Original Research Article

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Diabetes mellitus as a risk factor for ischemic stroke: a case control study

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ABSTRACT

Background: In developed countries, stroke is the third most common cause of mortality, following cancer and coronary heart disease. The increase risk is often seen in individuals with diabetes and is associated with poorer clinical outcomes (including higher mortality). That's why assessment of risk factors for stroke are important. **Methods:** This age and sex matched hospital based case control study assessed the risk factors of ischemic stroke in

Methods: This age and sex matched hospital based case control study assessed the risk factors of ischemic stroke in tertiary care hospital for a period of one year. Sample size was calculated for matched case control (1:1 ratio) by n-master software and came out to be 189 pairs. All patients under WHO case definition were enrolled as cases for study purpose, controls were selected from the same hospital with disease other than stroke. Analysis was conducted through calculation of odd ratio (OR) and confidence internal (CI) by using SPSS 22.0 program. Odds ratio (OR) of risk factor was calculated using bivariate analysis.

Results: Results revealed that male: female ratio among the case and control was 2.1:1, mean age of case and control were 58.86 ± 13.03 and 58.21 ± 12.67 . Out of 189 Case, 59 (31.2%) were suffering from diabetes, while only 39 (20.6%) controls were having diabetes mellitus. P value was 0.02, which is significant.

Conclusions: In the present hospital based case control study, it was found that diabetes mellitus was a significant risk factor among the ischemic stroke patients.

Keywords: Diabetes mellitus, Ischemic stroke, Case control study, Odds ratio

INTRODUCTION

World Health Organization (WHO) states that "any rapidly developing clinical signs of focal (or global) disturbance of cerebral function with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin" is stroke; a miserable disorder.¹

Ischemic stroke accounts for 87% of all stroke cases. Apart from mortality, it causes significant morbidity.²

Across the globe the prevalence of diabetes is increasing day by day and it is affecting the poorer countries like India. It is considered as the epidemic of the 21st century.³ In India it is estimated that the prevalence of diabetes is 61.3 million (2011). It is projected that the number will go up to 101.2 million by 2030. So we have to act promptly.⁴

It is observed for the last 30 years the pattern of diabetes has been change. Now it is one of the major killer disease affecting young and middle age people.⁵ Among various type of diabetes, type 2 has been emerged as main culprit for the increasing burden of non-communicable diseases.⁶ In addition to specific complications of diabetes mellitus like nephropathy, retinopathy, etc. some other non-specific complications, notably coronary artery disease and stroke are also increasing in frequency in diabetic patients. It is clearly an important risk factor for stroke, especially in those under 65 years of age.⁷ This is mainly due to atherosclerotic vascular disease, the prevalence of which has increased worldwide.⁸

METHODS

Study area

Himalayan Hospital, Dehradun, Uttarakhand.

Study design

Case control study.

Study duration

1st July 2017 to 30 June 2018.

Study participants

Patients diagnosed with first Ischemic stroke or transient ischemic attack (TIA) within seven days of onset, ready to give written consent and those in the age group 20 years and above were included.

Sample size

It was assumed that 50% is the proportion of exposed controls and 5% is the level of significance with power 90% in order to detect a threefold increased risk and using the formula:⁹

 $n=Z^{2}1-\alpha/2 [(1-P1)/P1+(1-P2)/P2]/[loge (1-\epsilon)]^{2}$

The Sample size was calculated for matched case control (1:1 ratio) by nMaster software. A minimum number of required pairs of case and control came out to be 189.

Ethical approval was obtained from the institute ethical committee (IEC) and a written consent was taken from all study subjects before including them in the study.

Case

The stroke cases were selected as per WHO definition.¹⁰

Control

The controls (1:1) were selected from the same hospital but admitted for conditions other than ischemic stroke. Age (± 5 years) and sex of controls were matched to cases. Only those subjects with stroke free status in past were selected.

Inclusion/exclusion criteria

Patients diagnosed with of first Ischemic stroke or Transient ischemic attack (TIA) within seven days of onset, ready to give written consent and age group 20 years and above were included. Patients who were diagnosed of ischemic stroke after seven days, history of any Ischemic stroke in past and severely ill patients were excluded.

Data collection

A predesigned and pretested modified questionnaire for WHO step-wise approach to chronic disease risk factor surveillance (11) and WHO step wise approach to stroke surveillance were used for data collection. Biochemical investigation including blood sugar of cases and control were done using auto-analyzers.

Analysis

Quantitative parameters such as age were expressed as mean and standard deviation. To ascertain association of risk factor with stroke, the analysis was conducted through calculation of odd ratio (OR) and confidence internal (CI) by using SPSS 22.0 program. In evaluating risk factor, significant p-values were taken as less than 0.05.

