



The Frequency of Elevated Serum Glucose Levels in Acute Stroke Patients who are not known to have Diabetes at the Time of Presentation in Lady Ready Hospital Peshawar

A Cross-sectional Study

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Abstract

Introduction:

Cerebrovascular accident represents a serious problem in public health. It's one of the most common conditions that have a strong effect on individuals and communities and it's one of the leading causes of mortality and morbidity worldwide and this is more pronounced in developing countries like Pakistan, but limited data is available. According to recently released statistics for the United States, the overall mortality rate from stroke was 251.2 per 100 000 in 2007. During the time period of 1997 to 2007, the mortality rate from cerebrovascular disease (CVD) decreased to (27.8%). The 2007 mortality data of United States shows that (CVD) is among 33.6% (813 804) of all 2 243 712 deaths or one of every 2.9 deaths.

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This study was conducted in the MTI Lady Reading Hospital Peshawar, Neurology department. This study is *Cross-sectional, descriptive study, the Duration was six months 03 February 2016 to 03 August 2016.*

In our this study, the total number of 143 patients were observed by keeping 38.5% proportion of hyperglycemia (abnormally elevated blood glucose level) among that stroke patients, margin of error was 8% and confidence interval was 95%, WHO software was used for sample size determination and for sample collection non-probability consecutive sampling technique was used. This study shows that the mean standard deviation of age was (63± 28.34 years). Fifty-two (52%) percent of patients were men and forty-eight percent of patients were women. The incidence of abnormally high serum blood glucose was 27% in our subjects.

In conclusions we found that the frequency of abnormally elevated blood glucose level was twenty-seven percent in patients with acute cerebrovascular accident (stroke) who were not known to have diabetes at the time of presentation in Lady Reading hospital Peshawar.

Keywords: high blood sugar levels/hyperglycemia; acute stroke.

I. Introduction

Stroke represents a serious problem in public health [1, 2]. Stroke is one of the common conditions that have a remarkable impact on individuals and communities [3]. Stroke is the leading cause of mortality and morbidity in the world and this is more pronounced in the developing countries like Pakistan, but limited data is available. According to recently released statistics for the United States, the overall mortality rate from stroke was 251.2 per 100 000 in 2007. From 1997 to 2007, the mortality rate from cerebrovascular disease (CVD) decreased to 27.8%. Mortality data in 2007 shows that (CVD) is among 33.6% (813 804) of all 2 243 712 deaths or one of every 2.9 deaths in the United States [4]. Only one prevalence study on stroke from Pakistan was conducted on adult Pushtoon community residing in Karachi. This study shows the prevalence of 4.8% which was same in the men and women [5]. High blood glucose level affects close to tierce of acute stroke patients and has the worst clinical outcome. In various stroke studies, hyperglycemia is deleterious to the penumbral tissue for many reasons [6]. It shows that in stroke patients who have hyperglycemia on admission or persistently during the first three days of hospitalization have bad prognosis than patients without diabetes. This finding has been confirmed by many stroke studies [7]. The exact mechanisms by which elevated blood glucose levels(during the acute ischemic stroke) leads to worse meaningful outcome is unknown, it may be due to uncontrolled blood sugar level throughout ischemia leads to larger brain injury compared to normoglycemia. During acute brain ischemia, it may impair thrombolysis and reperfusion [8]. Few experimental studies in this correspondence used primarily acute blood glucose level changes, during which hyperglycemia was induced by glucose injection or by depleting the endocrine function of islet cells by injecting streptozotocin (STZ) a few days before stroke surgery and they reported briefoutcome [9]. The role of uncontrolled blood glucose levels in non-diabetic patients presenting with an acute stroke is currently part of an ongoing discussion. Untreated or under-treated hyperglycemia is a common occurrence in the medical emergency [10] and is independently associated with in-hospital mortality [11]. Patients with uncontrolled blood sugar levels and no prior history of diabetes have significantly poorer outcomes following acute stroke as compared to patients with known diabetes and

hyperglycaemia [11]. Glycemic management could be a sturdy freelance determinant of survival after acute stroke and is ascertained in 38.5% of patients in one study [12].

