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FREQUENCY OF ADVERSE OUTCOMES OF ACUTE MYOCARDIAL INFARCTION IN PATIENTS WITH STRESS HYPERGLYCEMIA

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Contribution
All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To determine the frequency of in-hospital adverse outcomes of acute myocardial infarction in patients with stress hyperglycemia.

Methodology: This was a descriptive cross sectional study conducted from August 2010 to January 2011 in Cardiology department, Lady Reading Hospital, Peshawar. Patients of age 25-70 years, of either gender, non-diabetic with acute myocardial infarction with stress hyperglycemia were included. Random blood sugar $\geq$144 mg/dl was taken as stress hyperglycemia for patients at presentation of acute myocardial infarction. Patients were monitored for electrical complications such as atrial fibrillation, ventricular tachycardia, ventricular fibrillation and complete heart block and mechanical complications such as cardiac pulmonary edema and cardiogenic shock during hospital stay. The statistical analysis was performed using the statistical package for social sciences (SPSS Ver. 15.0).

Results: A total of 341 patients having acute myocardial infarction with stress hyperglycemia were studied. The mean age was 56.35 ± 9.748 (95% CI 57.39 – 55.31). Male were 58.1% (n=198). The frequency of various major in-hospital electrical adverse outcomes of acute myocardial infarction with stress hyperglycemia were atrial fibrillation (AF) 15.8%, ventricular tachycardia (VT) 11.7%, ventricular fibrillation (VF) 10.9% and complete heart block (CHB) 6.7%, while mechanical adverse outcomes were cardiac pulmonary edema (CPE) 7.9% and cardiogenic shock (CS) 11.7%.

Conclusion: Stress hyperglycemia has adverse impact on outcomes of patients presenting with acute myocardial infarction. Among electrical and mechanical complications of acute myocardial infarction in patients with stress hyperglycemia, the two most frequent in-hospital adverse outcomes were atrial fibrillation and cardiogenic shock, respectively.

Key Words: Stress hyperglycemia, In-hospital adverse outcomes/complications, Acute Myocardial Infarction.

INTRODUCTION

Acute myocardial infarction (MI) is a common medical emergency and is the leading cause of death world wide.[1] In Pakistan, approximately 100,000 individuals in a total population of about 150 million suffered acute MI in 2002.[2] Stress hyperglycemia (SH) is common in acute MI which deteriorates cardiac function and increases in-hospital and long term morbidity and mortality irrespective of diabetic status.[3]

Stress hyperglycemia which is encountered in up to 50% of patients with acute MI is associated with higher incidence of major acute cardiac events (MACE) such as significant arrhythmias (supraventricular tachycardia, atrial fibrillation, ventricular tachycardia, ventricular fibrillation or heart blocks), cardiac pulmonary edema, hypotension and cardiogenic shock.[4,5] The frequency of various major adverse cardiac events in patients of acute MI with stress hyperglycemia are atrial fibrillation 15%, ventricular tachycardia 11.3%, ventricular fibrillation 9.5%, complete heart block 6.4%, cardiac pulmonary edema 7.1% and cardiogenic shock 11.2%.[6,7,8]

Webster et al reported that for every 18mg/dl increase in blood glucose level, there is 4% increase in mortality whether patient is diabetic or nondiabetic.[4] Therefore, aggressive strategy to reduce hyperglycemia using insulin is needed to improve clinical outcomes in acute MI.[9]

Acute MI is a common medical emergency which bears potential adverse effects if not treated in time. Stress hyperglycemia if present, further deteriorates the adverse outcome of acute MI as it is not adequately managed in our set up. The aim of our study was to find out frequency of adverse outcomes of acute MI with stress hyperglycemia in our local setup.

METHODOLOGY

This was descriptive cross sectional study carried out at department of Cardiology, Lady Reading Hospital, Peshawar. The total duration of study was six months from August 2010 to January 2011.

