STUDY OF PATTERN OF STROKE IN DIABETIC PATIENTS CORRELATING WITH GLYCEMIC CONTROL

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ABSTRACT   **BACKGROUND:** Diabetes mellitus is a well-recognized risk factor for stroke. However, the effect of glycemic control regardless of the presence of DM on the clinical picture of stroke and its impact on the severity is not fully investigated. There are numerous studies on microvascular complications but there are only a few studies on strokes in diabetics. Therefore, this study was conducted to assess the impact of diabetes on the pattern and severity of stroke in our population. **METHODS:** This is a cross sectional observational study, carried out at Mahatma Gandhi Medical College And Research Institute, Pondicherry from December 2014 to December 2015. Sixty patients who presented with features of stroke and satisfy the inclusion criteria were enrolled in study. Stroke pattern was identified using CT scan. Statistical analysis was done by using chi-square test.(p<0.005=significant) **RESULTS:** The mean age in patients was 61.683±12.97. The ratio of male to female was 2.1:1 showing male preponderance. With increase in HbA1c levels more number of cases were found to have ischemic stroke and found to be statically significant (p=0.006). CI (cortical infarct) was the commonest subtype of ischaemic stroke in our study (76%). **CONCLUSION:** Stroke pattern is related with glycaemic control. Pattern of stroke is different in diabetics as cortical infarcts are more common. Ischaemic stroke is more prevalent than hemorrhagic stroke in diabetics.

INTRODUCTION

Stroke is defined by focal neurological signs or symptoms of vascular origin that persisted for >24 hr confirmed by brain CT and/or MRI in baseline conditions and brain CT with contrast medium after 48–72 hours. Diabetes mellitus affects more than 200 million people Worldwide (1). Stroke is the second most common cause of mortality and the third most common cause of disability (2). Diabetes mellitus has been established as a risk factor for stroke (3). Stroke in diabetics is 1.5–3 times more likely as compared to non-diabetics. The pattern of stroke in diabetics is different than non-diabetics (4). Diabetes substantially increases risk of stroke in younger patients as well as women (5). In recently published observation of 5017 patients with different types of ischaemic stroke, the prevalence of diabetes was significantly higher in subjects with small vessel cerebrovascular accidents (35.5%) compared to patients with large vessel atherosclerosis (29.0%) or cardio-embolic (28.1%), while it was less common in subjects with other combined etiologies of stroke(9.4%)(6). One large14 prospective European multicentre study calculated that stroke in diabetic patients was different from stroke in non-diabetics from several perspectives (7). Though considerable work has been done on this topic internationally, there is great paucity of data locally. Therefore this study is planned to identify the pattern of stroke in diabetics in our population, and how it differs from non-diabetics. This will hopefully help us in building a better strategy towards primary prevention of stroke in the diabetic population by administration of antiplatelet agents

AIMS OF STUDY

To study the pattern of stroke occurring in diabetic patients and correlating with glycemic control

INCLUSION CRITERIA

All patients with features of new onset stroke with HbA1c level > 6.5 % and known diabetic patients on medication (even if HbA1c level < 6.5 %)

EXCLUSION CRITERIA

Old known stroke cases.
Focal deficit induced by subdural haematoma/space occupying lesion/aneurysmal rupture/head injury.
Drug induced focal deficit (anticoagulants).
Patients with normal CT scan

MATERIALS AND METHODS

All patients who presented with features of stroke and satisfy the inclusion criteria were included in the study. Semi structural data collection proforma was used to record basic investigation reports, radiological findings. After confirmation of stroke from radiologic investigation, HbA1c value was calculated and patients with HbA1c > 6.5 % and diabetic patients on medication even with HbA1c < 6.5% were included in study population. On the basis of radiological features of stroke, study group was again categorised as per type of the stroke as shown in the fig1.Presence of other risk factors as age, sex, hypertension, smoking, dyslipidemia, ischemic heart disease, old cerebrovascular accidents were noted.
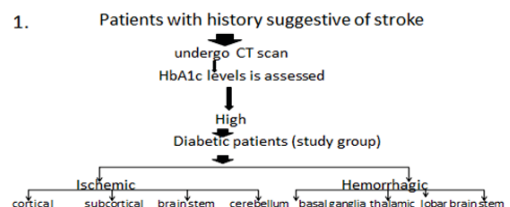

Figure : methodology of study

STATISTICAL METHODS

Data was entered using Microsoft Excel 2010 version and analysed using Epi-Info version 7. Data was summarized in percentages and proportions. Univariate analysis using Chi-square test with significance level at 5% was used to determine the association between variables. Spearman's correlation [correlation coefficient (r)] was used to determine any association with p<0.05 considered statistically significant