1.1 Rationale

The purpose of the current study is to determine the current trends of increasing blood glucose levels in patients with acute stroke. The rationale behind designing this study is that blood glucose monitoring is commonly ignored in our population among the group of patients who do not have any history of diabetes and once left undiagnosed or untreated the hyperglycemia plays an independent factor for worse outcomes in patients who already are compromised due to acute stroke. Also, a delay in diagnosing hyperglycemia among stroke patients is another problem which carries its risks of worst outcome among stroke patients. The results of this study if found to be significant as compared to previous surveys, will be used to develop policy recommendations in devising a strategy for hyperglycemia detection immediately at presentation and these guidelines will be disseminated to all health professionals even working in remote and far-flung areas because detection of hyperglycemia is relatively quick and easy procedure and early detection followed by early treatment will help in improving outcome in acute stroke patients.

1.2 Objective

The frequency of elevated serum glucose levels in acute stroke patients who are not known to have diabetes at the time of presentation in lady ready hospital Peshawar

1.3 Operational definitions

- a) Acute Stroke: It was defined as the neurological deficit of vascular etiology that persists beyond 24 hours, confirmed on CT scan brain showing an area of hypodensity (ischemic) or hyperdensity (hemorrhagic) within the brain parenchyma.
- b) Hyperglycemia/High blood sugar levels: Random blood sugar more than 200 mg per deciliter within the first 48 hours from stroke onset measured in serum by standard laboratory technique.

II. Materials and methods

- a) **Settings:** This study was carried out in the Neurology department of MTI Lady Reading Hospital Peshawar.
- b) **Study Design:** Cross-sectional, descriptive study.
- c) **Duration:** six months.
- d) **Sample size:** Sample size was 143, keeping 38.5% proportion of hyperglycemia among stroke patients, 8% margin of error and 95% confidence interval, W.H.O software was used for sample size determination
- e) **Sampling technique:** It is non-probability consecutive sampling

2.1 Sample selection

I. Inclusion criteria

- All patients within 48 hours of stroke onset.
- Age 45 years and above
- Both sexes

II. Exclusion criteria

- 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.

The above-mentioned conditions considered as confounders and if included had introduced bias in the study results.

III. Data collection procedure

The data was collected, after getting approval from the hospital ethical committee to conduct the study, of all those patients who presented to emergency or outpatient department with symptoms of focal neurologic deficit. Stroke was confirmed by hypodense or hyper dense lesions on non contrast CT scan of brain. Patients who satisfied the inclusion criteria were included in the study. History was taken to exclude the patients on steroids and taking thiazide diuretics and any history of diabetes. A baseline ECG was done to rule out acute myocardial ischemia, this was done to rule out confounders and bias in the study results. The written consent was taken from the patients or the guardian of the patients. Blood samples were obtained from patients after admission and sent to the laboratory for blood glucose level to detect hyperglycemia. All the laboratory investigations were done from the same hospital laboratory under the supervision of the same pathologist having at least 5 years of experience. Care was taken in the selection of cases to avoid selection bias. Similarly, care was taken in the extraction of information from the data so that information bias was reduced. All these information and other demographic data like name, age, sex, were also recorded into a proforma.

IV. Data analysis

Data was analyzed by using (SPSS) version 20. Descriptive statistics were used to analyze the data. Mean \pm standard deviation were calculated for quantitative variables like age, duration of stroke and blood glucose. Frequency/percentages were calculated for qualitative variables i.e. gender, type of stroke and hyperglycemia. Hyperglycemia was graded for age, sex, duration of stroke and the type of stroke; all the results were presented as tables and charts.

V. Results

This study was carried out at MTI Lady Reading Hospital Peshawar, the total number of patients was 143,

included in our study to determine the frequency of abnormally elevated blood glucose level in patients presenting with acute stroke who were not known to have diabetes at the time of presentation at lady reading hospital Peshawar and the results were scrutinized as: Among 143 patients 36(25%) patients were in the range of 45-55 years, 53(37%) patients were in the range of 56-65 years and 54(38%) patients were in the range of 66-75 years. Mean standard deviation of age range was 63 ± 28.34 years. (As shown in table No 1) Between 143 patients, 74(52%) patients were men and 69(48%) patients were women. (As shown in table No 2) Type of stroke between 126 patients was scrutinized as 83(58%) patients had an ischemic stroke while 60(42%) patients had a hemorrhagic stroke. (As shown in table No 3). Duration of stroke between 143 patients was scrutinized as 109(76%) patients had a stroke ≤ 12 hours while 34(24%) patients had stroke >12 hours. Mean duration was 10 hours with SD ± 6.53 . (As shown in table No 4). Blood glucose among 143 patients was analyzed as 104(73%) patients had serum blood glucose level less than 155mg/dl, 39(27%) patients had blood glucose values more than 200mg/dl. The mean blood glucose level was 141 mg/dl with SD ± 3.35 . (As shown in table No 5 and 6). Stratification of Hyperglycemia with age, gender, type of stroke and duration of stroke is given in table no 7, 8,9,10.

