Research Article

Prevalence of diabetes among stroke patients: a study in a tertiary care centre

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ABSTRACT

Background: Stroke is an abrupt onset of neurological deficit that is attributed to a vascular cause. Diabetes mellitus is known to be one of the major risk factors for stroke, apart from hypertension, ischemic heart disease, alcoholism, smoking, family history and hyperlipidemia. Since it was found that the serum glucose levels were elevated immediately after stroke, we had conducted this study to identify the clinical profile of the patients who suffered stroke, especially in relation to their glycemic status.

Methods: Detailed demographic, physical and clinical history was taken from the patients and their relatives. Within 3 days of the onset of symptoms related to stroke, CT scan was performed on all patients to confirm diagnosis and to categorize the type and size of stroke. Based on the glucose levels, the patients were divided into euglycemic, known diabetic, newly detected diabetes and stress hyperglycemia.

Results: The most common age in which stroke occurred was 50-60 years (55%), followed by 61-70 years (27.1%). 31.8% of the patients were known diabetic and the least was stress hyperglycemic with 8.5%. 51(39.5%) of the patients had ischemic stroke while 78 (60.5%) had hemorrhagic stroke.

Conclusions: Diabetes is a very important risk factor associated with high morbidity and mortality.

Keywords: Stroke, Diabetes mellitus, Hyperglycemia, HbA1c

INTRODUCTION

Stroke is an abrupt onset of neurological deficit that is attributed to a vascular cause.[1] It is diagnosed clinically and any laboratory diagnosis only helps in supporting the initial diagnosis.[2] It is the third leading cause of death worldwide after cardiovascular disease and cancer.[3] Cerebral infarction causes 80% of all first ever in a lifetime strokes, primary intracerebral hemorrhage (PICH) for 10% and subarachnoid hemorrhage for 5%.

Diabetes mellitus is known to be one of the major risk factors for stroke, apart from hypertension, ischemic heart disease, alcoholism, smoking, family history and hyperlipidemia.[4] The increased risk of diabetes has been linked to the pathophysiological conditions that are seen in the cerebral vessels of the patients with stroke. There have been a few studies that have shown that patients with diabetes have a poor outcome than this without.[5]

Around 2 out of every 3 stroke patients have an elevated glycemic levels (i.e. >6.1 mmol/L). This shows the extremely high prevalence of post stroke hyperglycemia (PSH) in acute ischemic stroke patients.[6]

It has been reported that hyperglycemia is associated with impaired recanalization[7], decreased perfusion[8], increases reperfusion injury[9] and cerebral lactic acidosis secondary to mitochondrial dysfunction.[10]

Glycosylated hemoglobin A1c (HbA1c) basically diagnoses the sugar levels in the blood over a 2-3 month period. This test is usually done in diabetic patients to monitor the glucose levels in the blood. WHO recommends that this test can be done as a diagnostic test for diabetes, with a cutoff value of 6.5%. For diabetics, the goal of therapy is less than 7.0%.[11] The advantage of this test is that there is no need for a fasting sample. Some studies have shown that an elevated value of HbA1c with or without diabetes mellitus is an indicator for microvascular complications.[12]

Since it was found that the serum glucose levels were elevated immediately after stroke, we had conducted this study to identify the clinical profile of the patients who suffered stroke, especially in relation to their glycemic status.

METHODS

This study was conducted by the Department of Medicine at Deccan College of Medical Sciences On 129 stroke patients who attended the emergency ward of medicine. All the patients were between 40-75 years of age.

Detailed demographic, physical and clinical history was taken from the patients and their relatives. Within 3 days of the onset of symptoms related to stroke, CT scan was performed on all patients to confirm diagnosis and to categorize the type and size of stroke. Based on the results, the stroke was categorized as either ischemic or haemorrhagic. Size was considered to be small if the stroke was 5 mm in diameter and not visible in more than 2 adjacent slices of the scan, medium if it was between 5 and 10 mm in diameter and large if it was more than 10 mm in diameter.

Patients who had symptoms of stroke for over 72 hours were excluded from the study. Patients with epilepsy, subdural hematoma and sub-arachnoid hemorrhage or any other neurological disability that would affect the Hba1c levels were excluded from the study.

Regular demographic details such as age, sex etc were taken for all patients along with the past clinical history like existing diabetes, previous stroke etc. Urine sugar, random blood sugar and glycosylated hemoglobin were estimated for every patient. Fasting and post parandial blood glucose levels were also done on the next day with a time difference of 2 hours. RBS > 200mg/dL, fasting glucose > 126mg/dL and post parandial glucose > 200mg/dL was considered as hyperglycemic range. 8% or more of glycosylated hemoglobin was considered to be in the diabetic range.

Based on the glucose levels, the patients were divided into

(a) *Euglycemic:* Patients with normal RBS, FBS and PLBS and Hba1c.

(b) *Known diabetic:* Those who have a previous history of diabetes.

(c) *Newly detected diabetes:* Those with RBS >200 mg/dL, fasting glucose >126 mg/dL, post prandial glucose >200 mg/dL and Hba1c >8% but without a history of diabetes.

(d) *Stress hyperglycemia:* RBS >200 mg/dL with Hba1c, 8%.

RESULTS

Out of the total 129 stroke patients, 74 (57.4%) were males and 55 (42.6%) were females. The most common age in which stroke occurred was 50-60 years (55%), followed by 61-70 years (27.1%) (Table 1).