RESULTS

In the present study sixty stroke patients who were admitted as

inpatients were studied. Data was collected by using preformed questionnaire .Descriptive statistics are presented as mean + SD and percentages. Chi square test was used to examine the categorical data. For all statistical analysis P<0.05 were considered as statistically significant

Table 2 : sex wise distribution

Sex	Number	Percentage
Male	41	68.3%
Female	19	31.7%
Total	60	100%

Out of 60 stroke patients 41(68%) were males and 19(32%) were females. Thus, the ratio of males to females was2.1:1

Table 3 : sex wise distribution

Age groups (years)	Number	Percentage
<50	8	13.3%
50-60	26	43.3%
61-70	09	15%
>70	17	28.4%
Total	60	100%

Mean age = 61.683±12.97 years

The mean age in patients was 61.683±12.97. Maximum patients were in the age group from 50-60(43.30%).Difference in mean age in study was not statistically significant

Table 3 : Relation between HbA1c and type of stroke

Serum Hb1Ac (%)	Ischemic stroke n=47 (78.3%)	Hemorrhagic stroke n=13 (21.7%)
>10%	07(14.9%)	--
9-10%	06(12.7%)	02 (15.4%)
8-9%	--	03 (23.1%)
7-8%	13(27.6%)	05 (38.4%)
6.5-7%	11(23.4%)	03 (23.1%)
<6.5%	10(21.4%)	--

(P=0.006)

In our study, 21.4% of patients had their Serum HbA1c level <6.5%, and 78.6% had their Serum HbA1c levels >6.5%.Out of which more number of cases(66%) found to have HbA1c level between 7-8%. 27.6% of patients with serum HbA1c more than 9% were having ischemic stroke where as 15.4% of patients were having hemorrhagic stroke. With increasing HbA1c level more number of cases were found to have ischemic stroke it is statistically significant p=0.006(Table 3)

Table 4 : Distribution according to history of diabetes and type of stroke

History of diabetes	Ischemic stroke (47)	Hemorrhagic stroke (13)
Yes	39 (82.9%)	09 (69.2%)
No	08 (17.1%)	04 (30.8%)

The patients with known history of diabetes, 39 (83%) had ischemic stroke and 9(69%) had hemorrhagic stroke. In the patients who are not known diabetics, 8 (17%) had an ischemic stroke, and 4 (31%) had a haemorrhagic stroke(Table 5) The differences between the distribution of type of stroke was found to be not significant (p=0.3)(table-4)

Table 5 : Distribution according to levels of serum HbA1c and site of ischemic stroke

Serum Hb1Ac (%)	Site of Ischemic stroke (n=47)				
	Basal anglia	Thalamus	Brain stem	Cerebellum	Cortical
>10	--	--	--	--	07 (14.9%)
9-10	--	--	--	02 (4.2%)	04 (8.5%)
8-9	–	--	--	--	--
7-8	--	--	5(10.6%)	01 (2.1%)	07 (14.9%)
6.5-7	--	--	--	--	11 (23.4%)
<6.5	--	01 (2.1%)	01(2.1%)	01(2.1%)	07(14.9%)

(P=0.3)

CI(cortical infarct) was the commonest subtype of ischaemic stroke in our study (76%). Subtypes of ischaemic stroke are described (Table-5).There is no statically significance (p=0.3)

Table 6: Distribution according to levels of serum HbA1c and site of hemorrhagic stroke

Serum Hb1Ac (%)	Site of hemorrhagic stroke (n=13)		
	Basal Ganglia	Thalamus	Brain stem
>10%	--	--	--
9-10%	02 (15.4%)	--	--
8-9%	03 (23%)	--	--
7-8%	04 (30.7%)	--	01(7.7%)
6.5-7%	01 (7.7%)	01(7.7%)	01(7.7%)
<6.5%	--	--	--

(P=0.3)

In our study out of 13 patients with hemorrhagic stroke, 10 patients (76.8%) have basal ganglia hemorrhage. More number of cases (30.7 %) basal ganglia hemorrhageis seen between HbA1C values 7-8%.There is no significant relation between site of lesion and serum HbA1c (p=0.4)

DISCUSSION

Stroke is a common clinical problem, current treatment for patients with established stroke is relatively ineffective. Approximately 50% of patients are left with permanent disability. Effective risk factor intervention offers a real hope of reducing stroke morbidity and mortality. Certain risk factors have been consistently identified as a significant predictor of stroke outcome, while some are less consistent. The present study involved 60 patients who satisfied the inclusion and exclusion criteria. Out of the 60 diabetic stroke patients 48 were known diabetics and 12 were detected to have type 2 diabetes during hospital stay. Data was collected by using preformed questionnaire and NIHSS scoring was assessed during admission.

