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CLINICAL PROFILE AND STROKE TOPOGRAPHY AMONG DIABETICS WITH ACUTE ISCHEMIC STROKE

Neurology

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ABSTRACT

Introduction: Stroke is the most devastating vascular complication in diabetes for its associated morbidity and mortality. Dyslipidaemia, hypertension, obesity and atherosclerosis are higher among diabetics, which make them more vulnerable to ischemic stroke. This study was done to corelate clinical profile and topography of strokes occurring in diabetics.

Materials and methods: This retrospective chart based descriptive study was done among diabetics with acute stroke at a tertiary care centre in Southern India over 2 years from 1st January 2016. The patients' data on demography, history, and investigations including neuroimaging were obtained from medical records and entered to a pre-formatted data sheet for further analysis. The outcome of the study was complete, partial, functional recovery or death.

Results: Among the 112 diabetic strokes selected, 8.9% had diabetes for less than a year. In this study, middle cerebral artery (MCA) territory strokes were common (62.5%) followed by lacunar infarcts (21.42%) and posterior cerebral artery (PCA) territory infarcts (9.2%). Sixty-six percent of lacunar infarcts (16 of 24 patients) were also in the MCA territory. Patients with MCA territory infarcts had higher HbA1C levels. MCA territory infarcts were associated with poorer outcomes, significantly longer duration of hospital stay and slower recovery. Mortality was higher in patients with higher HbA1C levels. Mean duration of hospital stay was 9.16 ±5.21 days.

Conclusion: Diabetics with strokes showed higher incidences of MCA territory infarction and lacunar strokes.. Poor glycaemic control was associated with poorer outcomes and slower recovery with higher mortality.

KEYWORDS

Stroke, Diabetes, Clinical Profile, Topography, Lacunar Infarcts, Ct, Mr Imaging.

INTRODUCTION:

Diabetes Mellitus (DM) has emerged as a major lifestyle disease in developing countries including India. Due to the high prevalence of DM; India is often referred to be the 'diabetic capital'.[1] DM is among the most important risk factor for atherosclerosis; causing arteriolar narrowing resulting in 2 to 3 fold rise in risk for developing organ ischemia.[2]

Numerous epidemiological studies have shown Asians to have a higher prevalence of stroke as compared to Caucasians.[4] Age adjusted prevalence rates of stroke in India range from 250-450 per lakh population. Studies have shown higher incidence of cerebral infarction among diabetics in the infra-tentorial region. Lacunar infarcts involving the thalamus, pons and other parts of the vertebra-basilar system are more frequent in diabetics than non-diabetics.[3]

Hypertension, smoking and diabetes mellitus are the commonest risk factors for developing stroke in India.[5-9] We intend to do this study for the limited Indian data on stroke topography among diabetics.

AIMS AND OBJECTIVES:

1. To study the clinical profile of acute ischemic stroke in diabetes.
2. To describe the stroke topography in diabetes.
3. To correlate the HbA1c levels with outcome.

MATERIALS AND METHODS:

Study design and source of data:

This retrospective chart-based descriptive study included patients admitted in the intensive care units of a tertiary care hospital in South India over a period of 2 years from 01st January 2016.

METHODOLOGY:

After obtaining Institutional Ethical Committee clearance, the clinical data was obtained from the in-patient and out-patient medical records. Data pertaining to demography, history of current illness, timeline of progression, details of investigations including neuroimaging, duration of hospitalisation and outcome (death / disability / functional recovery) were obtained. In this study, functional recovery was considered as an improvement in the independent functional ability of the patient after stroke. Partial recovery was considered as improvement in the deficits but lack of complete resolution. Complete recovery was defined as complete resolution of deficits.

Selection Criteria

INCLUSION CRITERIA:

1. Patients olderthan 18 years.
2. Diabetes patients admitted with acute ischemic stroke.
3. Patients with cerebral infarcts identified by computed tomography (CT) or magnetic resonance (MR) imaging.

EXCLUSION CRITERIA:

1. Patients with history of stroke.
2. Patients with intra-cranial bleeding on neuroimaging.

Statistical analysis:

Data collected was analysed using SPSS v20.0 and interpreted as frequencies, proportions, means and medians using Chi-square tests and student t-tests.

RESULTS:

The study included 112 patients out of which 72 were males and 40 were females. The mean age was 69.25± 12.19 years. The median age was 70 years. The age of the study population ranged from 36 to 88 years.

The common presenting symptoms were limb weakness, giddiness, slurring of speech, decreased responsiveness and sensory symptoms such as tingling and numbness. Limb weakness was the most common presenting symptom (65, 58%) followed by giddiness (20, 17.85%), slurring of speech (19, 16.96%), decreased responsiveness (5, 4.5%) and paresthesias with numbness of limbs (3, 2.67%). Median time of onset of symptoms was 1 day.

