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Study of ischemic stroke pattern in patients with diabetes and non-diabetes: A prospective study

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Abstract
Background: Stroke is one of the major causes of morbidity and mortality worldwide and apart from being exceedingly harmful in diabetics, stroke is a disabling disorder.
Aims and Objectives: To study the CT/MRI findings in ischemic stroke (IS) patients with or without diabetes.
Materials and Methods: One hundred and twenty IS patients were studied in Medicine and Neurology wards in G.R. Medical College, Gwalior from August 2015 to August 2016 after dividing them in to Diabetes (n=60, IS patients with diabetes) and Non-diabetes (n=60, IS patients without diabetes). Detailed histories including age, sex and hypertension status were recorded. All the subjects underwent CT/MRI of brain for identification of infract type and position.
Results: Maximum patients in diabetes and non-diabetes group were form the age group of 51-60 years (26.66%) and 61-70 years (28.33) respectively. Male preponderance was observed in both diabetes (75%) and non-diabetes groups (66.67%). CT/MRI of brain of diabetes group revealed that most of the patients were having right middle cerebral artery (MCA) infarct (30%) followed by multiple infarct (16.66%) whereas among non-diabetes group most common infarct was left MCA infarct (31.66%) and multiple infarct (31.66%). Lacunar infarct was observed in 20% and 8.33% patients in diabetes and non-diabetes patients respectively.
Conclusion: Ischemic stroke was more common in older male patients. Middle cerebral artery infraction and Lacunar infarct were the most common finding in CT/MRI.

Keywords: Infract, diabetes mellitus, multiple infarct, magnetic resonance imaging

Introduction
World health organization (WHO) has defined stroke as rapidly developing clinical signs of focal or global disturbance of cerebral function with symptoms lasting more than 24 h or leading to death with no apparent cause other than vascular origin [1].
Stroke is of two types; hemorrhagic stroke which results from the rupture of blood vessels which supply blood to brain tissue and ischemic stroke which results from the occlusion of the blood vessels either due to thrombus or embolus [2].
Diabetes is a major risk factor for cerebrovascular morbidity and mortality. This condition increases the risk of developing cerebrovascular, coronary and peripheral arterial diseases up to 4 fold [3]. The disease severity, as measured by chronic glycemia, is associated with increased frequency of the clinical event in each vascular bed [4]. Compared with patients without diabetes, those with diabetes have greater *de novo* vascular disease progression [5].
Ischemic stroke is caused by blockage of blood flow to the brain by a clot. It accounts for 87 percent of all stroke cases. An Ischemic stroke can arise by two ways-when a clot forms somewhere else in the body and gets lodged in a brain blood vessel, it is called an embolic stroke. When the clot forms in the brain blood vessel, it is called thrombotic stroke. Hemorrhagic stroke is caused by rupture of a weakened blood vessel to the brain. Two types of weakened blood vessels usually ruptures: aneurysms and arteriovenous malformations (AVMs).
In present study we tried to evaluate and compare the stroke pattern in IS patients with and without diabetes.

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Materials and Methods

The present observational study was done on 120 IS patients admitted in Medicine and Neurology wards in G.R. Medical College, Gwalior from August 2015 to August 2016.

Institutional Ethics Committee approval and written informed consent was obtained from each patient before staring study.

Stud cohort was divided into Diabetes (n=60, IS patients with diabetes) and Non-diabetes (n=60, IS patients without diabetes) using simple random sampling method.

Patients who fulfilled the criteria for ischemic stroke by standard definition, with and without diabetes were included in the present study. Patients with transient ischaemic attack (TIA), cardiac diseases and hepatic diseases, patients taking lipid lowering drugs that would lower plasma lipid levels, individual less than 18 year's age and patients with haemorrhagic stroke were excluded from the present study.

Detailed histories including age, sex and hypertension status were recorded. All the subjects underwent CT/MRI of brain for identification of infract type and position.

Standard diagnostic criteria were employed for defining DM and hypertension. Those with newly detected hyperglycemia whose FBS was more than or equal to 126mg%, PPBS more than or equal to 200mg%, RBS more than equal to 200mg% with symptoms and those already taking oral hypoglycemic agents were classified as diabetics.

Resting blood pressure more than or equal to 140/90 mm Hg or those already on antihypertensive drugs were classified as hypertensive. Cut off value for hypercholesterolemia was taken as 200mg% and hypertriglyceridemia was taken as 150mg%.

All the data were analyzed using IBM SPSS ver. 20 software. Data is expressed as percentage if and otherwise explained. Analysis was performed using two way ANOWA and independent sample student t test. Pearson correlation was used to establish the relation between the data. P values <0.05 was considered as significant.

Results

Most of the diabetes and non-diabetes IS patients belonged to age group of 51-60 years (26.66%) and 61-70 years (28.33) respectively. Most of the patients in diabetes and non-diabetes groups were male (75% and 66.67% respectively). Out of 120 cases, 39 (32.5%) were having hypertension.

