Original Article

Hyperglycemia in patients presenting with acute cerebral stroke: a single center study

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Objective: To determine the frequency of hyperglycemia in patients presenting with acute cerebral stroke.

Methodology: This cross sectional, descriptive study was conducted at Department of Medicine, Khyber Teaching Hospital, Peshawar, Pakistan from August 1, 2016 to July 31, 2017. The total sample size was 143, keeping 38.5%[12] proportion of hyperglycemia among stroke patients, 8% margin of error and 95% confidence interval, using WHO software. All patients with acute stroke within 48 hours of stroke onset in age 45 and above and both gender were included.

Results: Out of 143 patients, 54% were males while 46% were females. Mean age of males was 54±13 while those of females were 60±7 years. Mean blood sugar was 180±30. The frequency of hyperglycemia was 46.8%. 60% of the females had hyperglycemia (190±22) in comparison to 44% of the males (182± 19).

Conclusion: Our study showed that the 46% of the patients presenting with acute cerebral stroke in our setup had documented hyperglycemia. (Rawal Med J 201;43:619-622)

Key words: Hyperglycemia, acute cerebral stroke, diabetes.

INTRODUCTION

Stroke is a serious issue in public health.[1,2] It is a common illness that has a worse impact on the affected individuals and their families.[3] Stroke is an important cause of death and disability in the whole world but this problem is more severe in developing countries like Pakistan. According to recently released statistics for the United States in 2007, overall death rate from cerebrovascular disease (CVD) was 251.2 per 100 000. From 1997 to 2007, the death rate from CVD declined to 27.8%. Mortality data shows that CVD accounted for 33.6% (813 804) of all 2 243 712 deaths in 2007, or 1 of every 2.9 deaths in the United States.[4] There is only one published stroke prevalence study from Pakistan, conducted on adult Pushtoon community residing in Karachi, which showed a prevalence of 4.8% which was alike in men and women.[5]

The proportion of raised blood sugar level is almost one third in patients presenting with acute ischemic stroke, which leads to worse clinical outcomes.[6] Those patients with acute stroke who gets hospitalized with hyperglycemia or those who have persistently raised blood sugar level in the first three days of admission, have unfavorable clinical outcomes as compared to normoglycemic patients.[7] Various studies have shown that raised blood sugar level in a setting of acute stroke causes more brain damage as compared to the normal blood sugar level and hyperglycaemia interferes with thrombolysis and reperfusion in acute brain ischaemia.[8] Acute hyperglycemia in acute stroke may be due to acute stress response or due to preexisting diabetes.[9]

Untreated or under-treated hyperglycemia is a common occurrence in patients admitted to hospital with an acute medical emergency[10] and is independently associated with in-hospital mortality.[11] Patients with hyperglycemia and no prior history of diabetes have significantly poorer outcomes following acute stroke as compared to patients with known diabetes and hyperglycemia.[11] Glycemic control is a strong independent determinant of survival after acute stroke even after adjustment for age, gender, concomitant hypertension and diabetes and is observed in 38.5% of patients in one study.[12] The aim of current study was to determine the regional and current trends of hyperglycemia in patients with acute stroke.

METHODOLOGY

This study was conducted at Department of Medicine, Khyber Teaching Hospital, Peshawar

from August 1, 2016 to July 31, 2017. The total sample size was 143, keeping 38.5%[12] proportion of hyperglycemia among stroke patients, 8% margin of error and 95% confidence interval, using WHO software for sample size determination. Non-probability consecutive sampling technique was used. All patients with acute stroke within 48 hours of stroke onset in age 45, confirmed with CT scan and above and both gender were included. Known diabetic patients based on history, examination and previous medical record, patients with acute myocardial infarction based on ECG (electrocardiogram) findings of ST segment elevation, ST depression and pathological Q waves, patients on steroid medications or thiazide diuretics based on history and medical record were excluded. Approval from the hospital ethical committee was taken and an informed written consent was obtained from patients or relatives of the patients before data collection.

An ECG was done to rule out acute myocardial ischemia. Blood was obtained immediately after admission and was sent to laboratory for blood glucose level. All the laboratory investigations were done from the same hospital laboratory under the supervision of same pathologist having at least 5 years of experience. All information and other demographic data like name, age, gender was recorded. Data was analyzed by using SPSS version 20. Hyperglycemia was stratified among age, sex, duration of stroke and type of stroke to see the effect of modifiers.