Table 1: AGE DISTRIBUTION (n=143)

AGE	FREQUENCY	PERCENTAGE
45-55 years	36	25%
56-65 years	53	37%
66-75 years	54	38%
Total	143	100%

Mean age was 63years with SD ± 28.34

Table 2: GENDER DISTRIBUTION (n=143)

GENDER	FREQUENCY	PERCENTAGE
Men	74	52%
Women	69	48%
Total no	143	100%

Table 3: TYPE OF STROKE (n=143)

TYPE	FREQUENCY	PERCENTAGE
Ischemic	83	58%
Hemorrhagic	60	42%
Total	143	100%

Table 4: DURATION OF STROKE (n=143)

DURATION	FREQUENCY	PERCENTAGE
≤12 hours	109	76%
>12 hours	34	24%
Total	143	100%

Mean duration of stroke was 10.29±6.53 hours.

Table 5: BLOOD GLUCOSE, (n=143)

BLOOD GLUCOSE	FREQUENCY	PERCENTAGE
≤155 mg/dl	104	73%
>200 mg/dl	39	27%
Total	143	100%

Mean blood glucose was 141 mg/dl with SD ± 3.35

Table 6: HYPERGLYCEMIA, (n=143)

HYPERGLYCEMIA	FREQUENCY	PERCENTAGE
Yes	39	27%
No	104	73%
Total	143	100%

Table 7: STRATIFICATION OF HYPERGLYCEMIA W.R.T AGE (n=143)

HYPERGLYCEMIA	45 to 55 years	56 to 65 years	66 to 75 years	Total
Yes	10	14	15	39
No	26	39	39	104
Total	36	53	54	143

P-value was 0.9845 (Chi-square test)

Table 8: STRATIFICATION OF HYPERGLYCEMIA W.R.T GENDER (n=143)

HYPERGLYCEMIA	Male	Female	Total
Yes	20	19	39
No	54	50	104
Total	74	69	143

P-value was 0.9455 (Chi-square test)

Table 9: STRATIFICATION OF HYPERGLYCEMIA W.R.T TYPE OF STROKE, (n=143)

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

P-value was 0.8899 (Chi-square test)

Table 10: STRATIFICATION OF HYPERGLYCEMIA W.R.T DURATION OF STROKE, (n=143)

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

P-value was 0.9042 (Chi-square test)

III. Discussion

In our study we strictly monitored the blood glucose level of patients with acute stroke at the time of admission and 12hours after admission; we found that among 143 patients were analyzed as 39(twenty-seven %) patients had hyperglycemia while 104(seventy-three %) patients have normoglycemia. Type of stroke among 126 patients was analyzed as 83(58%) patients had an ischemic stroke while 60(42%) patients had a hemorrhagic stroke. Duration of stroke among 143 patients was analyzed as 109(76%) patients had a stroke ≤12 hours while 34(twenty-four %) patients had stroke more than12 hours. Mean duration was 10 hours with SD ±6.53.The abnormally elevated blood glucose in patients with acute stroke increases the size of cerebral infarct and will

lead to bad prognosis, Reference [13] Elevated blood glucose increases the cerebral lactate level and resulting in focal cerebral tissue acidosis [14]. In a study of sixty-three numbers of patients with acute stroke; it was observed that elevated blood glucose was shown to reduce penumbral salvage and increasing the size of infarct [13]. In one study of animal model in which rats with stroke and abnormally elevated blood glucose, Reference [15] it was found that hyperglycemia resulted in free radicals formation, disrupting the blood-brain barrier (BBB) and promoting cerebral edema. The PROACT II (Intra-arterial Prourokinase for acute ischemic stroke thrombolysis trial) [16] also concluded that hyperglycemia is one of the most important risk factor for the hemorrhagic conversion of an ischemic stroke.

Various studies have concluded that high blood sugar level has worse outcomes in acute stroke [17-19]. Thus, this study is supported by all other shreds of evidence proves the association of hyperglycemia on poor outcome after acute ischemic stroke.

IV. Conclusion

The frequency of abnormally elevated blood glucose level was twenty-seven percent in patients with acute stroke who were not known to have diabetes at the time of presentation at Lady Reading hospital Peshawar.

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