The Egyptian Journal of Critical Care Medicine 5 (2017) 93–98

Contents lists available at ScienceDirect

The Egyptian Journal of Critical Care Medicine

journal homepage: www.sciencedirect.com

Original article

Short term outcome of patients with hyperglycemia and acute stroke

Ahmed Al-Weshahy [a], Rania El-Sherif [b,*], Khaled Abd Al-Wahhab Selim [b], Ayman Heikal [b]

[a] Nasser Institute, Critical Care, Cairo, Egypt
[b] Cairo University Hospitals, Critical Care, Cairo, Egypt

ARTICLE INFO

Article history:
Received 13 March 2017
Revised 6 November 2017
Accepted 13 November 2017
Available online 21 December 2017

Keywords:
Stress hyperglycemia
Stroke
Outcome

ABSTRACT

Background: Preexisting hyperglycemia worsens the clinical outcome of acute stroke. Do non-diabetic patients with stress hyperglycemia have a similar outcome to those with diabetes mellitus (DM)?

Background: We aimed to assess the glycemic status after acute stroke and its role on stroke outcome.

Methods: 61 consecutive patients with acute stroke were included. 41 had hyperglycemia (20 diabetics and 21 non diabetics) and 20 were control. Admission blood glucose level, CT brain and NIHSS were performed. 30 days mortality was the study endpoint.

Results: 60.7% males with mean age of 62.9 ± 10.5 years. Compared to control, patients with hyperglycemia had a higher incidence of posterior circulation affection (19.5% vs. 0%, P = .03). The NIHSS was statistically higher than control (14.9 ± 5.9 vs.7.8 ± 3.5, p = .000). The mortality rate and the hospital length of stay were higher than control (65.9% vs. 5.0%, P < .001 and 12.5 ± 9.1 vs. 3.0 ± 4.2 days, P < .001 respectively). NIHSS score, and 30 days mortality were higher in stress hyperglycemia compared to diabetics (17 ± 5.1 vs. 12.7 ± 6.1, P = .018, and 85.7% vs. 45%, P = .006 respectively). Predictors of 30 days mortality were: history of hypertension (P = .04), NIHSS ≥ 10 (sensitivity 91% and specificity 100%) and admission blood glucose ≥ 223 mg/dL (sensitivity 63% and specificity 96%).

Conclusions: Hyperglycemia is associated with poor outcomes after acute stroke. History of HTN, admission glucose level ≥ 223 mg/dL and NIHSS ≥ 10 were predictors of worse stroke outcome.

1. Introduction

Stroke is one of the major causes of disability and mortality all over the world [1,2]. Given its major socioeconomic burden, there is always a need to improve our understanding of its high risk population, complications, and prognosis.

Diabetes is a major risk factor for stroke occurrence. A high incidence of patients who developed stroke may have hyperglycemia, even without a previous history of diabetes [3]. Many investigators think that this is not a benign condition and that stress-induced hyperglycemia is associated with a high mortality after stroke [4]. Despite these observations, the relationship between admission glucose level and stroke outcome is still a field for ongoing research. We aimed at this work to assess the glycemic status after acute stroke and its role on stroke outcome.

2. Patients and methods

This study included 61 consecutive patients presented with an acute stroke within 24 h of onset of symptoms, 41 patients with admission hyperglycemia and 20 were control. Hyperglycemia was defined as random blood glucose >200 mg/dL; 20 patients were diabetics with admission hyperglycemia and 21 had stress hyperglycemia with no history of DM and with normal HbA1c%. The control group included patients with acute stroke without history of DM and with normal RBS and HbA1c% on admission.

The study population was recruited from the Critical Care Units and Neurology departments at Nasser Institute for Research and Treatment Hospital.

Patients with other potential differential diagnoses like space occupying lesion, subdural hematoma, transient ischemic attack, subarachnoid hemorrhage and metabolic causes were excluded from the study.

* Corresponding author.
E-mail address: Rania.AlSharif@kasralainy.edu.eg (R. El-Sherif).

Peer review under responsibility of The Egyptian College of Critical Care Physicians.

Production and hosting by Elsevier

https://doi.org/10.1016/j.ejccm.2017.11.003
2090-7303/

All patients were subjected to the following:

- Detailed medical history (from the patient or his/her relative), routine laboratory investigations and full general and neurological examination.
- National Institute of Health Stroke Scale (NIHSS). The score is composed of 11 items, each of which scores a specific ability between a 0 and 4. For each item, a score of 0 typically indicates normal function in that specific ability, while a higher score is indicative of some level of impairment [5]. The individual scores from each item are summed in order to calculate a patient's total NIHSS score. The maximum possible score is 42, with the minimum score being a 0 [6]. It is graded as follows: 0 no stroke symptoms, 1–4 minor stroke, 5–15 moderate stroke, 16–20 moderate to severe stroke and 21–42 severe stroke.
- Glucose measurement: admission blood glucose and glycated Hemoglobin levels.
- Imaging.
- Computed Tomography (CT) brain was performed on admission and after 48–72 h. Bilateral extra-cranial carotid duplex was done during hospital stay.
- 30 days mortality served as the study endpoint.

