



A STUDY TO INVESTIGATE THE CORRELATION OF STRESS HYPERGLYCEMIA WITH CORONARY ANGIOGRAPHIC PROFILE IN ACUTE STEMI PATIENTS

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ABSTRACT

Many studies have showed the association between higher admission glucose levels and increased risk of mortality in patients with AMI. The aims of the study is to assess the correlation of stress hyperglycaemia in patients with STEMI with the coronary angiographic profile. Severity of the CAD was calculated by GENSINI scoring. Double and triple vessel involvements were more common in stress hyperglycaemia group in our study. Results showed Gensini score correlated positively with admission glucose level implicating important pathogenic effect of stress hyperglycaemia during acute MI. A positive correlation among admission blood glucose level and severity of coronary artery involvement was observed in STEMI patients in our study.

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INTRODUCTION

Acute ST elevation myocardial infarction (STEMI) is often accompanied by hyperglycemia at the time of hospital admission. Whether this hyperglycemia is a transient elevation of blood glucose (stress hyperglycemia) as a result of acute coronary syndrome or a manifestation of latent diabetes, is debatable. Recent observational studies have demonstrated that stress hyperglycaemia is an important prognostic indicator in acute myocardial infarction (AMI) (1) and may denote the severity of the underlying condition (2). It is well established that type 2 diabetics have a three fold and pre-diabetics have a two fold increased risk of major cardiovascular disease..(3).Diabetes patients have usually much more extensive coronary artery involvement compared to nondiabetic patients. Many studies have showed the association between higher admission glucose levels and increased risk of mortality in patients with AMI (4,5,6). Myocardial contrast echocardiography have also showed that the risk of periprocedural complications like “no reflow” phenomenon is significantly higher in AMI patients with elevated glucose levels after percutaneous coronary reperfusion. In this study, we tried to assess the interrelationship between blood glucose level at the time of admission (henceforth referred to as admission plasma glucose or APG) and severity of coronary artery involvement in acute ST elevation myocardial infarction (STEMI) patients in a tertiary care centre in Eastern India.

This study will look into stress hyperglycaemia in patients with STEMI and its correlation with coronary angiographic profile.

Aims and objectives

The aims of the study is to assess the correlation of stress hyperglycaemia in patients with STEMI with the coronary angiographic profile.

MATERIALS AND METHODS

This observational and cross sectional study was conducted in the Department of Cardiology, R.G.Kar Medical College, Kolkata, a tertiary care centre of Cardiology from April 2015 to April 2016. The study population comprised of 58 patients, aged 30-80 years, presenting with acute ST elevated myocardial infarction (MI) within 24 hours of chest pain admitted in the Department. Patients who were admitted more than 24 hrs from the onset of symptoms, known diabetics, and those with renal failure (creatinine>1.5), inflammatory disorders, infection, hepatic and thyroid disorder and malignancy were excluded.

STEMI was defined as persistent (>30mins) retrosternal pain associated with ST segment elevation >0.1 mv in two or more limb leads or >0.2 mv in two or more precordial leads or acute left bundle branch block (LBBB). Hyperglycaemia has been defined as an admission plasma glucose of >140 mg/dl (7.8 mmol/l). DM (Diabetes Mellitus) has been defined as prior history of diabetes obtained from past history or when patients report receiving treatment for DM or HbA1c values

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>6.5%. All patients received recommended standard management for STEMI. All diabetic or non-diabetic patients with hyperglycaemia in acute phase of STEMI received subcutaneous short acting insulin according to digital glycaemic test.

Selective coronary angiographies were performed with standard Judkins techniques or a radial approach. At least 4 positions of left anterior descending artery (LAD) and circumflex artery (Cx) and 2 positions of right coronary artery (RCA) were taken for analysis. Coronary angiographies were always analyzed in 2 orthogonal views.

Angiographically significant CAD will be defined as at least 70% lumen diameter reduction of major epicardial coronary arteries. Patients will be classified as having one-vessel, two-vessel or three-vessel disease, as having non-significant diffuse CAD (defined as lumen irregularities < 70% lumen diameter reduction) or no CAD (no lumen irregularities). More than 50% of the left main artery stenosis will be defined as significant CAD. Severity of the CAD will be calculated by GENSINI scoring. The Gensini severity score, 13 a measure of the severity of coronary stenosis, was also calculated; a severity coefficient was given for each segment (0, 1, 2, 4, 8, 16, or 32 according to the degree of stenosis) and the importance of the segment was rated (5 for the left main trunk to 0.5 for the most distal segments). Consequently, total digital Gensini scores were obtained that indicated the severity of CAD. The scoring was performed by 2 experienced observers who were unaware of the results of the laboratory data

RESULTS

Out of the 58 patients, 19 (33%) patients were excluded from the study as they were diagnosed to be diabetic. The stress hyperglycaemia group consisted of 21 patients (36%) with no past history of diabetes with HbA1c level < 6.5%. The rest 18 (31%) patients comprised the euglycemic group. Table 1 depicts the baseline characteristics of the study group. There were no differences in the sex distribution, smoking habits, lipid profile or creatinine level in both the groups. The mean age is slightly higher in stress hyperglycaemia group but not statistically significant (64.10±5.6 vs 61.11±7.4). Blood pressure and heart rate were little higher in stress hyperglycaemia group.

