



MODIFIABLE RISK FACTORS IN STROKE: A CASE-CONTROL STUDY

Medicine

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ABSTRACT

INTRODUCTION: Reducing the burden of stroke in the population requires identification of modifiable risk factors. The present study was conducted to assess the prevalence of various risk factors for stroke in the patients admitted to our hospital.

METHODOLOGY: Consecutive indoor patient admitted for stroke in ward or Intensive Care Unit (ICU) were included and were compared with controls, which were selected from the patients admitted in ward who had no history of stroke.

RESULTS: During the study period, we included 92 cases of stroke and 92 controls. We found a significantly higher proportion of obese in the stroke group as compared to the control group (28% vs 3%). A significantly higher proportion of stroke cases had a sedentary lifestyle as compared to controls (78% vs 39%, p value < 0.05). On obtaining detailed dietary intake history, a significantly lower proportion of stroke cases had fruits and vegetable consumption at least 400 gm/day, a significantly higher proportion of stroke cases had oil/ghee consumption more than 40 gm/day and salt more than 5 gm/day. Personal history revealed a significantly higher proportion of smoking, consuming smokeless tobacco and alcohol among stroke cases as compared to controls. Diabetes mellitus and hypertension cases were also significantly more commonly observed among stroke cases as compared to controls.

CONCLUSIONS: Identifying the risk factors and controlling them early is the only plausible way of reducing the burden of stroke in India.

KEYWORDS

Diabetes Mellitus; Hypertension; Risk Factors; Stroke

INTRODUCTION

A stroke is an acute neurologic injury that occurs as a result of one of reduced blood supply to brain tissue. The symptoms of brain ischemia may be transient, lasting seconds to minutes, or may persist for longer periods of time. Stroke is the second leading cause of death, accounting for 11.13% of total deaths, and the main cause of disability worldwide. During the past decade in India, the cumulative incidence of stroke ranged from 105 to 152/100,000 persons per year, and the crude prevalence of stroke ranged from 44.29 to 559/100,000 persons in different parts of the country during the past decade. Approximately 80% of strokes are due to ischemic cerebral infarction and the rest to brain hemorrhage. Risk factors for hemorrhagic and ischemic stroke are similar, but there are some notable differences; there are also differences in risk factors among the etiologic categories of ischemic stroke. Reducing the burden of stroke in the population requires identification of modifiable risk factors and demonstration of the efficacy of risk reduction efforts. There are numerous risk factors for stroke, including both modifiable (e.g., diet, comorbid conditions) and non-modifiable risk factors (e.g., age, race). In addition, risk factors may also be thought of as short-term risks or triggers (e.g., infectious events, sepsis, stress), intermediate-term risk factors (e.g., hypertension, hyperlipidemia) and long-term risk factors for stroke (e.g., sex, race). Risk factors for stroke in the young also likely differ from those in older patients. The present study was conducted to assess the prevalence of various risk factors for stroke in the patients admitted to our hospital.

METHODOLOGY

STUDY DESIGN AND SAMPLING

The present observational study was conducted in the Department of Medicine, DY Patil Hospital, Navi Mumbai. Over a period of one and half year, consecutive indoor patient admitted for stroke in ward or Intensive Care Unit (ICU) were included and were compared with controls, which were selected from the patients admitted in ward who had no history of stroke. For each case one control was selected (ratio 1:1). Patients aged less than 18 years of age, those developing stroke after trauma, space occupying lesion, metabolic encephalopathy or post surgery and pregnant females, those diagnosed with cerebral venous sinus thrombosis on imaging were excluded from the study. The diagnosis of stroke was made clinically by the treating physician and was confirmed by imaging studies. The patients or their attendants were explained the purpose of the study and a written consent was obtained from them before they were enrolled in the study. The study

was approved by the Institutional Ethics Committee.