Most patients had more than one risk factor for stroke. Seventy patients (62.5%) had hypertension, 33 (29.46%) had history of smoking, 20 (17.85%) had dyslipidaemia, 18 (16.07%) had ischemic heart disease and 6 (5.35%) had renal disorder.

Majority of the patients had long duration of diabetes mellitus i.e. 43 (38.39%) patients had duration between 5-10years and 34 (30.35%)

more than 10 years. Only 10, 8.92%) had a duration of diabetes of less than 1 year.

Neuroimaging studies CT and/or MR revealed predominantly MCA territory strokes, lacunar strokes, PCA and anterior cerebral artery (ACA) territory strokes.

Middle cerebral artery infarcts (n-70, 62.5%) were the most common strokes observed in this study. This was followed by lacunar infarcts (24, 21.4 %), posterior cerebral artery infarcts (10, 9.2%) and anterior cerebral artery infarcts (8, 7.1 %). (Table 1)

The mean RBS and FBS in the study group were 150.58 and 137.51. The mean HBA1c was 7.26. Mean HbA1c levels were higher in patients with MCA territory strokes followed by ACA strokes, PCA territory strokes and lacunar strokes. (Table 1).

The mean duration of hospital stay was 9.16 ±5.21 days. Minimum duration of stay was 3 days and maximum duration was 23 days. Stoke outcome in this study was measured as functional recovery, partial recovery, complete recovery or death.

TABLE 1: Comparison of stroke topography, frequency, mean HbA1C levels and outcome

STROKE TOPOGRAPHY	FREQUENCY	MEAN HbA1c LEVELS	STROKE OUTCOME
MCA INFARCTS	70, 62.5%	7.40	FUNCTIONAL = 73.33% PARTIAL = 18.66% COMPLETE = 5.33% DEATH= 2.66%
LACUNAR INFARCTS	24, 21.4%	6.8	FUNCTIONAL = 67.8% PARTIAL = 19.78% COMPLETE = 12.42%
PCA INFARCTS	10, 9.2%	7.02	FUNCTIONAL = 69.2% PARTIAL = 20.27 % COMPLETE = 10.53%
ACA INFARCTS	8, 7.1%	7.10	FUNCTIONAL = 71.3% PARTIAL = 28.7 %

In this study, functional recovery was observed in 51 (73.3%) patients with MCA territory infarcts, 16 (67.8%) patients with lacunar infarcts, 7 (69.2%) patients with PCA territory infarcts and 6 (71.3%) patients with ACA territory infarcts. Partial recovery was seen in 13 (18.66%) patients with MCA stroke, 4 (19.78%) patients with lacunar stroke, 2 (20.27%) patients with PCA stroke and 2 (28.7%) patients with ACA stroke. Complete recovery was observed in 4 (5.33%) patients with MCA stroke, 3 (12.42%) patients with lacunar strokes, 1 (10.53%) patient with PCA stroke. Death was observed in 2 patients with MCA territory stroke among the patients studied.

DISCUSSION:

Diabetes mellitus is a well-established risk factor for stroke and is associated with high morbidity, mortality and stroke recurrence.[10] We studied the clinical profile and stroke topography along with its outcome in diabetics.

The mean age of the study population was 69.25 ± 12.19 years and ranged from 36 to 88 years. A study from France showed a mean age of 70.7 ± 10.2 with age ranging from 13 to 102 years.[10] A similar Chinese study on diabetic stroke patients had a mean age of 68±8.1 years.[11] The Copenhagen Stroke Study demonstrated a mean age group of 71.5 ± 10.5 in their study population. [12]

In the study, limb weakness, giddiness and slurring of speech were the most frequently encountered presenting symptoms.Megherbi et al observed an increased proportion of the study population presenting with limb weakness and dysarthria. [10] A Spanish study demonstrated limb weakness, lacunar syndromes and sensory symptoms as the most common presenting features in stroke.[13] Zhang et al in China observed features of motor deficits and decreased consciousness in their study population. [11]A study from Japan noted motor paresis, vertigo, dysarthria and sensory disturbance as common presenting features. [14] Hypertension, smoking, dyslipidaemia, ischemic heart disease (IHD) and renal disorders were the risk factors observed in the present study. Jorgensen et al compared risk factors between the diabetic and non-diabetic stroke patients and found hypertension to be more common among the diabetic population. They also found smoking and IHD to be significantly higher in the diabetic population. [12]Hypertension, smoking, cardiac disease and dyslipidaemia were the most common risk factors according to a Japanese study. [14] A study trial performed in 8 countries demonstrated hypertension and smoking were the most significant risk factors for lacunar strokes. [15] Zhang et al found significant differences in smoking, alcohol intake and hypercho lesterolemia between the diabetic and non-diabetic stroke population. [11]Arboix et al observed that IHD and hyperlipidaemia were independent predictive factors for stroke. In addition, atrial fibrillation and chronic nephropathy were noted significant risk factors. [13]

