

Glycemic States of Patients Presenting with Acute Ischemic Stroke in Tertiary Care Settings

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ABSTRACT

Objective: To determine the glycemic states of patients presenting with acute ischemic stroke.

Methods: 50 patients of acute ischemic stroke presenting to Mayo Hospital within 24 hours of symptom onset were taken. Data about any previous diagnosed diabetes was recorded. Blood glucose levels (BSL) at the time of presentation were measured. The patients who were previously known diabetics and those whose presenting BSL was > 200mg/dl were excluded from the glucose tolerance test (GTT). Rest of the patients were subjected to GTT at day 7.

Results: Out of 50 patients, 32(64%) were male and 18(36%) were female. Eight(16%) patients were previously diagnosed diabetics and 11(22%) were newly diagnosed as having diabetes. Twelve(24%) patients had impaired glucose tolerance, whereas another 12(24%) had normal glucose levels both at presentation and on GTT. Seven(14%) patients had blood glucose levels in the hyperglycemic range only at presentation whereas GTT at day 7 showed normal values (transient hyperglycemia). Six(12%) patients were of age 40 years or less and in this age group 4(67%) had normal glucose levels, throughout the study. Forty four(88%) patients were of age greater than 40 years and in this age group only eight(18%) had normal glucose levels, throughout the study.

Conclusions: Abnormalities of glucose regulation are fairly common among acute stroke patients and mostly these are unrecognized. Blood glucose levels measurement and a formal GTT at one week should be part of work up of every stroke patient for early diagnosis and management of disturbed glucose metabolism.

INTRODUCTION

Around 382 million people of the world are suffering from Diabetes Mellitus and the number will increase to 592 million by the year 2035¹. The prevalence, complications and cost of this problem is increasing day by day². In the early days of stroke, hyperglycemia is commonly seen. On admission, blood glucose levels greater than 6mmol/L (108mg/dl) are seen in two thirds of patients of all subtypes of ischemic stroke and in at least half of patients in each subtype including lacunar infarction³.

Diabetes is a well-known risk factor for ischemic stroke⁴. It increases the risk of stroke by two to three times as compared to non-diabetics. Population attributable risk varies from 18 % to 54%⁵. In a study carried out in Finland, it was found that in males, diabetes caused 16% stroke mortality; and in females, it caused 33% stroke mortality⁶.

It is an under recognized fact that glucose metabolism is deranged in majority of acute stroke patients⁷. In a recent study⁸, it was found that

insulin resistance is an independent risk factor for stroke. Diabetes develops within 10 years in up to half of people with impaired glucose tolerance⁹, but this progression can substantially be reduced by regular physical activity, diet and weight control¹⁰. Hence goal of secondary prevention may be achieved by screening for disorders of glucose metabolism in high vascular risk group of stroke patients.

Moreover, elevated glucose levels after acute stroke are associated with a worse prognosis. In a study that used subcutaneous glucose sensor monitoring, it was found that hyperglycemia caused expansion of infarcts and was also found to be independently associated with change in the infarct volume¹¹.

A major proportion of acute stroke patients have elevated glucose levels not due to diabetes, but due to stress hyperglycemia, which is thought to be mediated by the surge of cortisol and norepinephrine¹¹.

The prevalence of disorders of glucose metabolism has not been studied in our population;

especially the issue of transient stress hyperglycemia has not been adequately addressed. This study was conducted so as to study the spectrum of disorders of glucose regulation in patients of acute ischemic stroke and also to address the issue of transient stress hyperglycemia by performing an oral glucose tolerance test one week after stroke.

METHODOLOGY

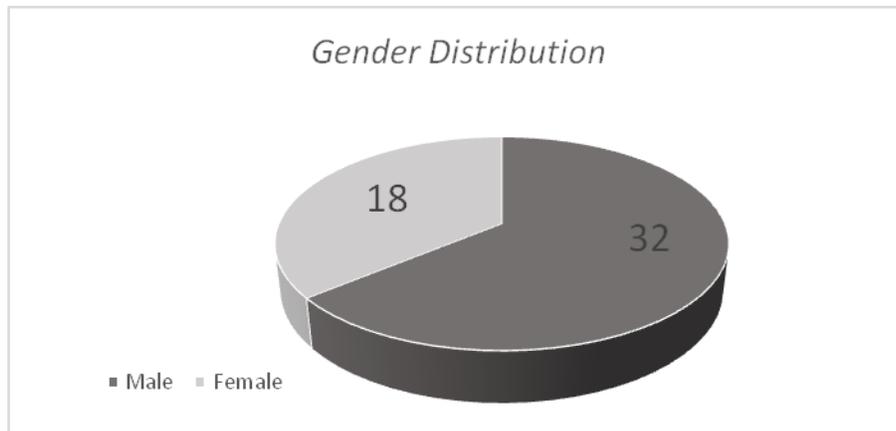
It was a descriptive cross-sectional study conducted at the Department of Neurology, Mayo Hospital Lahore after permission from the ethical review committee. Total 50 patients of acute ischemic stroke were selected by non-probability purposive sampling. Stroke was defined as sudden onset focal neurological deficit lasting greater than 24 hours or leading to death and caused by a vascular problem. Patients of either sex were included who presented within 24 hours of symptom onset and had no evidence of hemorrhage on plain CT scan of brain. Following patients were excluded from the study: those having deranged renal function tests (s/urea >40mg/dl; creatinine >1.2), those taking steroids and those having severe dysphagia. Their demographic profile and history of diabetes mellitus was recorded. Blood sugar level at presentation was checked in all patients at the pathology laboratory of King Edward Medical University Lahore. A 75g oral glucose tolerance

test was performed on patients at day 7. Known diabetics and those having presentation BSL >200mg/dl were excluded from the OGTT.