DATA COLLECTION AND DATA ANALYSIS

Confirmed cases of stroke were assessed using a pre-designed semi-structured questionnaire. The collected data consisted of general epidemiological data, history of present illness, significant past and family history and physical examination findings. If a study participant was spending less than 30 minutes/day for physical activity in the form of house work, brisk walking, running, cycling and other strenuous physical work have sedentary life style. The subjects were questioned regarding their lifestyle, diet and addiction. History of vegetables and fruits consumed in their daily diet, type of diet (veg/mixed), oil/ghee consumed more than 40 g/day, salt consumption daily more than 5g/day, lifestyle (sedentary non sedentary) and history of substance addiction was obtained. Smokers were defined as those using tobacco for smoking since last 2 years or more for more than 3 times a week. Alcoholics were defined as those consuming more than 75g/day of alcohol for more than 3 days week for more than 2 years. For the convenience of patient interview was done when they are recovering and stable and it was cross-checked with relatives/care takers if present. Anthropometric data were collected to calculate Body Mass Index (BMI) for all participants. The data were described and tabulated as frequency distribution tables. The proportion of cases and controls were compared using chi-square or Fisher's exact test, with p value less than 0.05 considered as statistically significant.

RESULTS

During the study period, we included 92 cases of stroke and 92 controls. Most common age group was 51 to 70 years in both the groups (Table 1). There were five participants in both the study groups aged less than 30 years. There were 57 males in the case group and 51 in the control group and were more common than the female participants. Our hospital caters to the urban population more as compared to rural population. This was reflected in our study as well, as urban participants were more common as compared to participants from rural residences. Majority of the participants were educated, as 38% in the case group and 46% in the control group were graduate or above. Overall, both the study groups had a similar distribution of baseline demographic variables. Various risk factors were assessed in both the groups (Table 2). A significantly higher proportion of patients in the control group had BMI less than 24.9 kg/m^2 (8% vs 68%, p value < 0.05) and higher proportion of obese in the stroke group as compared to the control group (28% vs 3%). A significantly higher proportion of

stroke cases had a sedentary lifestyle as compared to controls (78% vs 39%, p value < 0.05). Dietary patterns were similar in the to study groups (p value = 0.36). On obtaining detailed dietary intake history, a significantly lower proportion of stroke cases had fruits and vegetable consumption at least 400 gm/day, a significantly higher proportion of stroke cases had oil/ghee consumption more than 40 gm/day and salt more than 5 gm/day. Personal history revealed a significantly higher proportion of smoking, consuming smokeless tobacco and alcohol among stroke cases as compared to controls. Diabetes mellitus and hypertension cases were also significantly more commonly observed among stroke cases as compared to controls.

DISCUSSION

The present study was conducted to assess the prevalence of various risk factors for stroke in the patients admitted to our hospital. We obtained history from 92 cases of stroke and equal number of controls who did not have a history of stroke. It was observed that many risk factors were significantly more common among stroke cases as compared to controls. A significantly higher proportion of obese and those with sedentary lifestyle were found in the stroke group as compared to the control group. The relationship between physical activity and stroke may be due to the associated decrease in blood pressure, reduction in diabetes, and reduction in excess body weight. A meta-analysis of 1.8 million participants from 97 cohort studies, found that 76% of the effect of BMI on stroke risk was mediated by blood pressure, cholesterol, and glucose levels. Furthermore, we found increased proportion of participants with increased salt and oil consumption as compared to controls. This is important, as diet not only influences the risk of having a stroke, but the risk of developing other factors such as diabetes, hypertension, and dyslipidemia as well. A Mediterranean diet, which is a diet high in fruits and vegetables, reduces the risk of stroke. However, there are several limitations to dietary studies, like recall bias and measurement error, which the investigators should be careful about while collecting data.

In addition, in our study a significantly higher proportion of smoking, smokeless tobacco and alcohol consumption was observed among stroke cases as compared to controls. There is evidence of a J-shaped relationship between alcohol consumption and risk of ischemic stroke, with light to moderate alcohol consumption being protective against stroke, and heavy drinking associated with an increased risk of ischemic stroke, however this needs to be confirmed by large clinical trials. Cigarette smoking also is a major risk factor for stroke, nearly doubling the risk with a dose response relationship between pack-years and stroke risk. It has been reported that smoking cessation rapidly reduces the risk of stroke, with excess risk nearly disappearing 2-4 years after smoking cessation.