The sample size was 341 using WHO sample size estimating software taking 6.4%[7] proportion of complete heart block in acute myocardial infarction with stress hyperglycemia with confidence interval of 95% and precision level of 2.6%. Purposive non probability sampling technique was used. Patients of age 25-70 years and of either gender who were non-diabetic, presented to our unit through OPD/emergency, with diagnoses of acute MI and stress hyperglycemia, were included in the study. After getting proper prior permission from hospital ethical committee, written informed consent was obtained from every patient. Demographic data like name, age, sex, address were obtained. Detail medical history and complete physical examination of the patient was undertaken.

Acute myocardial infarction was diagnosed as patients having two of the following three criteria: 1.prolonged chest pain of more than 20 minutes, 2. cardiac enzymes (CKMB) elevation $\geq$ 2 times upper normal limit measured 4 hours after onset of chest pain, 3. ECG changes as ST elevation of more than 1mm in two or more contiguous leads or new onset LBBB. Random blood sugar $\geq$ 144 mg/dl was taken as stress hyperglycemia for patients at presentation of acute myocardial infarction. Random blood sugar was checked at the time of admission on venous blood sample with Toshiba Accua Check machine in hospital laboratory.

Patients were excluded, if they had previous myocardial infarction, heart failure, valvular heart diseases, congenital heart diseases, cardiomyopathies of any cause, previous history of diabetes mellitus, already diagnosed such as ventricular tachycardia, atrial fibrillation, complete heart block, old left bundle branch block, and having permanent pacemakers (PPM) or implantable cardiac defibrillators (ICD), with chronic renal failure (CRF) and coronary artery bypass graft surgery (CABG).

Patients were treated on standard ward protocol. Patients were monitored for adverse cardiac events. Cardiac monitors (NIHON KOHDEN BSM-2301 K) and ECG (NIHON KOHDEN) were used for the monitoring of electrical complications such as atrial fibrillation, ventricular tachycardia, ventricular fibrillation and complete heart block. Mechanical complications such as cardiac pulmonary edema and cardiogenic shock were detected with the help of clinical examination. Biases in the study were controlled by following strict inclusion criteria, same ECG machine and RBS measurement with same machine in all patients.

The statistical analysis was performed using the statistical package for social sciences (SPSS Ver. 15.0). Numerical variables like age were presented as mean $\pm$ SD. Categorical variables like gender, atrial fibrillation, ventricular tachycardia, ventricular fibrillation, complete heart block, cardiac pulmonary edema, and cardiogenic shock were presented as frequencies and percentages. Adverse outcomes were stratified among the age and sex to see the effect modifiers. Data was presented as tables and graphs where appropriate. All the detailed information was collected through a specially designed Proforma.

RESULTS

A total of 341 patients having acute myocardial infarction with stress hyperglycemia were studied. Among these patients, male were 58.1% (n=198) and female were 41.9% (n= 143).The mean age was 56.35 $\pm$ 9.748 (95% CI 57.39 – 55.31).Baseline characteristic are shown in (Table 1) Patients were categorized into two age groups i.e. younger

Table 1: Baseline Characteristics of Study Population with Acute Myocardial Infarction with Stress Hyperglycemia

Characteristics	Study Population n=341
Mean Age	56.35±9.748 years
Sex	
Male	58.1%
Female	41.9%
Hypertension	61.58%
Smoker	29.03%
Hyperlipedemia	66.56%
Anterior MI	56.89%
Inferior MI	43.11%
Thrombolysed (SK)	85.92%

Table 2: Electrical and Mechanical Complications of Acute Myocardial Infarction in Patients with Stress Hyperglycemia

S.No	Complications	Percentages (n)
1	Atrial Fibrillation	15.8% (54)
2	Ventricular Tachycardia	11.7% (40)
3	Ventricular Fibrillation	10.9% (37)
4	Complete Heart Block	6.7% (23)
5	Cardiac Pulmonary Edema	7.9% (27)
6	Cardiogenic Shock	11.7% (40)

