Original Article

Assessment of Ischemic Stroke Severity in Relation to Glycemic Status at Presentation: A Prospective Observational Hospital Based Study

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ABSTRACT

Aim: The aim of present study was to investigate the prestroke glycemic status, severity, and outcome in patients with ischemic stroke.

Design: The prospective hospital based study

Materials and Methods: Total 60 patients were included in this study. During this study period, all patients presenting with acute cerebral infarction and fulfilling the inclusion criterion were included in the study.

Results: The mean age of the patients in the study group was 53.9 + 12.9 years. Maximum number of patients of cerebral infarction belonged to age groups 51-60 years and 61-70 years. The diabetes group have a higher baseline score among the glycemic groups ($p>0.05$). Stress hyperglycemia group has a slow progression of score from baseline compared to the diabetes group ($p<0.020$).

Conclusion: In conclusion of our study showed that the stress hyperglycemics had poor recovery on NIHSS scores for both medium and large sized infarcts from the baseline score.

Keywords: Prestroke, glycemic status, ischemic stroke, NIHSS, stroke severity

INTRODUCTION

Diabetes mellitus is a major risk factor for stroke. A high incidence of patients who developed stroke may have hyperglycemia, even without a previous history of diabetes.[1] Many investigators think that this is not a benign condition and that stress induced hyperglycemia is associated with high mortality after stroke. [2]

Diabetes and prediabetes both show increased risk for ischaemic stroke and are associated with poor patient outcomes. [3,4]

Hyperglycemia is common in patients with acute stroke, occurring in up to 60% of patients overall and approximately 12-53% of acute stroke patients without a prior diagnosis of diabetes.

It has been associated with increased stroke severity and mortality. Many studies has demonstrated that post stroke hyperglycemia is associated with worse patient outcomes following in acute stroke, including increased post stroke mortality. [5]

The aim of present study was to investigate the prestroke

glycemic status, severity, and outcome in patients with ischemic stroke.

MATERIALS AND METHODS

Subjects and Populations: This prospective observational study was conducted in Chalmeda AnandRao Institute of Medical Sciences, Karimnagar, during the period of January 2017 to June 2017. During this study period, all patients presenting with acute cerebral infarction and fulfilling the inclusion criterion were included in the study.

Sampling Size: Totally 60 ischemic stroke patients were included in this study.

Inclusion criteria

1. Confirmed diagnosis of first ischemic stroke with onset of symptoms in the last 72 hours before admission.
2. Age group: above 33 to 80 years
3. HBA1 level positive cases

Exclusion criteria

1. TIA
2. Head injury
3. Malignancy in brain
4. Family history of stroke

All patients underwent a detailed history taking and physical examination and all relevant investigations were performed. The diagnosis of stroke was assessed according to the World Health Organization definition of stroke.

Stroke severity

The National Institutes of Health Stroke Scale (NIHSS) was used to assess the severity of the stroke.[5] Three stroke severity categories were developed from the NIHSS score: Mild (0-10), moderate (11-20), and severe (> 20).

Ethics Approval

The study was approved by Institute Ethics committee, CAIMS, Karimnagar. All patients had provided informed consent before enrollment in this study.

STATISTICAL ANALYSIS

Data were collected using Microsoft Excel and Statistical analysis was performed using SPASS software version. $P < 0.05$ was considered significant in this study.

RESULTS

Total 60 patients were included in this study. The mean age of the patients in the study group was 53.9 + 12.9 years. Maximum number of patients of cerebral infarction belonged to age groups 51-60 years and 61-70 years. (Table 1)

Table 1: Age distribution of stroke

Age Group	No. of cases	Percentage (%)
33-40	9	15.0 %
41-50	10	16.67 %
51-60	18	30.0 %
61-70	17	28.33 %
71-80	6	10.0%

Table 2: Sex Distribution

Age Group	No. of cases	Percentage (%)
Male	38	63.33%
Female	22	36.67 %

Table 2 showed that 63.33 % of the cases were males and 36.67 % were females. There was a male preponderance with male: female ratio 1.73:1.

Table 3: Glycemic status in the study group

Glycemic status	No. of cases	Percentage (%)
Euglycemia	15	25.0%
Stress hyperglycemia	19	31.67%
Diabetes	26	43.33%

Above the table no 3 showed that 43.33 % had diabetes, 31.67 % had stress hyperglycemia and 25 % were euglycemia.

Table 4: Admission blood glucose in various glycemic groups

Admission Blood Glucose	Euglycemia (n=15)	Stress hyperglycemia (n=19)	Diabetes (n=26)
100-140	15		
141-180		10	1
181-220		7	9
221-260		1	5
261-300		1	3
301-340			2
341-380			2
381-420			1
>420			2

Table no 4 showed, the admission blood glucose in the study group ranged from 100-420 mg %. Only two patients had blood glucose> 420 mg % at admission.