In our study population, diabetes mellitus and hypertension were more commonly observed among stroke cases as compared to controls. Diabetes results in various metabolic derangements that can lead to stroke, including stiffness of blood vessels, vascular inflammation, endothelial dysfunction, and heart failure. In addition, hypertension is also an established risk factor for stroke, both ischemic and hemorrhagic. Clinical studies suggest that improvements in nutrition and dietary pattern, beside weight management, in diabetic patients lower cardiovascular disease incidence significantly. Thus, dietary changes can not only reduce the burden of stroke directly, but can reduce the prevalence of diabetes and hypertension as well, which will reduce the burden of stroke indirectly.

There are a few limitations of this study. First, we did not include patients with transient ischemic attack (TIA), as their diagnosis is difficult. These patients can progress to stroke and should be included in future studies. Second, in few cases, patients were not in condition to answer the questions themselves and their history was obtained from their family members, which can introduce observation bias. Last, we did not include laboratory findings of as the medical documentation was incomplete in some cases.

CONCLUSION

We observed a significantly higher presence of various risk factors like obesity, sedentary lifestyle, high salt and oil intake, low fruit and vegetable intake, smoking, alcohol, diabetes mellitus and hypertension among strokes as compared to non-stroke controls. Medical and surgical management of stroke is not widely available in India and where available is beyond the pocket of many Indians. Even with adequate management, complete recovery is not guaranteed.

Therefore, identifying the risk factors and controlling them early is the only plausible way of reducing the burden of stroke in India.

Table 1. Baseline characteristics of the patients included in the study

Patient variables	Stroke cases		Non-stroke controls	
	n	%	n	%
Age group (years)				
Less than 30	5	5%	5	5%
31 to 50	24	26%	25	27%
51 to 70	46	50%	44	48%
More than 70	17	18%	18	20%
Gender distribution				
Females	35	38%	41	45%
Males	57	62%	51	55%
Type of residence				
Urban	61	66%	71	77%
Rural	31	34%	21	23%
Education level				
Illiterate	21	23%	12	13%
Primary	21	23%	19	21%
Secondary	9	10%	12	13%
Higher secondary	6	7%	7	8%
Graduate	26	28%	31	34%
Post-graduate	9	10%	11	12%

Table 2. Comparing risk factors among stroke cases and non-stroke controls

Risk factors	Stroke cases		Non-stroke controls		p value
	n	%	n	%	
Body mass index (kg/m³)					
Normal (18.5-24.9)	7	8%	63	68%	
Overweight(25-29.9)	59	64%	26	28%	<0.05
Obese(>30)	26	28%	3	3%	
Lifestyle					
Sedentary	72	78%	36	39%	<0.05
Non-sedentary	20	22%	56	61%	
Type of diet					
Mixed	54	59%	60	65%	0.36
Vegetarian	38	41%	32	35%	
Fruits and vegetable at least 400 gm/day					
Yes	41	45%	70	76%	<0.05
No	51	55%	22	24%	
Oil/ghee consumption more than 40 gm/day					
Yes	57	62%	35	38%	<0.05
No	35	38%	57	62%	
Salt consumption more than 5 gm/day					
Yes	73	79%	34	37%	
No	19	21%	58	63%	
Smoking					
Yes	46	50%	24	26%	<0.05
No	46	50%	68	74%	
Smokeless tobacco					
Yes	49	53%	24	26%	<0.05
No	43	47%	68	74%	
Alcohol					
Yes	40	43%	21	23%	<0.05
No	52	57%	71	77%	
Past medical history					
DM	51	55%	22	24%	<0.05
Hypertension	60	65%	16	17%	<0.05

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