(27-50 year old) and older (51-70year).The frequencies of various major in-hospital electrical adverse outcomes in patients of acute MI with stress hyperglycemia were atrial fibrillation 15.8%, ventricular tachycardia 11.7%, ventricular fibrillation 10.9% and complete heart block 6.7 %.The occurrences of in-hospital mechanical adverse outcomes in patients of acute MI with stress hyperglycemia were cardiac pulmonary edema 7.9% and cardiogenic shock, 11.7 % (Table 2). The incidences of cardiac electrical and mechanical complications were more in elderly male as compared to young patients, though it was not statistically significant. Among the electrical and mechanical in-hospital adverse outcomes of acute MI with stress hyperglycemia, atrial fibrillation (15.8%)and cardiogenic shock(11.7%) were more frequent events, respectively.

DISCUSSION

In this study, frequencies of major in-hospital adverse outcomes of acute myocardial infarction in patients with stress hyperglycemia were studied. Among electrical complications of acute myocardial infarction with stress hyperglycemia, atrial fibrillation was more frequent 15.8 %. Koracevic et al reported almost the same frequency of atrial fibrillation. They studied 543 patients of acute myocardial infarction, reporting stress hyperglycemia in 200 patients with 15 % of atrial fibrillation.[8]Similarly, in a large cohort study, Kadri and coworkers reported 17.8% atrial fibrillation in patients with acute myocardial infarction and underlying stress hyperglycemia.[10]Frequency of atrial fibrillation in our study is in line with the international research work.

Ventricular arrhythmia including ventricular tachycardia and ventricular fibrillation was 11.7% and 10.9% respectively, in patients of acute myocardial infarction with stress hyperglycemia in our study population. Kadri et al reported ventricular fibrillation as 6.7%, which is almost half of the incidence of ventricular fibrillation in this study.[10] The probable reason might be their large sample size and secondly, not all of our patients presented to hospital in time for proper thrombolysis, due to poor knowledge of acute MI and logistic problem, so the chances of ventricular arrhythmia were more in our patients, while Meisenger et al reported almost the same incidence of ventricular fibrillation i.e. 9.5 % as that was in present study.[6]

Khan et al studied our local population and reported the frequency of complete heart block as 6.4 % as compared to 6.7 % in the present study.[7] The sample size of present study was approximately three times that of Khan et al, but we reported almost the same frequencies of complete heart

block in our respective studies, which shows the similarities in demographic features of our local population.

Mechanical complications are well recognized cardiac complications of acute myocardial infarction in patients with stress hyperglycemia and the incidence of these complications increases with increasing severity of hyperglycemia.[6] Cardiogenic shock was more frequent among the mechanical complications, with frequency of 11.7%. Naber et al documented cardiogenic shock with incidence of 17.2 %.[11] The co-morbidities like previous myocardial infarction, CABG or having chronic renal insufficiency were excluded from present study and were considered by Naber et al, which might have been the reason for high incidence of cardiogenic shock in their study.

Cardiac pulmonary edema was one of the mechanical complication included in this study and was reported 7.9 %.This is in an agreement with Meisenger et al who reported 7.1%.[6] On the other hand Ishihara et al reported almost twice the prevalence of cardiac pulmonary edema in patients of acute myocardial infarction with stress hyperglycemia.[12] The reason for this high prevalence might be that their patients were mostly elderly population as compared to our study population, which was more prone to adverse outcome of acute myocardial infarction.

When these complications were further analyzed in term of age and gender, it was found that there was no statistically significant difference of these complications in either gender or younger or older age groups. Furthermore, these complications were more frequent in elderly male patients, however statistically not significant. This was in accordance with the previous literature.[13-18]

CONCLUSION

Stress hyperglycemia has adverse impact on outcomes of patients presenting with acute myocardial infarction. Among electrical and mechanical complications of acute myocardial infarction in patients with stress hyperglycemia, the two most frequent in-hospital adverse outcomes are atrial fibrillation and cardiogenic shock, respectively.

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