Table 5: Follow-up, Baseline of NIHSS score in various glycemic groups (n=60)

Glycemic Group	No	Mean NIHSS score± SD Day 0	Mean NIHSS score ± SD Day10	Change in the mean NIHSS score± SD Day10
Euglycemia	15	12.47 ± 3.62	7.53 ± 0.99	4.93 ± 3.08
Stress hyperglycemia	19	23.53 ± 7.82	15.84 ± 7.65	7.68 ± 0.89 **
Diabetes	26	27.92 ± 5.34*	19.46 ± 4.56	8.73 ± 1.73

*p>0.05 **p<0.020

Table 5 showed that the diabetes group have a higher baseline score among the glycemic groups (p>0.05). Stress hyperglycemia group has a slow progression of score from baseline compared to the diabetes group (p<0.020). This slower change in the scores indicates slow recovery on day 10 of hospitalization. This slow progression is noted for all infarct sizes in stress hyperglycemia. There was no statistical significance is seen in the follow up scores in both stress hyperglycemia and diabetes group.

DISCUSSION

The current study aims is to study glycemic status with acute ischemic stroke and to assess the severity, and outcome of stroke. Total of 60 patients with acute cerebral infarction proven by computed tomography who met the inclusion criteria were included in the study.

Glycemic control may be indicated also in nondiabetic patients, in which stress hyperglycemia was associated with a 3-fold risk of fatal 30-day outcome and 1.4-fold risk of poor functional outcome, as compared with normoglycemic patients. Good glycemic control seems warranted also in hemorrhagic stroke. In several thrombolysis trials, hyperglycemia has been found to be associated with hemorrhagic events.

In our study, the age group of the patients ranged from 30-80 years with mean age 53.9 ± 12.9 years, the maximum distribution of cases were in the fifth and sixth decade (58.3%). There were 63.33 % males and 36.67 % female patients. There was a male preponderance with male, female ratio 1.73:1.

The admission blood glucose ranged from 100-540 mg % in the study group, 44 of the total 60 patients (73.33%) had admission glucose in the hyperglycemic range i.e. >140 mg%. The admission glucose in the stress hyperglycemia group ranged from 140-300 mg % (n=19).While the admission glucose in the diabetes group ranged from 100-512 mg %. (table 4)

The majority of the stroke patients were ischemic and mainly in the euglycaemic patients. This study revealed a high mortality with stress hyper glycaemics and diabetic groups which are consistent with others as reported by some authors. [6]

Many studies have confirmed that stress hyperglycemia is associated with poor outcome. [7] The major cause of hyperglycemia related to brain damage includes; acidosis, oxidate stress, reperfusion injury, interference with glucose/sodium transport and glucose related cortisol increase. [8]

In our study, demonstrates admission hyperglycemia as a bad prognostic marker. The follow up scoring was done on the 10th day using the NIHSS scale. The decrease in the score from baseline was taken as a sign of improvement or recovery. Non progression in the scores from the day of admission or slow progression was taken as slow or non-recovery and bad prognostic sign (table 4).

The diabetes group have a higher baseline score among the glycemic groups (p>0.05). Stress hyperglycemia group has a slow progression of score from baseline compared to the diabetes group (p<0.020). This slower change in the scores 62 indicates slow recovery on day 10 of hospitalization. This slow progression is noted for all infarct sizes in stress hyperglycemia.

Murros et al study found that prestroke blood glucose level, unlike post stroke blood glucose level, did not have any predictive value concerning stroke outcome. It was concluded that high fasting blood glucose values after stroke reflect a stress response to a more severe ischemic brain lesion. [9, 10]

In present study, shows that in patients with no history of diabetes who have an ischemic stroke, with elevated glucose levels (stress hyperglycemia) are associated with increased risk of poor functional recovery compared with lower glucose levels.

This finding is supported by other studies showing higher mean admission glucose level in non-survivors of stroke compared with survivors. It is also supported by multivariate analyses of data from other large studies, in which admission glucose level was a significant predictor of mortality or poor functional recovery after stroke independent of other prognostic factors.

CONCLUSION

In conclusion, patients with hyperglycemia in acute cerebral infarction had increased severity with high NIHSS scores on admission, irrespective of infarct size. Stress hyperglycemics had poor recovery on NIHSS scores for both medium and large sized infarcts from the baseline score. Hyperglycemia on presentation was associated with larger infarct size and poor recovery in diabetes mellitus.

CONFLICT OF INTEREST :

The authors declared no conflict of interest.

FUNDING : None

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