Age & Gender:

In the present study, age group ranged from 30-84 years (Mean age = 61.683±12.97 years). 41 of them were males (68.3%) and 19 females (31.7%). Men have a greater frequency of stroke than a woman has, but because life expectancy is higher in women, women often outnumber men in many stroke studies. As per study was done by Sacco et al, during the pre-menopausal years, women have fewer strokes than men but the incidence levels were off after 60 year

Table 7 : comparision of age distribution with other studies

Study	Age
Zafar A– (8) et al (2007)	59.5 (±11.82)
Megherbie (7) et l(2003)	70.7±10.2
Kamel A (9) – et al(2006)	58.8±10.1
Sarkar RN(10) et l(2004)	51.2
Present study	61.683±12.97

In our study, the male to female ratio shows a male preponderance as which differ out by other international(10)(11) and national studies–(8)(12) This difference was not found to be significant in our study.

STROKE TYPE:
There was a higher incidence of ischemic stroke in the diabetics in our study.

In our study out of the 60 diabetic individuals,47(78%) patients suffered an ischemic stroke and 13(22%) had a hemorrhagic stroke.

Our findings were consistent with many other studies,(13)(14) which suggest that diabetics are more prone to have an ischemic stroke and less likely to have a hemorrhagic stroke.

The European BIOMED Stroke Project, a large multicentre study, showed that the diabetic patients were more likely to have an ischemic stroke and less likely to have a hemorrhagic stroke than non-diabetic patients (7).

In one more study,(15) diabetic individuals had a lower relative prevalence of intracerebralhemorrhage (ICH: 6.4 versus 9.7%; p=0.011).

Also, low frequency of intracerebralhemorrhage in diabetics is well known–(16). This maybe explained by the fact that severity of fibrinoid necrosis of small cerebral arteriole walls, which is usually associated with ICH, is less pronounced in patients with diabetes and arterial hypertension compared to those with hypertension alone (17). However, Stegmayr and Asplund19 found a two-time higher incidence of ICH in diabetic subjects compared to non-diabetic subjects (18). The sub-types and topography of ischaemic stroke are presumed to differ between diabetic and non-diabetic individuals according to the type of angiopathy induced by diabetes mellitus.

Lacunar (small, less than 15 mm in diameter infarction, cyst-like, frequently multiple) is the typical type of stroke in diabetic subjects (19).

In our study, CI (cortical infarct) was the commonest subtype of ischemic stroke. Out of ischemic stroke cortical infarct(76%) is more commonly found in our study which was also pointed out by Arboix et al (20) study.

As far as the etiology of ischemic stroke is concerned, large artery disease was more common than small vessel disease in the diabetic group. A similar result was described in one more study (15). In the study by Zafar A et al– (8) cortical infarcts were more frequent in diabetics and diabetes was found as a risk factor for ischemic stroke and not for hemorrhagic stroke(8)(21).Our results were consistent with their study.

Lacunar infarcts, which are more prevalent in the diabetic patients, show a paradoxical clinical course with a favorable prognosis in the short term, characterized by a low early mortality and reduced functional disability on hospital discharge, but with an increased risk of death, stroke recurrence and dementia in the mid- and long-term. For this reason, lacunar infarction should be regarded as a potentially severe condition rather than a relatively benign disorder and,

therefore, lacunar stroke patients require adequate and rigorous management and follow-up.

It has been proven that stroke in diabetics carries a poorer prognosis (22) therefore, aggressive treatment of diabetes and its risk factors are important to minimize its complications. Anti-platelet drugs, careful blood pressure control, use of statins and modification of lifestyle risk factors is a key element in secondary prevention after lacunar stroke conclusion Commonest modifiable risk factors in stroke are hypertension, smoking, dyslipidemia, alcohol consumption, and diabetes mellitus. Commonest non modifiable risk factors are increasing age, male sex and family history of stroke. Diabetes is an independent risk factor for stroke.

Stroke pattern is related with glycaemic control.Diabetes mellitus has been found a riskfactor for ischaemic stroke and not for hemorrhagicstroke. (p=0.006) Pattern of stroke is different in diabetics as cortical infarcts are more common.

Early diagnosis, treatment including lifestyle modification and prevention of diabetes may reduce the development of stroke and its complications and it presents a major challenge for health care professionals facing an epidemic of both diabetes and stroke.

Measurement of HbA1c in every ischemic stroke patient is very important even if the patient is not known to be diabetic because the prestroke glycemic control is a predictor of stroke severity.

Wesuggest the need for routine HbA1c testing in allpatients with ischaemic stroke for secondary prevention

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