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To study hyperglycemia at admission in non-diabetic acute myocardial infarction patients: prognostic implications

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Abstract
Background: High entry glucose levels in non-diabetic patients with acute myocardial infarction are independently linked to larger infarct sizes and an increased death rate compared to those with normal glucose levels. There has also been a strong link shown between glycemia and shock or the onset of heart failure.
Aim and objectives: The purpose of this study was to evaluate the prognostic significance of admission hyperglycemia in non-diabetic patients with acute myocardial infarction. Methodology: The study involved 150 non-diabetic STEMI patients admitted to a Mediciti Institute of Medical Sciences, Hyderabad, India from July 2024 to June 2025. Individuals with acute myocardial infarction confirmed by ECG, cardiac enzymes, and clinical symptoms indicative of acute myocardial infarction, who lacked a prior history of diabetes and had HbA1c levels <6.5, were incorporated into the study.
Results: Out of the patients whose entry blood glucose levels were less than or equal to 140 mg%, 6 (8.10%) experienced cardiogenic shock, 4 (5.40%) had arrhythmias, 3 (4.05%) had AV block (≥2nd degree), and 5 (6.75%) passed away while hospitalized. Out of the patients whose blood glucose levels were higher than 140 mg% upon admission, 16 suffered cardiogenic shock (21.05%), 14 arrhythmias (18.42%), 11 AV block (14.47%), and 14 patients died while hospitalized. Patients whose entrance blood glucose levels were greater than 140 mg% had a substantially increased risk of complications and fatality.
Conclusion: Hospital sequelae such as cardiogenic shock, arrhythmias, and AV block, as well as mortality, are more common in non-diabetic patients with acute ST elevation myocardial infarction who had hyperglycemia at admission.

Keywords: Prognostic consequences, patients without diabetes, myocardial infarction, acute, cardiovascular results, hospital death rate, stratification of risk, Forecast

Introduction

Despite improvements in diagnosis and treatment, acute myocardial infarction (AMI) remains a leading cause of death and disability globally. Clinical decision-making and patient outcomes can be greatly improved with early risk classification of AMI patients. There is a growing body of evidence that suggests high blood glucose levels at admission are an indicator of poor prognosis [1, 2].

Even in those who have never had diabetes before, hyperglycemia is a frequent symptom during the early stages of a myocardial infarction. The stress hormones cortisol, catecholamines, and pro-inflammatory cytokines are believed to be responsible for this spike in blood sugar by increasing hepatic gluconeogenesis and decreasing insulin sensitivity. Several investigations have shown that admission hyperglycemia is linked to increased infarct size, poorer left ventricular function, arrhythmias, and higher in-hospital mortality, despite previously being considered a transitory and adaptive process [3, 4].

It appears that entrance hyperglycemia has a more significant predictive influence on non-diabetic individuals than on those with preexisting diabetes. Sudden hyperglycemia worsens cardiac damage in non-diabetic people due to increased endothelial dysfunction, oxidative stress, and pro-thrombotic alterations, in contrast to the adaptive mechanisms induced by chronic hyperglycemia in diabetics. Accordingly, hyperglycemia at admission has become a

possible independent predictor of both immediate and future negative cardiovascular outcomes in this group [5-7].
It is highly relevant to clinical practice to assess the predictive value of entry hyperglycemia in patients with AMI who do not have diabetes in light of these findings. Improving patient survival and decreasing complications may be possible with early treatment interventions guided by a better knowledge of this link and by risk stratification tools [8, 9].

Methodology
In this study, 150 patients without diabetes who were admitted to the critical care unit of a Mediciti Institute of Medical Sciences, Hyderabad, India, between July 2024 and June 2025 and presented with ST-Elevation Myocardial Infarction (STEMI) were studied. Clinical examinations, as well as appropriate laboratory and imaging studies, were used to assess each patient.

Inclusion criteria
- ST-segment elevation >0.1 mV in at least two contiguous leads.
- Positive Troponin I or elevated CPK-MB levels.
- Symptoms suggestive of acute myocardial infarction (such as chest pain, sweating, or dyspnea).
- Patients with no prior history of diabetes mellitus.
- Patients with HbA1c < 6.5% at admission.

Exclusion criteria
- Patients presenting with Non-ST Elevation Myocardial Infarction.
- Patients with a previously established diagnosis of diabetes mellitus.
- Patients receiving drugs known to elevate blood glucose levels.
- Patients who had received dextrose-containing intravenous fluids before admission.
- Patients admitted to the Critical Care Unit more than 48 hours after onset of symptoms.