Most patients in this study had duration of diabetes of more than 5 years. Only 8.92% had a history of diabetes of less than a year. The values of fasting blood sugar (FBS), random blood sugar (RBS), and HbA1c at admission were measured. Diabetics with acute stroke werestudied across 8 countries as a part of the Secondary Prevention of Small Subcortical Strokes (SPS3). In 91% of the study population the mean duration of DM was 11 years and the HbA1c exceeded 7 at presentation.[15]A Mexican study found 78% patients with stroke to have an glycated haemoglobin more than 6.4 [16]The average random blood glucose and HbA1c levels were 198.6 ± 74.1 and 7.3 ± 5.2 respectively in a Japanese study on diabetics with brainstem strokes. A study done in Greece showed a mean duration of 11.1 ± 8.2 years of DM and a mean HbA1c of 7.6 ± 1.5 [17]

CT and/or MRI imaging showed predominantly MCA territory and lacunar infarcts with PCA and ACA infarcts being less common. A Spanish study observed a predominant pattern of parietal, temporal, thalamic and pontine infarction in the diabetic population. [13] An Australian study concluded that cortical strokes and lacunar strokes were the most common presentations in diabetics. However there was no significant difference in topography as seen among non-diabetics. [18]A Japanese study on DM and non DM patients with brainstem infarctions demonstrated a higher frequency of DM patients having pontine and medullary infarctions.[14] The SPS3 trial observed that most diabetics had lacunar infarcts in the brainstem and cerebellum (PCA territory). [15] A study in Glasgow and China concluded that lacunar strokes and ACA territory strokes were the most common in diabetics. [19][11] The Copenhagen stroke study concluded a higher frequency of cortical, basal ganglia and internal capsular involvement in diabetics thus demonstrating that lacunar infarcts were not as common as expected. [12] Iwase et al in Japan demonstrated that infra-tentorial brain infarction > 5 mm in diameter were more common in the diabetics as compared to the non-diabetic population. [20]

In the present study, higher HbA1c levels were observed in MCA territory and lacunar strokes. A study in China demonstrated that HbA1c levels more than 6% were associated with an increased incidence of isolated pontine infarcts.[21]A Swedish study found that a HbA1c of more than 6% significantly correlated with acute stroke severity and poor functional outcome. [24] Weir et al showed that a plasma glucose concentration above 8 mmol/L (144 mg/dL) after acute stroke predicts poorer chances of survival and independence.[19]An Australian study found no correlation between the HbA1c and stroke outcomes among the diabetics. [18]A novel study in Netherlands demonstrated that moderate hyperglycaemia with glucose levels more 8 mmol/L was associated with favourable outcome in lacunar strokes and unfavourable outcomes with non-lacunar strokes. [22]

The mean duration of hospital stay among the 112 patients were 9.16 ±5.21 days ranging from 3 to 23 days.An Italian study on stroke recovery in diabetics showed that the mean duration of hospital stay was 39 ± 14.2 days. However, it considered the possibility of patients with mild stroke symptoms obtaining an earlier discharge. [23] Limited literature was available on duration of hospital stay of diabetic stroke patients.

Stroke outcome was measured at the time of discharge as functional, partial, complete recovery and death. This study demonstrated higher rates of functional recovery in MCA territory strokes. Complete recovery rates were noted to be higher in patients with lacunar infarcts.

Studies around the world assessed stroke recovery at 3 and 6 months using the Rankin Scale and Barthel Index. Diabetics were noted to have more disabilities as compared to non-diabetics. [10]Zhang et al observed that functional recovery and survival were favourable with lacunar infarcts. [11] A similar finding was noted in the Netherlands study [22] Limited data was available on partial and complete recovery in stroke.

The mortality rate in this study was 0.017% (2 out of 112) and both patients had an HbA1c of more than 9 with both being large MCA territory infarcts. The Copenhagen stroke study concluded that the presence of diabetes increased mortality [12]A study in Spain showed an in hospital mortality of 12.5% among its study population.[13]Kiers et al observed higher mortality rates among the newly detected diabetics and patients diagnosed to have stress hyperglycemia apart from the known diabetics. [18]

CONCLUSION:

Diabetics with strokes showed higher incidences of MCA territory infarction and lacunar strokes. Poor glycemic control was associated with poorer outcomes, slower recovery and higher mortality. Management of hyperglycemia and prevention of stroke in diabetes is the key to reduce morbidity and mortality.

Conflicts of interest:
Authors have not received any grants from funding agencies.

Disclosure:
Authors have no disclosures to make.

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