker (remote >2 years)
Recent ex-smoker (<2 years)
Statistical analysis: Data was analysed using SPSS version 16. Analysis was done using Chi-square test, t- test and Fisher exact test.
Ethical issue: Ethical approval was taken from the Institutional Ethics Committee, RIMS, Imphal before starting the study. Informed consent was obtained from all the participants.

III.   Results And Observations

In this study stroke cases occurred mostly in age above 60 years (49%) and also with the increase in age there was increased in stroke cases. However in controls the commonest age group was 51-60 years and there was no increasing trend of stroke with age. This finding was found to be statistically significant ($p < 0.05$). Mean age was also statistically higher among cases than controls. Both cases and controls had males patients more than females and this was found to be statistically significant ($p < 0.05$).Almost cent percent of the stroke cases were married (98%) and among the controls also 90% of them were married (p value of 0.017).Non employed respondents had significantly high chance of stroke (p value 0.0001).Meitei were the most common ethnic group having stroke in this study and this finding was statistically significant ($p < 0.05$). Smoking was more common among stroke cases (51%) than controls (41%) and this finding was statistically significant ($p < 0.05$). And stroke was more common in recent smoker than remote smokers. (Table .1)

Table 1: Distribution of respondents by smoking stratified by cases and control

Chi-square test	Total n(%)	Control n(%)	Cases n(%)	Smoking status
	216 (54.0)	118 (59.0)	98 (49.0)	Non-smoker
	184 (46.0)	84 (41.0)	102 (51.0)	Smoker
Value=31.08 p-0.000	54 (13.5)	8 (4.0)	46 (23.0)	Non-smoker (remote)
	130 (32.5)	74 (37.0)	56 (28.0)	Recent smoker
	400 (100.0)	200 (100.0)	200 (100.0)	Total

Hypertension was significantly more among stroke cases than the control group (66% vs 20%). Untreated hypertension had higher chance of stroke than currently treated hypertension (57% vs 9%) (Fig.1). Diabetes mellitus was present in 19 % of stroke cases which is less than that of controls (21%) but the finding is statistically insignificant (chi square value of 0.25,p=0.61).Among cases, 48% were ex and current alcohol drinker whereas in control it was 40%. Current drinker had increased chance of stroke than controls (15% vs. 0%) and this finding was statistically significant (chi square value=22.24, p-0.000). Those having history of AF had significantly increased chance of stroke than controls (5% vs. 0%) (Fisher exact test value=10.26,p value of 0.001). Heart disease was also common in stroke cases than controls (10% vs. 4%) and this finding was statistically significant. History of migraine was not related to the occurrence of stroke (chi square test =5.5, p value of 0.001).
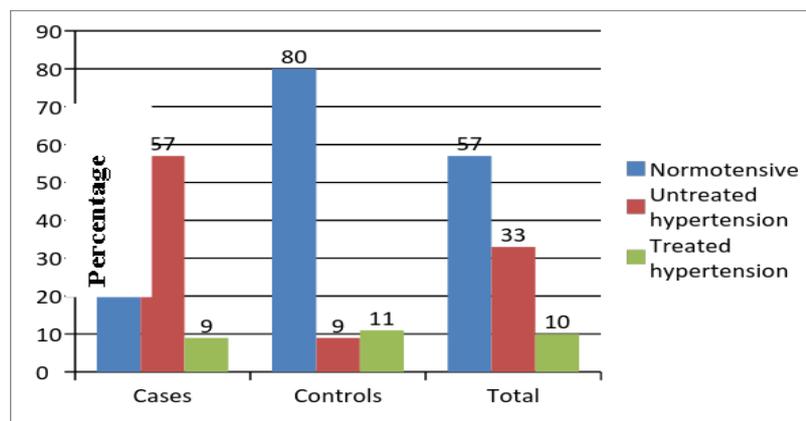
Figure 1: Bar diagram showing distribution of respondents by presence of hypertension stratified by cases and control.