Outcome measures
Mortality rate while hospitalized was the main outcome measured. Heart failure, reinfarction, arrhythmias, cardiogenic shock, and length of hospital stay were included as secondary outcomes.

Results
This study included 150 non-diabetic STEMI patients; 74 patients were assigned to Group I (normoglycemia) and 76 patients were assigned to Group II (hyperglycemia).

Sex distribution
There were 90 men and 60 women among the total patients. Both Group I and Group II contained a similar ratio of males to females: 44 for Group I and 30 for Group II. In terms of gender distribution, the two groups were statistically indistinguishable (p = 0.894).

Age distribution
The mean age of patients in Group I was 62.45 ± 12.24 years, and in Group II was 61.14 ± 11.35 years. The median ages were 65 and 62 years respectively. The difference in mean age between the groups was not statistically significant (p = 0.608).

Personal and past history
Out of a total of 32 participants, 21.33 percent were smokers; 18 from Group I and 14 from Group II were enrolled in the study. A total of 24.32 percent of patients in Group I and 18.42 percent of patients in Group II reported a smoking history, respectively. When comparing the two groups' smoking rates, no statistically significant difference was found (p= 0.378). Included in the study were 46 individuals who had a history of alcohol consumption. With 23 patients in each group, there was no statistically significant difference in the proportion of patients reporting an alcohol use history. Out of the 45 patients surveyed, 20 were found in Group I and 25 in Group II, and all of them had a history of hypertension. In terms of hypertensives, the two groups were not significantly different from one another.

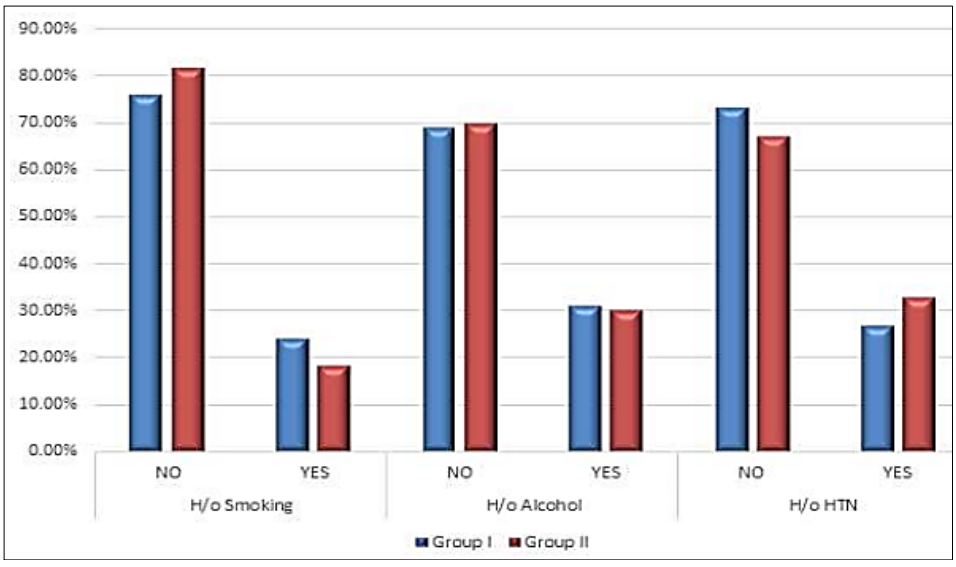

Fig 1: Mean HbA1c levels in Group I (normoglycemia) and Group II (hyperglycemia) were not significantly different (p = 0.475).

HbA1c levels: There was no statistically significant difference between Group I and Group II with respect to the mean HbA1c values (5.46 vs. 5.50, p = 0.475). The results showed that the glycemic state before the infarction was

similar in both groups, and that the hyperglycemia in Group II was probably due to stress.

General physical examination: Comparing the two groups, this table displays the average heart rate, systolic blood pressure, and diastolic blood pressure. When comparing the two groups, heart rate, systolic blood pressure, and diastolic blood pressure were all significantly different.

Table 1: Comparison of mean heart rate, SBP, and DBP in Group I (normoglycemia) and Group II (hyperglycemia).