Patients were divided into the following result groups (based on WHO diagnostic criteria¹²):

- 1). Previously diagnosed diabetics:
From history
- 2). Newly diagnosed diabetics:
Presentation BSL > 200mg/dl
OR
0hr GTT value > 126mg/dl
OR
2hr GTT value > 200mg/dl
- 3). Impaired glucose tolerance:
0hr GTT value < 126mg/dl
OR
2hr GTT value > 140mg/dl and < 200mg/dl
- 4). Normal glucose values:
Presentation BSL < 140mg/dl
AND
0hr GTT value < 110mg/dl
AND
2hr GTT value < 140mg/dl
- 5). Transient stress hyperglycemia:
Presentation BSL > 140mg/dl and < 200mg/dl
AND
0hr GTT value < 110mg/dl
AND
2hr GTT value < 140mg/dl

RESULTS



Age Distribution

Age range	20-80 years
Mean age	55.1 years
Age < 40years	6 (12%)
Age > 40 years	44 (88%)

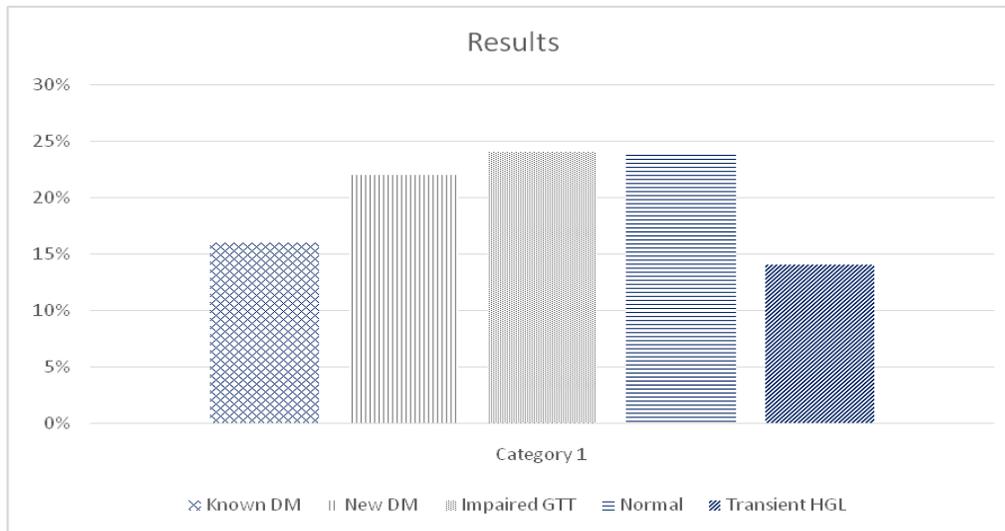
ORIGINAL ARTICLE

Result Groups

Out of 50 patients, 8 (16%) had previously diagnosed diabetes. Newly diagnosed diabetes was found in 11 (22%) patients, while 12 (24%) patients were found to have impaired glucose

tolerance. Only 12 (24%) of patients had normal glucose values, whereas another 7 (14%) had only transient stress hyperglycemia.

Previously diagnosed diabetics	08 (16%)
Newly diagnosed diabetics	11 (22%)
Impaired glucose tolerance	12(24%)
Normal glucose values	12(24%)
Transient stress hyperglycemia	07(14%)



Normal Glucose Values in Different Age Groups

Age Group	Normal Glucose Values
>40 years	8 (18%)
<40 years	4 (67%)

DISCUSSION

Abnormalities of glucose metabolism are fairly common in acute stroke patients in our population, and mostly these are unrecognized. Our figures for newly diagnosed diabetes are slightly higher than the figures of an international study⁷, that reported newly diagnosed diabetes in 16.4%, whereas it is 22% in our study. This may indicate that people in our setup are more unaware of their health status. Their higher blood glucose levels remain unrecognized till the time they present with a major complication- stroke in our case. Another great majority (24%) have impaired glucose tolerance and they need at least a proper diet and lifestyle advice and then regular follow up. This figure correlates well with the figure of an international study⁷. A small percent (14%) of our patients had transient stress hyperglycemia, i.e. their higher

BSL levels were not due to any disturbed glucose metabolism; in fact, they represented a stress response and they normalized in one week. In older patients (>40yrs) with stroke, only 18% had normal glucose values throughout the test; whereas in younger age group (i.e. <40yrs), 67% had normal glucose values. This implies that stroke in a young patient likely has a cause other than that of disturbed glucose regulation.

CONCLUSION

Since our study indicates that abnormalities of glucose regulation are very common among our stroke patients and it remains unrecognized, we recommend that blood glucose levels measurement and a formal oral glucose tolerance test one week after stroke should be part of work up of every ischemic stroke patient so that timely

steps can be taken for their proper long term management and also to exclude those who develop only a transient stress hyperglycemia after stroke.

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