Table 1: Showing distribution of diabetic patients with IS according to CT/MRI of brain

CT/MRI of brain	Diabetes No of patients (%) (n=60)	Non-diabetes No of patients (%) (n=60)
Infarct Midbrain	1 (1.66)	0 (0)
Lacunar Infarct	2 (20)	5 (8.33)
Lt. MCA Infarct	5 (25)	19 (31.66)
Multiple Infarct	10 (16.66)	19 (31.66)
Rt. ACA Infarct	2 (3.32)	0 (0)
Rt. MCA &ACA Infarct	1 (1.66)	2 (3.32)
Rt. MCA Infarct	18 (30)	14 (23.33)
Rt. PCA Infarct	1 (1.66)	0 (0)
Lt PCA infarct	0 (0)	1 (1.66)

MCA; Middle cerebral artery, ACA; anterior cerebral artery, PCA; posterior cerebral artery CT/MRI of brain of diabetes patients revealed that, most of the patients were having Rt. MCA infarct [18 (30%)] followed by multiple Infarct [10 (16.66%)] followed by 15 (25%) patients who had Lt. MCA Infarct. Lacunar infarct was observed in 12 (20%) patients. Among non-diabetic patients CT/MRI scan revealed that most of the patients had Lt. MCA infarct [19 (31.66%)] and multiple infarct [19 (31.66%)] followed by 14 (23.33%) patients who had right MCA Infarct. Lacunar Infarct was observed in 5(8.33%).

Discussion

More than two-thirds of the global burden of stroke is borne by developing countries, where the average age of patients with stroke is 15 years younger than that of developed countries [6]. In India the incidence of stroke is likely to increase in the coming years due to: a) increase in population; b) increase in life expectancy; c) rapid urbanization from migration of village population to cities; d) changing life styles involving sedentary habits, smoking, excess alcohol use etc.; e) rising stress level in life [7].

A study done by Rajeev et al. [8] on 100 patients to evaluate CT/MRI findings in acute ischemic stroke patients reported that most of the patients were from age group of 61-70 years in both the groups. The data presented by Rajeev et al. [8] is in accordance with present study findings as in present study also most of the diabetes and non-diabetes IS patients belong to age group of 51-60 years (26.66%) and 61-70 years (28.33) respectively. Zafar et al studied hundred IS patients and reported that mean age was 59.5 (±11.82) in diabetics and 60.4 (±14.8) in non-diabetics [9].

Rajeev et al also reported a male predominance (74%) in case group and control group (74%). (Rajeev H 2013)Similar findings were revealed in present study where most of the IS patients were males in diabetes and non-diabetes groups (75% and 66.67% respectively). Gayathri et al also reported male predominance in their study which is similar to the present study data [10]. Owolabi et al studied 136 stroke patients, out of that 85 were diabetes reported that most of the patients were male (56.4%) which is in agreement to present study findings [11]. Zafar et al studied 100 IS patients in a similar study also reported preponderance of male patients in diabetes and non-diabetic group [9].

In present study CT/MRI of brain of diabetes patients revealed that, most of the patients were having Rt. MCA infarct (30%) followed by multiple infarct (16.66%). Twenty five percent patients had left MCA infarct. Lacunar infarct was observed in 20% of the patients. Among non-diabetic patients CT/MRI scan revealed that most of the patients had left MCA infarct (31.66%) and multiple infarct (31.66%) followed by 23.33% patients who had right MCA Infarct. Lacunar infarct was observed in 8.33% patients.

Zafar *et al* analyzed 100 (50 diabetes and 50 non-diabetes) IS patients reported that cortical infarcts (CI) was found in 22, sub cortical infarcts (SCI) in 14, brainstem in 5 and cerebellar in 2 diabetic patients. CI was also the commonest subtype of ischaemic stroke in non-diabetics [9]. Karapanayiotides *et al* reported that SCI were more frequent in diabetics, whereas complete MCA territory infarcts were less frequent. The association of diabetes mellitus with lacunar infarcts or SCI suggests small vessel disease (SVD) as the underlying pathophysiology of IS [12]. In one study by Syed *et al* reported that lacunar strokes was the most common subtype of stroke, which was considered to be due to high burden of inadequately treated hypertension and diabetes. As diabetic angiopathy is presumed to differ from atherosclerotic angiopathy, strokes experienced by diabetic versus non-diabetic individuals may also differ [13]. In similar study by Karapanayiotides *et al*. [12] reported that as far as the aetiology of ischaemic stroke is concerned, large artery disease was more common than small vessel disease in diabetic group. Similar result was described in one more study [13]. Baliga *et al* reported that higher frequency of large artery disease can be the result of an increased incidence of large vessel intracranial vascular disease in diabetics [14]. Ali *et al* studied 80 IS patients (40 diabetes and 40 non-diabetes) and reported that in diabetes group 50% of the individuals suffered from cortical infarcts, whereas of the non-diabetic group 52.5% of the individuals had a cortical infarct. Also In the diabetic group 32.5% of the individuals suffered from lacunar infarcts and in the non-diabetic group 10% suffered from lacunar infarctions, which is in agreement to the reports of present study where Lacunar infarct was observed in 20% and 8.33% patients in diabetes and non-diabetes patients respectively [15]. Arboix *et al* showed that people with diabetes compared to people without diabetes present more frequently with lacunar infarction [16]. The European BIOMED Stroke Project also showed that diabetic patients were more likely to have lacunar cerebral infarction [17].

Cross sectional nature of present study was the main limitation of present study due to that present finding cannot be applied to whole population. A large randomized clinical trial is needed to strengthen the present study findings.

Conclusion
IS was most common in patients who were in 5th to 6th decade of their life and were male. MCA infarct and Lacunar infarct both are most common pattern observed in radio imaging. We recommend greater use of antiplatelet agents, strict control of blood pressure, modification of lifestyle risk factors, ACE inhibitors, and statins to lower the risk of ischemic and lacunar stroke in diabetic patients.

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