More than half (52%) of the stroke patients were hemorrhagic (Fig.2). Commonest age of infarct is above 60 year of age but for hemorrhage age was lower 41-50 and 51-60 years which is statistically significant (p<0.05). The mean age of infarct was more than that of hemorrhage (62.7±11.8 vs 59 ± 13.6) (Table 2). There was not much difference in the occurrence of type of stroke in between sex (p value of 0.744).There was no significant difference between type of stroke and smoking (p value of 0.377). Hypertension was more common among hemorrhagic stroke and this finding is found to be statistically significant (p<0.05). Diabetes mellitus was significantly more common among infarct cases than hemorrhagic cases (p value of 0.000). Among respondents with dyslipidemia, infarct was more common than hemorrhagic stroke and this finding was statistically significant (p<0.001).
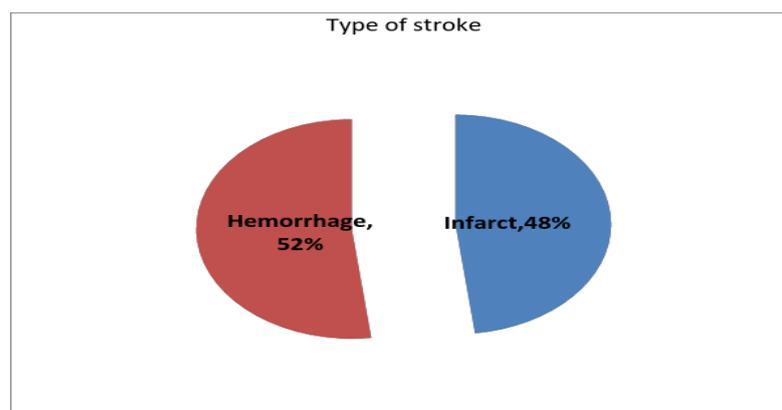
Figure 2: Pie chart showing distribution of stroke patients by type of stroke

Table 2: Relation between age and type of stroke

Chi-square test	Total n(%)	Type of stroke		Age in years
		Haemorrhage n(%)	Infarct n(%)	
	14 (100.0)	10 (71.4)	4 (28.6)	30-40
	30 (100.0)	18 (60.0)	12 (40.0)	41-50
Value=10.25	58 (100.0)	36 (62.1)	22 (37.9)	51-60
p-0.001	98 (100.0)	40 (40.8)	58 (59.2)	>60
	200 (100.0)	104 (52.0)	96 (48.0)	Total
t-test t=3.569 p-0.049		59 ± 13.6	62.7±11.8	Mean ± SD

Table 3: Relation between some variables and type of stroke

Fisher exact test	Total n(%)	Type of stroke		Variables
		Haemorrhage n(%)	Infarct n(%)	
	H/o AF			
	10 (100.0)	4 (40.0)	6 (60.0)	Yes
Value=0.61 p-0.43	190 (100.0)	100 (52.6)	90 (47.4)	No
	H/o heart disease			
Value=0.04	20 (100.0)	10 (50.0)	10 (50.0)	Yes
p-0.85	180 (100.0)	94 (52.2)	86 (47.8)	No
	H/o migraine			
NA*	0 (0.0)	0 (0.0)	0 (0.0)	Yes
	200 (100.0)	104 (52.0)	96 (48.0)	No
	200 (100.0)	104 (52.0)	96 (48.0)	Total
				Mortality
Value= 14.19	14 (100.0)	14 (100.0)	0 (0.0)	Yes
p-0.000	186 (100.0)	90 (47.7)	96 (52.3)	No
	200 (100.0)	104 (52.0)	96 (48.0)	Total

There was no relation between history of atrial fibrillation, heart disease and migraine with the type of stroke as shown in Table 3. All deaths occurred in hemorrhagic stroke patients and this finding was statistically significant (p<0.05).

IV.   Discussion

Stroke occurs mostly in the age group above 60 years in this study. Mean age was 60.9 years with a standard deviation of 12.9 years. This finding was similar with studies by Rajen et al [7] where mean age was 57.1 years and other studies. [8, 13, 14, 16, 18] With the increase in age there was increase in stroke in this study and this finding was supported by Carroll et al [18] study. Male predominance (76% males and 24% females) was seen in this study which is also consistent with many studies. [7,10,11,14,16,19] But in a population-based longitudinal study on stroke disorder by Das et al[9] at Kolkata, India incidence was more in females. Married persons had higher chance of stroke than unmarried individuals. This may be due to more responsibility (stress) among these individuals and other factors which needs to be studied further. Stroke was common in individuals who were government employed and unemployed individuals. This can be explained by sedentary lifestyle involved in these occupation groups. Since the Meitei community is more in this state prevalence of stroke also common in this study which accounted for 80% of the cases.

