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Stress Hyperglycemia as a Prognostic Indicator in Non-Diabetic Myocardial Infarction Patients

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Abstract

The present study aims to find out prognostic importance of stress hyperglycemia and incidence of various complications in patients of Acute myocardial infarction (MI) without diabetes mellitus.

Method: We studied 50 patients admitted with acute MI without previous diabetes mellitus. Blood glucose level were estimated at time of admission and regularly thereafter. Glycosylated hemoglobin was estimated at the time of admission to rule out diabetes. Based on the blood glucose level at time of admission, patients in the study were divided into two groups i.e. Group A (patients with blood glucose level 140 mg/dl). Incidence of various complications of MI and mortality was compared between two groups.

Results: Incidence of heart failure in group B patients was 52% as compared to group A patients with 36% incidence (p value **Conclusion:** Stress hyperglycemia is common in patients of acute myocardial infarction. Patient with stress hyperglycemia have more adverse events including heart failure, arrhythmias, heart block, re-infarction and mortality. So it is advised that in all patients with AMI, blood glucose level should be estimated at time of admission to prognosticate and for early initiation of appropriate preventive measures.

Keywords: Myocardial infarction, Heart failure, Stress hyperglycemia, Arrhythmia.

Introduction

Ischemic heart disease has become one of the most common illnesses in the today's world with acute myocardial infarction presenting as emergent manifestation having significant mortality and morbidity and complication rate. Various indicators have been proposed to predict the severity and complications an episode of acute myocardial infarction for example clinical profile, electrocardiogram changes, hemodynamic parameters, cardiac size, metabolic acidosis and cardiac enzymes. Elevated free fatty acids, cortisol and catecholamines and depressed insulin secretion have also been characterized in patients with myocardial infarction.

Hyperglycemia is common in patients of acute myocardial infarction in the initial phase and appears

to be related to stress mechanism and is a reflection of relative insulin deficiency, associated with elevated free fatty acids. Previous reports of relationship between admission plasma glucose levels and development of cardiac failure have been found.

Therefore, the present study was planned to assess the prognostic importance of non diabetic hyperglycemia in acute myocardial infarction and to find incidence of various complications in AMI patients without diabetes mellitus, thereby permitting early initiation of appropriate preventive measures.

Material and methods

Present study comprised of 50 patients who had evidence of AMI diagnosed by clinical examination, electrocardiogram and other investigations.

Patients with diabetes mellitus, septicemia, endocrine disorders, comorbid conditions, and on drugs affecting blood glucose levels like – Beta blockers, thiazides, glucocorticoids were excluded from study. Patients with HbA1C values above 6.5 % were considered diabetic and were excluded from the study.

All patients were briefed about the research protocol and a written consent of participation was taken thereafter.

On admission, random blood sugar was determined as early as possible and patients were stratified into two groups i.e. with admission blood glucose levels < 140 mg/dl and those with blood glucose levels > 140 mg/dl. 25 consecutive patients of each group were included in the study.

Blood glucose levels were repeated thereafter on 3rd day and 7th day. Electrocardiogram was taken in each and every case immediately after admission and also repeated as and when required. Assessment of cardiovascular system was made daily or as frequently as needed in cases with complications. All cases were followed for 7 day for occurrence of complications.

Results

There was no statistically significant difference in the mean age, male to female ratio between the two groups (Table I).

All patients were assessed for any adverse

cardiovascular events during hospitalization for 7 days. Incidence of heart failure was present in 09 (36%) patients in group A while in group B was in 13 (52%) while incidence of arrhythmias in group A patients was 3 (12%) compared to group B in 6 (24%) respectively (p). Incidence of reinfarction in group A patients was nil compared to 1 patients (4%) in group B (p).

Discussion

The hyperglycemia and impaired glucose tolerance (IGT) are common during AMI. This hyperglycemia may result from stress or may be due to preexisting undiagnosed DM or IGT. Stress hyperglycemia in the initial phase of acute myocardial infarction appears to be related to stress mechanism and is a reflection of relative insulin deficiency and excess of adrenaline, glucagon and steroid hormones with elevated free fatty acids.

Glucose appears to be a more favourable energy source than free fatty acids for ischemic myocardium by more efficiently replenishing the Krebs cycle and stimulating contractile performance. Insulin is needed for glucose uptake in myocardium and relative insulin deficiency causes suboptimal uptake. Hyperglycemia measured on admission in most non diabetic patients with AMI is determined both by extent of infarction mainly through the secretion of adrenaline and other stress hormones that are independent of infarct size¹. In experimental myocardial infarction it has been suggested that the stimulus to adrenaline release is a reflex arising from receptors at the site and boundary of the infarct.

Hyperglycemia is a reflection of relative insulin deficiency which is associated with increased lipolysis and excess circulating free fatty acids which though normally a substrate of choice for healthy myocardium, are toxic to the ischemic myocardium². Furthermore, acute hyperglycemia may precipitate osmotic diuresis. The resulting volume depletion may interfere with Frank-Starling mechanism⁴. Natalie MO et al showed that hyperglycemia is associated with negative outcomes in various settings of critical illness⁵.

The hyperglycemia after AMI is associated with an increased risk of CHF, cardiogenic shock, arrhythmia and hospital mortality regardless of diabetic status⁶. The recent studies have also shown that hyperglycemia increases the risk of mortality during cardiopulmonary bypass. Intensive secondary preventive measures and intensive insulin treatment improve outcome of AMI in patients with hyperglycemia⁷.

In the present study adverse cardiovascular events i.e. arrhythmia, CHF, post infarction angina, heart block, re-infarction and death were more common in group B patients (admission blood glucose > 140 mg/dl) than group A patients (p). Jorik et al⁹ divided the patients of AMI on basis of admission glucose level, group I (11.0 mmol/l). Group III patients had marked reduction in left ventricular function and high mortality rate than group II patients, whereas group I patients had the lowest mortality rate and better left ventricular function than other groups. Oswald et al showed that in-hospital mortality increased significantly in patients of AMI with increasing plasma glucose concentration¹⁰.

The finding in the present study released high adverse cardiovascular events in patients of AMI with stress hyperglycemia. Therefore, it is recommended that in all patients with AMI, random blood glucose should be measured at admission and at discharge.

Conclusion

In setting of AMI, stress hyperglycemia is very common. These patients with hyperglycemia developed more adverse cardiovascular events as compared to patients with normal glucose tolerance. Therefore, in all patients of AMI, a basal blood glucose level be performed at admission to predict cardiovascular complications and early institution of therapy. Also blood glucose levels may be repeated at discharge from hospital and again at 3 month follow up to detect glucose abnormalities as early as possible to prevent future adverse cardiovascular events.

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Illustrations

Illustration 1

Table 1: Showing demographic profile

Sr. No.	Parameter	Group A	Group B
1	Mean age	48.23±10.23	47.47±11.02
2	Male” Female ratio	4:1	4:1

Illustration 2

Table 2: Showing comparison of cardiac adverse events

Sr. No.	Parameter	Group A	Group B
1	Heart failure	9 (36%)	13 (52%)
2	Arrhythmias	3 (12%)	6 (24%)
3	Post infarction angina	3 (12%)	4 (16%)
4	Heart block	3 (12%)	7 (28%)
5	Re-infarction	0 (0%)	1 (4%)
6	Mortality	1 (4%)	5 (20%)

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