Out of the stroke patients, most of them did not have elevated glycemic levels and were non-diabetic (45%). 31.8% of the patients were known diabetic and the least was stress hyperglycemic with 8.5% (Table 2).

51 (39.5%) of the patients had ischemic stroke while 78 (60.5%) had hemorrhagic stroke. Most of the patients with ischemic stroke had no diabetes while 2.5% of them were known diabetic. Our of the hemorrhagic stroke patients, the most common was known diabetic (37.2%).[9] Patients who were stress hyperglycemic had hemorrhagic stroke (Figure 1).

Table 1: Age wise distribution and outcome of patients.

Age	Number of patients (%)	No recovery	Complete recovery	Partial recovery	Expired
40-50 years	15 (11.6%)	5	2	7	1
51-60 years	71 (55%)	18	11	31	11
61-70 years	35 (27.1%)	4	3	19	9
>70 years	8 (6.2%)	0	1	3	4

Table 2: Categorization of patients accourding to glycemic status.

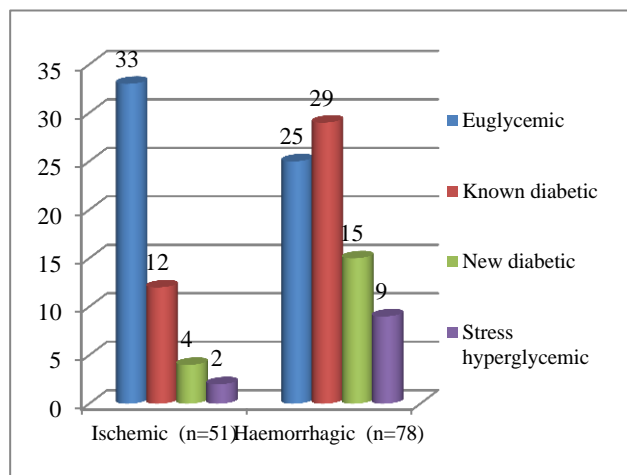| Glycemic status	No of patients
Euglycemic	58 (45%)
Known diabetic	41 (31.8%)
New diabetic	19 (14.7%)
Stress hyperglycemic	11 (8.5%)

Figure 1: Types of stroke in various glycemic stages.

DISCUSSION

Stroke whether ischemic or hemorrhagic is a common clinical problem though the treatment is comparatively ineffective. Instead treatment for control of diabetes, hypertension and other risk factors have shown to be useful. In the past it has been reported that patients with acute ischemic stroke and similar glucose concentrations has similar outcomes regardless whether the oatietns had diabetes or not.[13] But in the recent studies, it has been seen that increased mortality is seen in patients with stroke and stress hyperglycemia.[14-16]

In our study, there was as slight preponderance of males over females, though this was not found to be significant.

Among the stroke patients the age group where diabetes was more common was 51-60 years in our study. Singh et al also reported 51-60 years to be the most common age in which patients has diabetes.[17] This was also observed by Topie et al.[18] This was in contrast to another study by Sharma et al, where 41-50 was found be the common age where diabetes was identified in patients with stroke.[19]

Only 45% of the patients who had stroke had normal blood glucose levels while the rest were known diabetics, new diabetic or stress hyperglycemic.

Majority of the strokes in our study were hemorrhagic while in the study by Singh it was Ischemic.[17] The prevalence of known diabetes in our study was comparatively higher (31.8%) than many other studies.

Singh et al showed a prevalence of 24%[17] while Gracy et al[20] reported 8.5% and Kiers et al reported 17%.[21] Another study by Patil et al reported a prevalence of 21.25%[22] while Latheef et al reported 9.8%[23] and Woo et al reported 6.25%.[13]

The newly diagnosed diabetic cases in our study were 14.7%, while Woo et al reported 18%, Latheef et al reported 11.47% and Singh et al reported 8.75%.

There have been a few mechanisms that have described the effects of blood sugar level on stroke such as impaired auto regulation of cerebral blood flow in diabetics.[24] It was observed that patients who had hyperglycemia were more prone to develop cerebral oedema[25], and those who had stroke and hyperglycemia had higher lactate content in the brain compared to the patients with normal glycemic levels.

For optimization of the efficacy and safely of treatment, selecting an appropriate target range is very important. There is no proper consensus on the issues of glycemic control and its effect on acute stroke patients.[26] It was observed in an animal experiment that glucose levels showed a U shaped association with cortical necrosis and total infarction with a nadir for cerebral necrosis if the 108-126 mg/dL range.[27,28] In human, in studies on association between glucose and poor outcome the thresholds used were 108-150mg.dL.[29-32] It was observed in a meta-analysis that there was an association between admission glucose levels higher than 110-126 mg/dL and an increased risk of mortality in nondiabetic ischemic stroke patients.[33]

It is suggested that in the early hours of stroke, arterial hypertension should be treated only f the diastolic blood pressure exceeds 120 mmHg.[34] Monitoring of serum glucose is essential and should be maintained at 110 mg/dL using an insulin pump if necessary.[35] It is recommended to keep mean arterial pressure (MAP) <130 mm of Hg in cases of cerebral haemorrhage unless an increased intracranial pressure is expected.[36]

CONCLUSION

The prevalence of diabetes in stroke patients was highest in 52-60 age group. The prevalence of diabetes was almost 55%, with 31.8% being known diabetes and 14.7% were new diabetics. These patients were at a higher risk of ischemic stroke. Hence, diabetes is a very important risk factor associated with high morbidity and mortality.

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