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Original Research Article

Distribution of aetiological types of stroke among the diabetic adults admitted with stroke in a referral hospital: an observational study

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ABSTRACT

Background: Stroke is one of the most devastating disorders worldwide, in terms of morbidity and mortality. Association of comorbid conditions increase severity and chances of unfavourable outcome in stroke patients. Diabetes is one of the vital comorbidity risk factors reported to be associated with occurrence, poor outcome in stroke patients. An increased incidence of stroke has been reported in advanced age among diabetic patients. The aim of this study was to determine the relative distribution of aetiological types of stroke among the stroke patients having diabetes.

Methods: All adults (18-65) admitted in medicine indoor of Midnapore medical college and hospital with a provisional diagnosis of stroke having random blood glucose level ≥ 200 mg/dl and/or h/o diabetes were enrolled and screened for different etiological factors e.g., hypertension, dyslipidemia. Age group and gender wise distribution pattern were also obtained.

Results: A total 384 subjects were included in the study. Hypertension was found to be most common (75%) comorbid condition among participants, followed by dyslipidemia (56%). 77.9% of subjects presented with random glucose level of >200 mg/dl.

Conclusions: stroke of either types is very much prevalent among diabetes. Uncontrolled diabetes along with hypertension and dyslipidemia increases the chance many times. Early detection and prompt therapeutic intervention may reduce the mortality rate overall.

Keywords: Stroke, Diabetes, Hypertension, Dyslipidaemia

INTRODUCTION

Stroke is the second leading cause of mortality, accounting for almost 11% of total deaths, and remains one of the commonest causes of disability worldwide. The major type of stroke is ischemic, which occurs in about 87% of all stroke cases while the remaining 13% is of hemorrhagic type.¹ The incidence of stroke rapidly increases with age, doubling for each decade after age 55. Among adults ages 35 to 44, the incidence of stroke is 30 to 120 of 100,000 per year, and for those ages 65 to 74, the incidence is 670 to 970 of 100,000 per year. Sickle cell disease is the most common cause of childhood stroke, with the highest

incidence between ages 2 to 5 years.² Studies have identified several conditions that increase a person's risk for primary or recurrent stroke. These risk factors are viewed as non-modifiable or modifiable and generally apply to primary and recurrent stroke.³ An international case-control study (inter stroke study) of 3000 stroke cases, and corresponding number of controls, showed that roughly 90% of strokes could be explained by 10 risk factors: 1) hypertension, 2) diabetes, 3) cardiac causes, 4) current smoking, 5) abdominal obesity, 6) hyperlipidemia, 7) physical inactivity, 8) alcohol consumption, 9) diet, and 10) psychosocial stress and depression.⁴ Diabetes mellitus (DM), commonly known as diabetes, is a metabolic

disorder characterized by high blood sugar levels over a prolonged period.⁵ If left untreated, diabetes can cause many complications. Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death. Serious long-term complications include cardiovascular disease, chronic kidney disease, foot ulcers, and damage to the eyes and stroke.⁶ This endocrine disorder has a complex pathophysiology and is one of the vital comorbidity risk factors reported to be associated with occurrence, poor outcome, and recurrence in stroke patients. An increased incidence of stroke has been reported in advanced age among diabetic patients.⁷ This study aims to find out the etiological type of stroke among the in-patient department stroke patients having diabetes. We tried to determine the relative distribution of etiological types of stroke among the in-patient department stroke patients having DM.

METHODS

In this cross-sectional study, patients with diabetes mellitus (DM), including those that were previously diagnosed, presenting with stroke from various etiologies were recruited in the emergency unit, medical wards from January 2018 to June 2019. Eligibility of the participants was in accordance with the world health organization (WHO) definition of stroke as 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. A total 384 adults (age 18-65) admitted in inpatient department of Midnapore medical college and hospital with a provisional diagnosis of stroke with random blood glucose level ≥ 200 mg/dl with symptoms of diabetes (information from patient's relatives provided patient remains unconscious) were recruited as participants. Patients with history of diabetes or patient is on anti-diabetic medications were also included. Diabetes mellitus was defined and diagnosed in accordance to American diabetic association criteria of standards of medical care in diabetes 2018.

Informed consent forms were obtained from each subject or the guardian of the participants in accordance to GCP guidelines. Subjects were assessed thoroughly to find out concomitant co morbidities apart from DM using standard criteria. All the patients enrolled were assessed by neurologists experienced in the subtlety of stroke diagnosis, typing and management. Classification of stroke into hemorrhagic and Ischemic stroke was based on radiological interventions.