More than half (52%) of the stroke patients were hemorrhagic in this study. But in the study by Suresh et al [14], Tomar et al [16] and Shrestha et al [1], infarct was more common than hemorrhagic stroke. Commonest age of infarct is above 60 year of age but for hemorrhage is lower 41-50 and 51-60 years which is statistically significant (p<0.05). This is proved by mean age of infarct was more than that of hemorrhage (62.7 vs 59 years). There was not much difference in the occurrence of type of stroke in between sex. Hypertension (66%) was the most common risk factor for stroke in this study. Consistent finding is found in studies by Tomar et al [16], Engstrom et al [15] and Suresh et al. [14] In the study by Shrestha et al [19] smoking was the most common modifiable risk factor for stroke followed by alcohol, hypertension and diabetes mellitus. Hypertension was significantly more among stroke cases than the control group (66% vs 20%). Untreated hypertension had higher chance of stroke than currently treated hypertension (57% vs 9%). Diabetes mellitus was present in 19 %

of stroke cases which is less than that of controls (21%) but the finding was statistically insignificant (p>0.05). Hypertension was significantly more common among hemorrhagic stroke. Smoking was prevalent in 51% of stroke patients. They had higher chance of stroke compared to non-smokers. [18] And stroke was significantly more common in recent smoker than remote smokers. There was no significant difference between type of stroke and smoking.

Stroke patients had alcohol consumption in 48% (ex and current drinker) of cases whereas in control it was 40%. Current drinker had increased chance of stroke than controls (15% vs. 0%) and this finding was statistically significant. Hemorrhagic stroke had more current and ex-drinker than infarct but non drinker was more in infarct. Light drinker had insignificantly more chance of infarct and heavy drinker had more chance of hemorrhagic stroke in this study. In a study by Liu P et al [21] light alcohol intake ($\leq$ 20 g/d) was associated with a lowered risk of ischemic stroke whereas heavy alcohol intake was associated with an elevated risk of stroke, particularly hemorrhagic stroke and all-cause mortality. Those having history of AF had significantly increased chance of stroke than controls (5% vs. 0%). This finding was consistent with the finding by Carroll et al [18] and Engstrom et al. [15] Previous history of heart disease is also significantly common in stroke cases than controls (10% vs. 4%). This finding is supported by finding by Hart et al. [17] Diabetes mellitus was prevalent in 19% of stroke patients. Diabetes mellitus was significantly more common among infarct cases than hemorrhagic cases in this study. This finding is supported by Jamrozik et al [12] where diabetes mellitus was associated with a significantly increased risk of ischemic stroke but a decreased risk of hemorrhagic stroke. Among respondents with dyslipidemia infarct was more common than hemorrhagic stroke and this finding was statistically significant (p<0.05).All deaths were hemorrhagic stroke patients. In most of the studies hemorrhagic strokes were mostly fatal. [16, 20] There was significant difference in the mortality of stroke patients with respect to sex in this study. This finding is supported by finding by Hart et al. [17]

V. Conclusion

This cross-sectional study was conducted in the Department of Medicine in Regional Institute of Medical Sciences, Imphal, Manipur among 200 cases of stroke and 200 cases of control to determine the risk factors of stroke and its relation with different types of stroke. Stroke was common in the age group above 60 years and it increases with the increase in age. Male predominance of stroke is seen in this study. Hypertension was the most common risk factor of stroke followed by smoking, alcohol use and diabetes mellitus. Previous history of atrial fibrillation and heart disease were also associated with increased occurrence of stroke. Infarct was less common than hemorrhagic stroke in this study. Hypertension was more common among hemorrhagic stroke but diabetes mellitus and dyslipidemia were common in infarct. All mortality were due to hemorrhagic stroke.

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