This study was approved by the Human Research Ethics Committee, and informed consent was obtained for all patients or his (or her) relatives.

3. Statistical methods

Statistical presentation and analysis of the present study was conducted, using the mean, standard error, Student *t*-test [Unpaired], and Chi-square by SPSS V. 17.

1. *Mean, SD standard deviation:* to measure the central tendency of data and the distribution of data around their mean.
2. *Student's t test:* for testing statistically significant difference between means of two samples.
3. *X2 test (Chi square test):* to test statistically significant relation between different variable or grades (qualitative data) or percentages.
4. *Pearson's correlation test:* to test a positive or negative linear relationship between two variables (one dependent and the other is independent variable).
5. A stepwise Multivariate logistic regression analysis was performed in order to assess which variables were independently associated with outcome. Variables selected for regression analysis were those that were significant by univariate analysis. Results were expressed as adjusted odds ratios (OR) and Corresponding 95% Confidence Intervals (CIs). The level of significance was chosen to be P < .05.

Significant result is considered if P < .05. Highly significant result is considered if P < .01.

4. Results

This is a prospective cohort study which was conducted on 61 consecutive patients with acute stroke.

According to the glycemic status; 20 patients had hyperglycemia and history of DM (diabetics), 21 had stress hyperglycemia (Non-diabetics) and 20 were control.

Patients were compared according to the following variables:

1. *Demographic Data and Baseline characteristics.*
2. *CT brain and NIHSS.*
3. *Hospital stay.*
4. *ICU stay.*
5. *30 days mortality.*
6. *Outcome predictors.*

In each variable, we compared: a) Hyperglycemia (both diabetics and non-diabetics) versus control and *b*) Diabetics, non-diabetics, and control.

4.1. Demographic data and baseline characteristics

a) Patients with hyperglycemia versus control

No significant difference between patients with hyperglycemia and control regarding age, sex, and baseline characteristics Table 1. However, Patients with hyperglycemia had statistically higher RBS & HbA1c% on admission than control (268.2 ± 35.3 mg/dL versus 113.1 ± 13.4 mg/dL, p .000 and 7.0 ± 1.3 versus 5.6 ± 0.4, p .000, respectively) (Fig. 1).

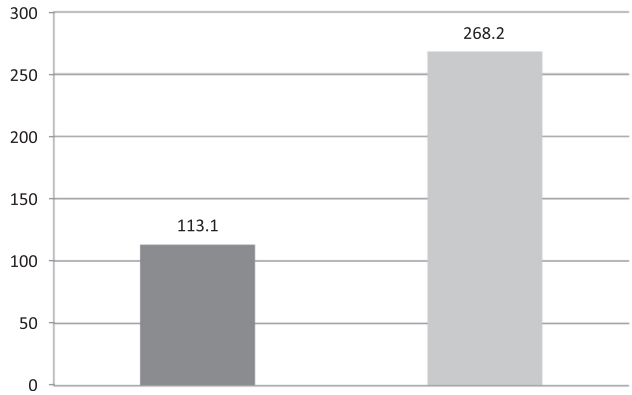

Fig. 1. Comparison between patients with hyperglycemia (Rt panel) and control (Lt panel) regarding RBS on admission (mg/dl).

Table 1
Demographics and baseline characteristics between patients with hyperglycemia versus control.

	Control (*n* = 20)	Hyperglycemia (*n* = 41)	P-value
Age in years (Mean ± SD)	59.7 ± 9.7	64.5 ± 10.8	0.09
Gender (Males)	14 (70%)	23 (56.1%)	0.3
DM	0	20 (48.8%)	**0.000**
History Of Hypertension	11 (55%)	31 (75.6%)	0.10
IHD	6 (30%)	17 (41.5%)	0.39
AF	1 (5%)	8 (19.5%)	0.13
Old CVS/TIA	1 (5%)	9 (22%)	0.09
Smoking	11 (55%)	19 (46.3%)	0.53

DM. Diabetes mellitus, **IHD**. Ischemic Heart Disease**, AF**. Atrial Fibrillation, **CVS**. Cerebrovascular Stroke, **TIA**. Transient Ischemic Attack.
Bold values mean statistically significant.