RESULTS

A total 384 subjects met the inclusion criteria and were included in the study. It is evident from the above table that in our study stroke is more common in age group between 51-65 (43%) years followed by 41-50 (39.8%) years and 31-40 (14.8%) years. The least common age group of our study was 18-20 (0.3%) followed by 21-30 (2.1%) years. The type of stroke among the study subjects is mentioned

in Table 1. 74.2% (285) patients of the study participants were presented with ischemic stroke and another 25.8% (99) were presented with hemorrhagic stroke (Figure 2). Distribution of study subjects according to the random blood glucose level and HbA1c level is mentioned in Table 2 and Figure 3. Regarding random blood glucose level, it was observed that in the present study 77.9% (299) patients had a random blood glucose level >200 mg/dl and 22.1% (85) patients had a glucose level ranged between 140-200 mg/dl. On HbA1c level we observed 82% (315) patients had a HbA1c level $>6.5\%$ and 18% (69) patients had HbA1c level ranged between 6.0- 6.5% (Table 2). Apart from diabetes the most common comorbid risk factor we observed was hypertension consisting 75.3% (289) patients followed by dyslipidemia involving 56% (215) patients, family history of diabetes accounts for 19.8% (76%) patients, family history of hypertension involving 14.6% (56) patients and ischemic heart disease accounts for 13.5% (52) patients. The least common comorbid risk factor was chronic kidney disease accounts for only 45.8% (176) patients (Figure 4). As we mentioned earlier 285 (74.2%) patients were presented with ischemic stroke among them 38.8% (149) were male and 35.4% (136) were female. Total 99 (25.8%) patients were presented with hemorrhagic stroke among them 14.6% (56) were male 11.2% (43) were female. Above analysis for types of stroke among male and female participants we found no significant difference (p value=0.462) (Table 3) (Figure 5). We tried to find out Age distribution of the study participants who were presented with both hemorrhagic and ischemic stroke. It was seen that in hemorrhagic stroke group the most common age group was 41-50 (43.5) years followed by 51-65 (40.4%) years, and 31-40 (15.1%) years. The least common age group of hemorrhagic stroke was 21-30 years consisting only 1 patient (Figure 6). Whereas in case of ischemic stroke the most common age group was found to be 51-65 (43.9) years followed by 41-50 (38.6%) years, and 31-40 (14.7%) years (Figure 7). As we found hypertension as the most common risk factor, it was observed (table 4) the distribution of study participants according to the stage of SBP and DBP in patients with ischemic stroke and hemorrhagic stroke individually. Above analysis for prevalence of hypertension as a risk factor of stroke among ischemic and hemorrhagic stroke patients we found a very highly significant difference (p value <0.001). Regarding dyslipidemia total cholesterol level >200 was observed in 149 (69.3%) ischemic stroke and 49 (22.8%) hemorrhagic stroke patients. Triglyceride level >150 was observed among 69.8% (150) ischemic and 27.4% (59) hemorrhagic stroke patients respectively (Figure 8).

Table 1: Distribution of stroke types among subjects

Type of stroke	No. of patients	Percentage (%)
Hemorrhagic stroke	99	25.8
Ischemic stroke	285	74.2

Table 2: Prevalence of hyperglycemia among subjects.

Blood sugar level/ mg/dl	No. of patients	Percentage (%)
Blood glucose (R) >200	299	77.9
Blood glucose (R) 140-200	85	22.1
Hb A1c >6.5	315	82.0
Hb A1c 6.0-6.5	69	18.0

Table 3: Prevalence of hypertension risk factor of stroke.

Sex	Hemorrhagic stroke		Ischemic stroke		Total	
	No	%	No	%	No	%
Male (n=205)	56	14.6	149	38.8	205	53.4
Female (n=179)	43	11.2	136	35.4	179	46.6
Total	99	25.8	285	74.2	384	100
Statistic	Odds ratio		95% CI		P value	
	0.8413		0.530-1.333		0.462	

Table 4: Distribution of hypertension among different type of stroke population

Hypertension (n=289)	Hemorrhagic stroke		Ischemic stroke		Total	
	No	%	No	%	No	%
SBP stage-I DBP stage-I	13	4.5	24	8.3	37	12.8
SBP stage-II DBP stage-II	25	8.7	147	50.9	172	59.5
SBP stage-III DBP stage-III	35	12.1	45	15.6	80	27.7
Total	73	25.3	216	74.7	289	100

Chi-square-26.88, p value <0.001 (HS)