RESULTS

Table 1 depicts socio-demographic characteristics of the cases and controls. 128 (67.7%) were male and 61 (32.3%) were female in both group .All subjects were distributed in a range of 20 years age groups: 20-40, 40-60, 60-80 and >80 in both case and control. Among Cases there were equal no of subjects in age group of 40-60 and 60-80 year (43.4% in both) whereas among controls maximum respondents were in age group of 40-60 years (47.1%). Least participants were found in >80 years age group among both cases and controls. Mean age of case and control were 58.86 ± 13.03 and 58.21 ± 12.67 .

Table 1: Demographic distribution of the study subjects (cases and controls) (n=189).

Variables	Cases Control	
Gender		
Male	128 (67.7)	128 (67.7)
Female	61 (32.3)	61 (32.3)
Age group (in years)		
20-40	17 (9)	21 (11.1)
40-60	82 (43.4)	89 (47.1)
60-80	82 (43.4)	72 (38.1)
>80	8 (4.2)	7 (3.7)
Total	189	189
Mean±SD	58.86±13.03 58.21±12.67	

Numbers in parenthesis are percentages.

Table 2 shows that out of 189 case, 59 (31.2%) were suffering from diabetes mellitus, While only 39 (20.6%)

controls were having diabetes mellitus. P value was 0.02, which is significant.

Table 2: Distribution and association of diabetes mellitus in study subjects (n=189).

Diabetes mellitus C	Case	Control	χ^2 , P value	OR	CI
Present 59	59 (31.2)	39 (20.6)	5.51 (0.02)*	1.75	1.09-2.79
Absent 11	30 (68.8)	150 (79.4)			

Numbers in parenthesis are percentages, statistically significant (p value*<0.05, **<0.001, ***<0.0001), OR- odds ratio, CI-confidence interval.

DISCUSSION

In the present study subjects were distributed in a range of 20 years age groups in both case and control. Maximum subjects in cases group were present in age group of 40-60 and 60-80 year (43.4% in both). Similar to our study Hossain et al, showed that stroke events were more common in 40-60 years age group.¹² Abu-Odah et al reported that majority of the cases (60%) and controls (56%) were \geq 50 years of age.¹³ Sorganvi et al also showed a very high proportion, which is 85% of the cases and 83% controls were \geq 50 years of age.⁹

Mean age of case and control was 58.86 and 58.21 years respectively, similar findings were reported by Abu-Odah et al in their study: that mean age of the cases and controls were 54.74 and 53.22 years.¹³ Sorganvi et al, also found approximate same difference in his study i.e. mean age 62.88 years in cases and 61.39 years in controls.⁹ Our study shows that approximately one fourth respondents (98) had history of diabetes of which more 59 (31.2%) were from case group as compared to 39 (20.6%) in control group and risk of stroke is significantly associated with diabetes mellitus (OR=1.75, 95% of C.I-1.09-2.79). Sorganvi et al reported similar data in their study that diabetes mellitus was positive in significantly higher proportion (38%) among stroke cases as compared to controls (15%). They reported that risk of stroke is significantly associated with diabetes mellitus (OR=3.473, 95% of C.I-1.757-6.866).⁹ Khodabande, Iran also reported similar data on diabetes 27% in cases and 15.3% in controls.¹⁴ Kannel et al inspected the relation of diabetes to the cardiovascular complications, in Framingham cohort study. It was found that cardiovascular disease, its risk factors and stroke was higher in diabetic men and women.¹⁵ Hamidon et al reported that diabetes mellitus was a strong risk factor for stroke in his study. Within type 1 and type 2, it was found that type 2 diabetes mellitus to be significantly associated with stroke.¹⁶

CONCLUSION

Our study revealed that age were important and significant risk factors among non-modifiable factors. Among modifiable risk factor like diabetes mellitus was found to be a significant risk factor in patients with Ischemic stroke. It is estimated that the burden of stroke is expected to increase in the poor and middle income countries. Therefore it is very much essential to estimate the risk factors for better understanding the pathophysiology, to make proper prevention strategy to decrease the burden of stroke in the population.

Recommendations

There should be a proper health education and increase in awareness about the primordial prevention of risk factors. People should be motivated and encouraged to undergo regular physical exercises and to avoid sedentary lifestyles. Community based research studies need to be carried for further verification and generalizability of the result of this study. A stronger design study such as a cohort study would further validate the research findings.

Limitation of the study

Being a hospital-based study it cannot provide information about occurrence of stroke in the general population as they are restricted to admitted patients of concerned hospital. Chances of selection bias can't be ruled out as the controls are also selected from the same hospital setup and not from the community.

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