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Original Research Article

Random blood glucose on admission as prognostic factor for assessment of severity of acute myocardial infarction

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ABSTRACT

Background: Assessment of risk factors or prognostic markers is essential to determine the adverse outcome related to acute myocardial infarction (AMI). The aim of the present study was to examine the role of random blood glucose as prognostic marker for assessment of severity of AMI.
Methods: This prospective study was conducted on 79 patients with onset symptoms of AMI. All the patients both diabetics and non-diabetics underwent serum blood glucose estimation in the hospital. Primary endpoint of the study was all cause mortality till day 90 follow-up. The secondary end points were composite of death, reinfarction and heart failure till day 90.Mortality rate is higher in the diabetics as compared to nondiabetics.
Results: The mean age group was 55.9 years. Males (86%) outnumbered females (14%). The mean BMI was 22.3±2.83. The mean random blood glucose in the study population was 138±92.9 mg/dl (7.7±5.15 mol). Of total 79 patients, 5 were diabetics, of them 2 (40%) died. Among 79 patients, 16 patients were died during 3 months following the qualifying event, 7 had heart failure and 4 had reinfarction.
Conclusions: In patients with AMI, hyperglycemia should consider as one of the important prognostic marker to determine the adverse cardiovascular events.

Keywords: Acute myocardial infarction, Prognosis, Random blood glucose

INTRODUCTION

The role of hyperglycemia in the occurrence of cardiovascular events in acute myocardial infarction (AMI) is still a major concern.[1] Hyperglycemia can also be seen in normal patients when hormonal control of blood glucose level was disturbed by any acute or major illness such as AMI.[2] There are two hypotheses in the literature to explain the relation of hyperglycemia and the AMI. First perspective is hyperglycemia in patients with AMI is induced by activation of adrenergic receptors. Second one is that increase in blood glucose in patients with AMI is a marker of pre-existing carbohydrate metabolism disorders.[3] Previous studies by Meier et al, showed an association between high blood glucose levels in AMI patients and increased overall mortality rate.[4]

Changes in random blood glucose levels by adrenergic stimulation are responsible for recurrent MI and initiate the development of ventricular arrythmiasis. Furthermore, hypoglycemia inhibits metabolic processes in the myocardial cells and causes apoptosis in cardiomyocytes leading to MI. The increased release of anti-insulin hormones also results in the development of hyperglycemia, especially in patients with acute diabetes mellitus.[5] Hence, it is important to estimate the levels of blood glucose in patients with AMI, regardless of diabetic status in the in hospital period and it should be

considered as an important metabolic marker of adverse outcomes.

The present study was aimed to evaluate the role of random blood glucose on hospital admission for assessment of severity of acute myocardial infarction.

METHODS

This prospective cohort study conducted on 189 patients admitted to emergency department of Maharaja Yeshwant Rao Hospital, Indore with suspected acute coronary syndrome, during the period from November 2004 to July 2005. All the patients were screened thoroughly and 79 patients with evolving STEMI within 12 hours of symptom onset were included in the present study. Diagnostic criteria of acute myocardial infarction (AMI) were patients with typical ischemic chest pain/symptom ≥30 minute duration or with onset of symptoms within 12 hours of presentation. Patients with advanced neoplastic or concomitant life threatening disease, which might limit the expectancy to less than 3 months, patients with psychiatric illness and those under legal custody, patients who refused to give consent and patients anticipated poor compliance with follow-up were excluded from the study.

The study protocol was approved by the institutional ethics committee. A written informed consent was obtained from all patients for the participation in the study. If a patient had full pain or not in full conscious consent was taken from close relatives. Complete details related to patient history were collected in a predesigned format. Blood sample was withdrawn from all the patients for laboratory investigations. Serum blood glucose was estimated by standard procedures (GOD-POD) method. Standard 12-lead electrocardiography was taken for all the patients. All patients were also evaluated for major conventional risk factors including hypertension, smoking, and previous cardio-vascular event like previous MI, and stroke. Patients received usual line of management as per the guidelines set by the treating unit.

Statistical analysis

All the collected data was collected and analysed by using SPSS 10 version software. Continuous data are expressed as the mean±SD. Comparison between two groups was performed by using unpaired t-test for the continuous variables and Chi-square test was used to compare the categorical (non-continuous) variables. P value <0.05 was considered as significant.

RESULTS

Demographic and clinical characteristics of study population were given in Table 1. A total of 79 patients were included in the study. The mean age group was 55.9 years. Males (86%) outnumbered females (14%). The BMI was ranged from 16.5 to 28.1 with a mean of 22.3±2.83.The mean Killip class for all the patients at presentation to the hospital was 1.4±0.8. The mean random blood glucose in the study population was 138±92.9 mg/dl (7.7±5.15 mol). Previous history of hypertension was present in 17 (22%) patients, myocardial infarction in 11(14 %) patients and prior history of CVA was present in 7 (9%) of the patients.

Table 1: Demographic and clinical characteristics of study population (n=79).

Characteristics	Minimum	Maximum	Mean (n=79)	Std. deviation
Age (years)	32.00	80.00	55.92	10.48
Body mass index	15.94	31.20	22.30	2.85
Killip class	1.00	4.00	1.36	0.78
Random blood glucose (mmol%)	3.39	37.14	7.66	5.18
Associated disease	N (%)			
Hypertension	17 (22)			
Previous MI	11 (14)			
Old CVA	7 (9)			

All-cause mortality was determined as the primary end point of the study (Table 2). Among 79 patients, 16 patients were died during 3 months following the qualifying event. Of them 10 died before discharge from the hospital, 2 patients within 30 day and remaining 4 patients subsequently. There were 3 (7%) deaths in patients less than 60 years (n=43) versus 13 (36.1%) deaths in patients greater than 60 years (n=36) showing a statistically significant increased mortality rate among the older patients (p=0.001). Out of 79, 11 were females. Four (36%) patients died of them as compared to 12 male patients died out of 68 (17.6%). Although there is greater mortality rate among the females, but the difference was not statistically significant. Mortality rate is higher in the diabetics as compared to non-diabetics. Of total 79 patients, 5 were diabetics, of them 2 (40%) died. while 14 died of 74 non-diabetics with a mortality rate of 19%.