RESULTS

Mean age of all the participants was 58±20 years. 54% of the entire sample comprised of males while 46% were females (Table 1). Eighty three (58%) patients had ischemic stroke while 60(42%) patients had hemorrhagic stroke. Mean duration was 10±6.53 hours (Table 2). The mean blood sugar was 180±30.

The frequency of hyperglycemia was 46.8%. 60% of the females were having hyperglycemia (190±22) in comparison to 44% of the males (182±19). The incidence of hyperglycemia increased with age (Table 3). Furthermore, hyperglycemia was more common in those with ischemic stroke than those with Intracereberal bleed (Table 4). Similarly, those who presented early (less than 12 hours) had more hyperglycemia than those with delayed presentation (Table 5).

Table 1. Age distribution (n=143).

Age	Number	Percentage
45-55 years	36	25%
56-65 years	53	37%
66-75 years	54	38%
Total	143	100%

Table 2. Duration of stroke (n=143).

Duration	Number	Percentage
≤12 hours	109	76%
>12 hours	34	24%
Total	**143**	**100%**

Table 3. Stratification of hyperglycemia with respect to age (n=143).

Hyperglycemia	45-55 years	56-65 years	66-75 years	Total
Yes	10	14	43	67
No	20	30	26	76
Total	36	53	54	143

Chi square test was applied in which P value was 0.9845

Table 4. Stratification of hyperglycemia with type of stroke (n=143).

Hyperglycemia	Ischemic	Hemorrhagic	Total
Yes	23	16	39
No	60	44	104
Total	83	60	143

Chi square test was applied in which P value was 0.8899

Table 5. Stratification of hyperglycemia with respect to duration of stroke (n=143)

Hyperglycemia	≤12 hours	>12 hours	Total
Yes	30	9	39
No	79	25	104
Total	109	34	143

Chi square test was applied in which P value was 0.9042

Table 6. Stratification of hypergylcemia with respect to clinical features (n=143).

Variable	Hyperglycemia		*P* value
	Yes	No	
Hemiparesis	55%	45%	0.05
Hemiplegia	30%	70%	0.05
Cranial nerve palsy	15%	85%	0.07
Seizures	27	73%	0.04
Aspiration	33	67%	0.06

Amongst all 143 patients, 55% presented with hemiparesis, 30% with hemiplegia and the remainder with a combination of limb weakness and cranial nerve palsy. The most commonly encountered cranial nerve palsy was that of facial nerve which was seen in 47.8% of the sample (Table 6).

DISCUSSION

Stroke is a serious and common illness that has a worse impact on the affected individuals and their families.[3] There is only one published stroke prevalence study from Pakistan, which reported a prevalence of 4.8%.[5] Our study showed that among 143 patients, 25% patients were in age range 45-55 years, with mean age of 63±28.34 years. Fifty two percent patients were male and (48%) patients were female. Fifty eight percent patients had ischemic stroke while (42%) patients had hemorrhagic stroke. Seventy six percent patients had stroke ?12 hours while (24%) patients had stroke >12 hours. Mean duration was 10 hours with SD ±6.53. The incidence of hyperglycemia was 46.8%.

Glycemic control is a strong independent determinant of survival after acute stroke even after adjustment for age, gender, concomitant hypertension and diabetes and is observed in 38.5% of patients in one study.[18] Similar results were found in another study conducted by Fayyaz et al on 171 patients with mean age of 53.82±10.31years. Eighty nine (52.05%) were males and 82 (47.95%) were female patients. Mean duration of disease was 10.29±6.53 hours, mean BMI was 28.41±5.33kg/m^2 and hyperglycemia was found in 25.73% patients.[13]

Hyperglycemia is very common in patients of acute stroke, occurring in up to 60% of patients and is believed to aggravate cerebral ischemia.[14] It leads to intracellular acidosis, accumulation of extra cellular glutamate, cerebral edema, blood brain barrier disruption, and tendency for hemorrhagic transformation.[15] It is observed that between 20-40% of patients admitted with ischemic stroke are hyperglycemic, often without a preexisting diagnosis of diabetes, which can be due to stress hyperglycemia or undiagnosed diabetes exposed during an acute incident.[16]

Zahra et al in their study has found 20% stroke patients with hyperglycemia who were previously non-diabetics.[17] Zafar et al in their study found that in non-diabetics, 58.0% had ischemic stroke while 42.0% had intracerebral hemorrhage.[18]

CONCLUSION

Our study concludes that the frequency of hyperglycemia was 46.8% in patients presenting with acute cerebral stroke in our setup, more common in females than in males. This had a positive relationship with increasing age and inverse with the time of presentation.

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