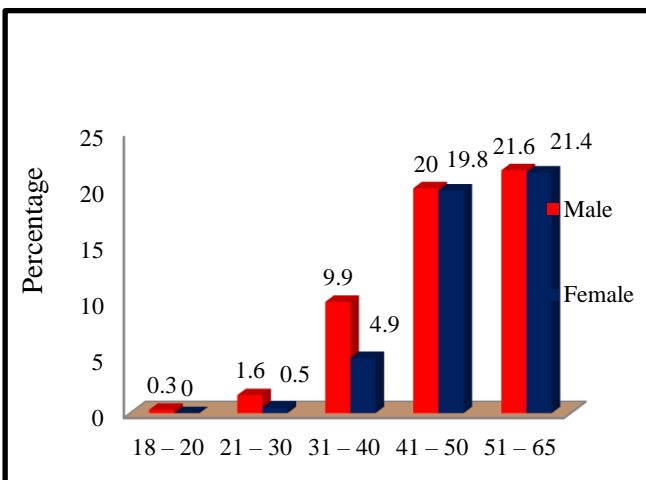


Figure 1: Age and sex distribution among study population.

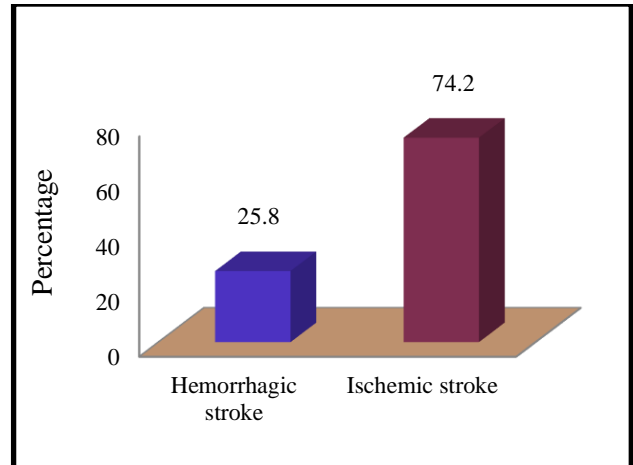


Figure 2: Distribution of study subject according to type of stroke.

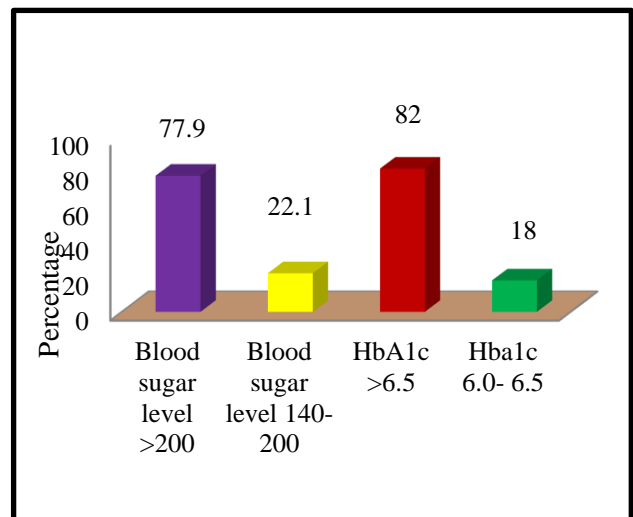


Figure 3: Blood sugar and HbA1c level.

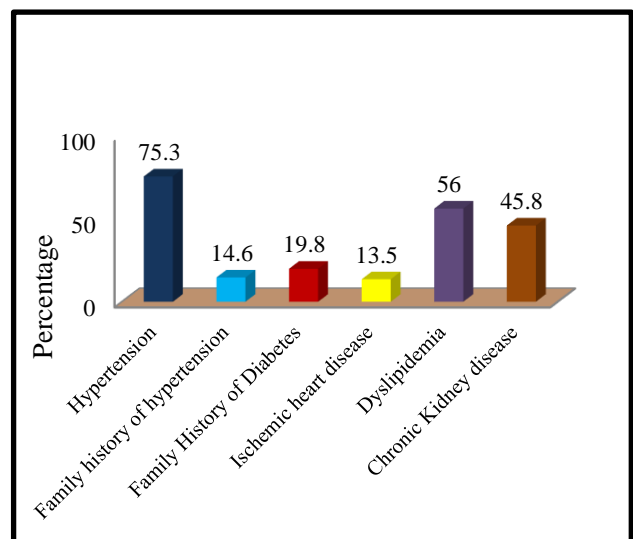


Figure 4: Comorbid risk factors of stroke.