However, the difference noted above is not significant statistically. Among 79 patients, 17 were hypertensive, 3 (17.6%) died out of them till day 90. This rate of mortality is somewhat lower in comparison to the 21% mortality rate in non non hypertensives (13/62) but the difference was not significant. 11 had history of prior myocardial infarction. Mortality rate of 46% (n=5) in this group is considerably higher than those without any prior history of myocardial infarction (16.2%) (p=0.045). Of the total patients, 7 had prior history of ischaemic stroke, of them 2 (28.5%) patients died while 14.4% (14/72) mortality rate was observed in patients without no prior history of CVA (p=0.566).

Table 2: Comparison of patient's characteristics with primary outcome (n=79).

Variables		No of pt.	No of death	Deaths (%)	$\chi 2$	P
Age in years	<60	43	3	7	10.298	0.001
	≥60	36	13	36		
Sex	Male	68	12	17.6	2.054	0.152
	Female	11	4	36.4		
Diabetes mellitus	Present	5	2	40	1.289	0.256
	Absent	74	14	19		
Prior history of hypertension	Present	17	3	17.6	0.091	0.763
	Absent	62	13	21		
Prior history of MI	Present	11	5	46	4.017	0.045
	Absent	68	11	16.2		
Prior history of stroke	Present	11	5	46	0.329	0.566
	Absent	68	11	16.2		

As shown in Table 3, secondary outcome events reported in our study are composite of death, reinfarction and heart failure till day 90.Out of 79 patients, 27 patients either had reinfarction, heart failure or died by the 90 day of the qualifying event. Of them 16 died, 7 had heart failure and 4 had reinfarction. No events of severe recurrent ischemia, stroke or major hemorrhage were observed. It is found that age and kilp class significantly affected the occurrence of the events with a p value of less than 0.05 The random blood glucose that was a significant factor in determining the mortality is of lesser significant in secondary outcome events having p-value 0.141.

Table 3: Secondary outcome events observed in the study population (n=79).

Characteristics	Secondary outcome events	Mean	Std. deviation	t value	P value
Age (years)	Event	61.58	10.26	3.373	0.001
	No event	53.45	9.67		
Risk index	Event	22.50	3.13	0.406	0.686
	No event	22.21	2.74		
Killip class	Event	1.91	1.17	4.597	<0.001
	No event	1.12	0.33		
Random blood glucose (mmol%)	Event	8.96	6.87	1.488	0.141
	No event	7.09	4.20		

DISCUSSION

Elevated blood glucose levels at admission during acute illness are common and are associated with poor outcome in acute cardiopulmonary events such as AMI, heart failure, and stroke.[6-8] From recent years, the association between hyperglycemia and the outcome of acutely ill patients has received considerable importance because of potential benefits and risks of tight glycaemic control.[9]

Considering the post prandial blood glucose levels helps in determination of prognosis in patients with MI in the development of adverse cardiovascular events.[10,11] Many studies suggested that post prandial blood glucose levels are more important for the risk assessment of

cardiovascular complications rather than fasting blood glucose level.[12]

In the current study, the prevalence rate of diabetes in AMI patients is 6.3%. This rate was comparatively lesser than previous findings, suggesting 14.3-40.9% prevalence of diabetes mellitus in patients with MI according to the national population characteristics.[13,14]

Irrespective of diabetic status, hyperglycemia is considered to be a major predictor of survival or increased risk development of cardiovascular events in AMI patients.

Irrespective of diabetic status, hyperglycemia is considered to be a major predictor of survival or increased risk development of cardiovascular events in AMI patients.[3]Our study results showed that during consideration of baseline characteristics the mean random blood glucose levels are more in non-survivors (9.91±8.1 mmol/l)with acute AMI compared to survivors(7.09±4.04 mmol/l). These findings confirm that patients with hyperglycemia had a significantly higher mortality rate (p=0.05). Our findings are consistent with the findings of Capes et al.[8]They found that patients without diabetes who had glucose concentrations more than or equal to range 6.1-8.0 mmol/L had a 3.9-fold (95% CI 2.9-5.4) higher risk of death than patients without diabetes who had lower glucose concentrations. Similarly, in the present study, the mortality rate in diabetic patients was higher (40%) compared to non-diabetics (19%) which is comparatively higher than the findings of Karetnikova et al.[1] In his study, the mortality rate was 14.82% in diabetic patients and 10% in non-diabetics (p>0.05).

In our study, out of 79 patients, recurrent MI was seen in 4 patients during the follow up period. This was lower in comparison to the studies of Karetnikova et al.[1] In their study, 8 patients with diabetes mellitus and 10 patients without diabetes mellitus had shown recurrent MI during their one year follow up period.

CONCLUSION

In conclusion the findings of the data suggested that hyperglycemia at the time of admission in patients with AMI were significantly associated with risk of mortality. Hence, future studies should focus on the development of therapeutic strategies related to the association of hyperglycemia and AMI. Further studies need to be done to determine whether glucose-lowering treatments could improve outcomes in Hyperglycemic patients with AMI.

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