Table 1 Baseline characteristics of patients

	Stress hyperglycaemia	Normoglycaemia
Patients (n)	21	18
Sex(m/f)	13/8	12/6
BMI(kg/msq)	27±0.5	26±0.3
SBP(mmHg)	129±10	121±12
DBP(mmHg)	84±5	81±7
Mean age(yrs)	64.10±5.59	61.11±7.36
Gensini Score	70.38±39.67	30.33±16.68
Admission blood glucose level(mg/dl)	229±38.26	98.67±16.29

Table 2 Angiographic characteristics of Stress Hyperglycaemia and Normoglycaemia Group.

CAD	Stress Hyperglycaemia	Normoglycaemia
1 vessel disease	9	13
2 vessel disease	5	4
3 vessel disease	7	1
Gensini Score	70.38±39.67	30.33±16.68

Patients in stress hyperglycaemia group had significantly higher APG level compared to normoglycaemia group (p<0.0001). The APG in stress hyperglycaemia group was 229±38.26mg/dl whereas it was 98.67±16.29mg/dl in normoglycaemia group.

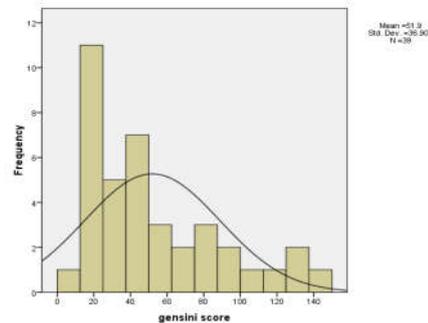


Figure 1 Distributions of Gensini Score among Patients.

Table 2 depicts angiographic characteristics of stress hyperglycaemic group and normoglycaemic group. Patients with stress hyperglycaemia group had severe CAD as assessed by the Gensini score compared to the normoglycaemic group (70.38±39.67 vs 30.33±16.68, P<0.0001). Multivessel involvement is more common in stress hyperglycaemic group and it is statistically significant. Spearman correlation analysis showed that Gensini score positively correlated admission sugar level (p<0.0001). Another important finding in our study was thrombolytic therapy was unsuccessful in most cases in stress hyperglycaemia group. Even after thrombolysis, TIMI flow grade was 0 in infarct related artery in most patients of hyperglycaemia group compared to normoglycaemia group.

DISCUSSION

The prevalence of stress hyperglycaemia in our study was around 36% as against 30-50 % in other studies.(7,8,9). In this study patients with stress hyperglycaemia had severe CAD as assessed by Gensini score compared to normoglycaemic patients. Double and triple vessel involvements are more common in stress hyperglycaemia group. Our finding is consistent with other studies (10,11, 12,13). In our study Gensini score correlated positively with admission glucose level indicating pronounced pathogenic effect of stress hyperglycaemia during acute MI. Moreover multivariate regression analysis revealed admission blood glucose level was an independent risk factor for the severity of CAD. Our findings were similar to other studies (11,12,13).

Hyperglycemia during stress is because of sympathetic nervous system activation and raised production of catecholamines and cortisol which stimulate the process of glyconeogenesis and glycogenolysis. Because these hormones are responsible for insulin resistance, so there are in same time hyperglycaemia and insulin resistance.

Hyperglycemia may cause significant QT prolongation and fatal arrhythmias,(14),and a larger infarct size due to an increased incidence of the no-reflow phenomenon (15,16,17).. It has been observed that increased platelet activation after an MI is correlated with hyperglycaemia in non-diabetic patients. (16,17,18) and is probable role of hyperglycaemia in the activation of blood coagulation factors.(19). Acute hyperglycaemia induces a shortening of the fibrinogen half-

life, and increases in fibrinopeptide A, fragments of prothrombin, and in platelet aggregation, and may interfere with fibrinolysis which all may cause increased activation of thrombosis and may explain more extensive coronary artery involvement.(20,21,22,23). However, our study has got certain limitations due to observational nature and small sample size of this study, the possibility of selection bias and/or residual confounding from unmeasured covariates cannot be excluded.

CONCLUSION

Hyperglycaemia on admission is not an uncommon occurrence in patients with STEMI. It may not be simply manifestation of stress; rather it is an important indicator of functional cardiac outcome and is mainly reflection of the severity of coronary artery involvement. A positive correlation among admission blood glucose level and severity of coronary artery involvement was observed in STEMI patients in our study.

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