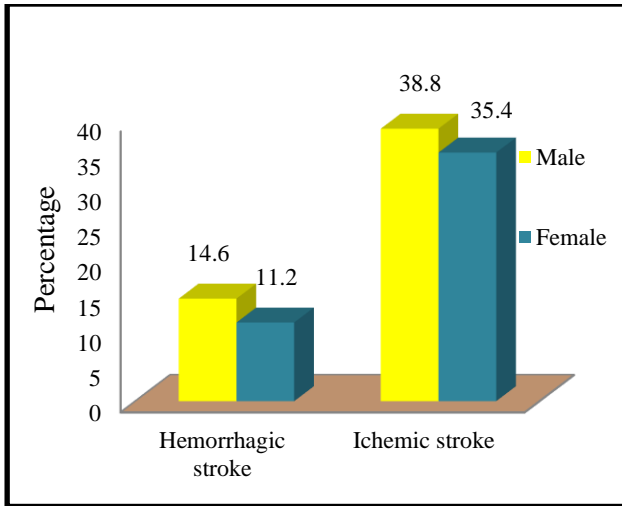


Figure 5: Sex distribution of study subject according to type of stroke.

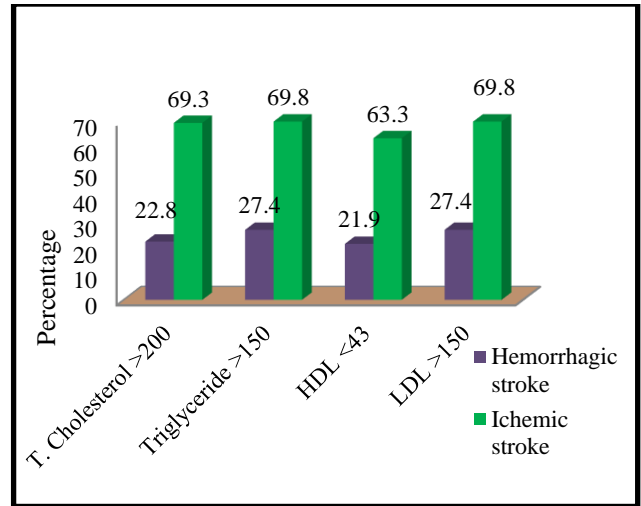


Figure 8: Prevalence of dyslipidemia risk factors of stroke.

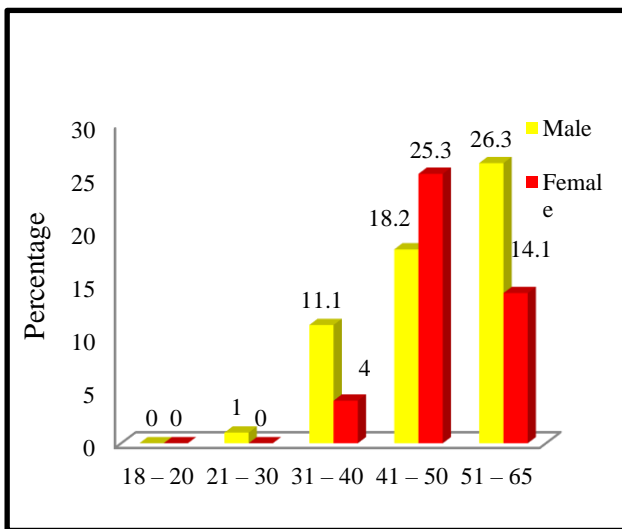


Figure 6: Age distribution of study subject according to hemorrhagic stroke.

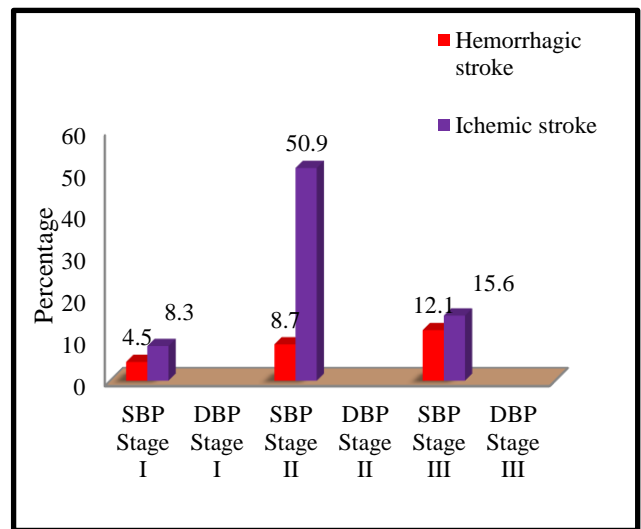


Figure 9: AHA 2017 guidelines were followed for staging of hypertension.

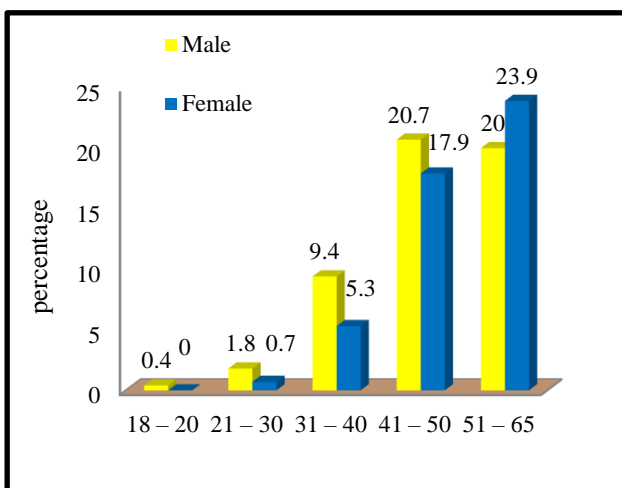


Figure 7: Age distribution of study subject according to ischemic stroke.

DISCUSSION

In our study stroke was more common in age group between 51-65 (43%) years followed by 41-50 (39.8%) years and 31-40 (14.8%) years. The least common age group of our study was 18-20 (0.3%) followed by 21-30 (2.1%) years. It is also evident from the results that males are more likely to be affected than females in our study with a male to female ratio of 1.14:1. A cross sectional epidemiological survey conducted in Singapore by Teh et al in the year 2012-13 found the prevalence of weighted stroke was 7.6% among the older adults aged 60 and above.⁸ The results were comparable to our results. AHA statistical update on stroke published in the year 2007 demonstrated that the incidence of stroke is higher in men until advanced age, with a higher incidence of stroke in women after age 85 years.⁹ These findings are similar to our findings. A study conducted by Rao et al in India in the year of 2016 tried to find out the prevalence of DM in

stroke.¹⁰ They found Only 45% of the patients who had stroke had normal blood glucose levels while the rest were known diabetics, new diabetic or stress hyperglycemic, which is relatable to the result we found in our study. As we found hypertension as the most common risk factor, we observed the distribution of study participants according to the stage of SBP and DBP in patients with ischemic stroke and hemorrhagic stroke individually Regarding hypertension the most common observation was SBP and DBP stage II for ischemic stroke involving 50.9% (147) patients followed by SBP and DBP stage III accounts for 15.6% (45) patients and stage I involving 8.3% (24) patients. In hemorrhagic stroke group the most common observation among study participant was SBP and DBP stage III involving 12.1% (35) patients followed by stage II comprising 25 subjects (Figure 9). According to a study conducted in Iraq hypertension increases the risk of stroke by sevenfold more than general population, and strict blood pressure control can decrease the risk of recurrent stroke by one third.¹¹ A study conducted in the state of Telangana reported hypertension was the most frequent risk factor of stroke, irrespective of the vascular subtype, with a total prevalence of 62%.¹² We obtained similar finding in our study. We found dyslipidemia as one of the most common risk factors, total cholesterol level >200 was observed in 149 (69.3%) ischemic stroke and 49 (22.8%) hemorrhagic stroke patients. In terms of LDL value of > 70 mg/dl was observed in 150 subjects, among them 69.8% were presented with ischemic stroke and 27.4% were presented with hemorrhagic stroke. Grace et al conducted a cross sectional study in the year of 2016 which showed 120 patients with stroke 51 (42.5%) had cholesterol levels >200 mg/dl and 77 (64.2%) had LDL cholesterol >100 mg/dl sating High total and LDL cholesterol are important risk factors in the development of stroke of either type.¹³

CONCLUSION

The present study was designed and determines the prevalence of stroke among diabetic patients and their relations to risk factors. We tried to establish the relationship of stroke with comorbid conditions like hypertension, Dyslipidemia and tried to figure out the age wise and gender wise distribution of stroke among a certain population. This analysis as evidence-based medicine becomes an indispensable part of prevention and treatment strategies, the quality of these records in hospitals is of high importance. Moreover, early intervention to treat conditions like hypertension and diabetes can be beneficial in terms of prevention of both type of stroke.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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