Variable	Group I	Group II	*p* value
Mean heart rate (beats/min)	76.88 ± 12.75	81.83 ± 13.52	0.023
Mean SBP (mmHg)	125.49 ± 25.75	111.58 ± 25.25	0.001
Mean DBP (mmHg)	79.08 ± 13.64	71.47 ± 14.17	<0.001

Development of complications

Cardiogenic shock occurred in 14.66% of patients overall. The incidence of cardiogenic shock was 6.1% in group I and 21.05% in group II. In group II, the incidence of cardiogenic shock was significantly higher (p= 0.025). Four patients (5.40%) in group I and fourteen patients (18.42%) in group II experienced arrhythmias. The number of patients experiencing arrhythmias increased significantly in group II (p= 0.022). Fifteen patients (9.33%) in the research experienced a second-degree AV block. AV block (≥2nd degree) developed in 3 patients (4.05%) of group I and in 11 patients (14.47%) of group II. In group II, the incidence of AV block was significantly higher (p=0.046).

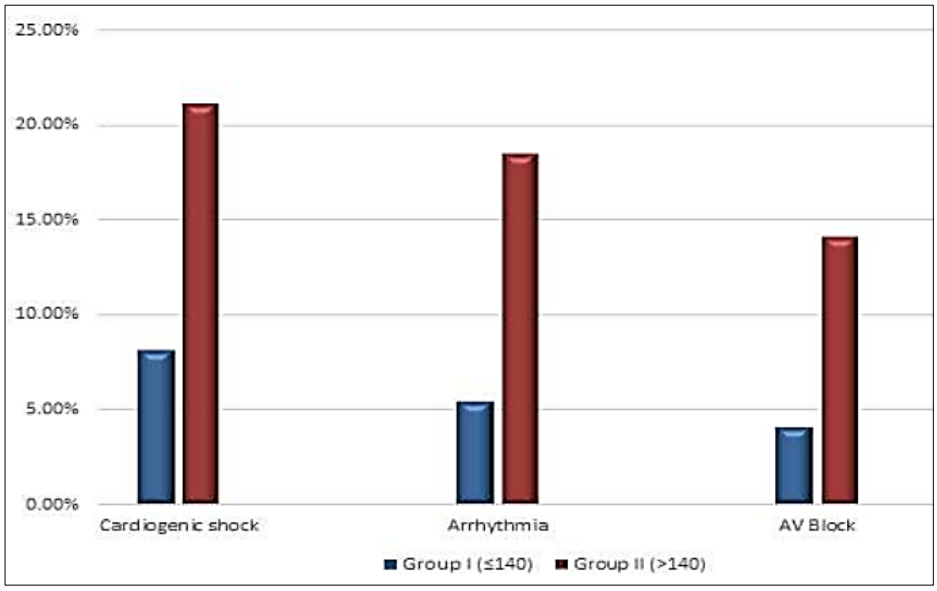

Fig 2: Development of complications

Thirteen individuals, or fourteen percent, passed away while hospitalized. During their hospital stay, 5 patients (6.75%) from group I and 16 patients (21%) from group II died. Hospital stay mortality was significantly higher in group II patients (p= 0.012). The impact of potential confounding variables was mitigated using univariate logistic regression analysis. Cardiogenic shock, arrhythmias, AV block, mortality, and systolic and diastolic blood pressure were all linked to hyperglycemia.

In-hospital mortality

In all, 21 patients (about 14% of the total) passed away while in the hospital. There were 5 fatalities (6.75%) in Group I and 16 deaths (21.05%) in Group II. It was statistically significant (p = 0.012) that there was a difference in mortality.

Univariate logistic regression analysis

A higher incidence of cardiogenic shock, arrhythmias, AV block, and in-hospital mortality was associated with admission hyperglycemia, according to regression analysis, which also showed a significantly higher heart rate and lower systolic and diastolic blood pressures.

Discussion

This research aimed to examine the predictive power of admission hyperglycemia in non-diabetic individuals suffering from acute myocardial infarction (AMI). There was a strong correlation between higher blood glucose levels at admission and both short-term problems and worse outcomes while hospitalized, according to the results. Thus, even in patients who have never had diabetes before, entry hyperglycemia should be considered a separate prognostic indicator [10-13].

Previous research has shown that stress-induced hyperglycemia is common during acute coronary events and is strongly associated with negative cardiovascular outcomes; our results are in line with that. According to Capes *et al*., hyperglycemia increases the probability of in-hospital death in non-diabetic AMI patients when compared to their normoglycemic counterparts [14-16]. Patients with acute coronary syndromes were found to have an increased risk of both immediate and delayed death when their admission glucose levels were high, as pointed out by Kosiborod *et al*. The current results corroborate existing findings and add weight to the argument that admission hyperglycemia is a clinically significant risk stratification criterion [17, 18].

There are a number of factors that contribute to this correlation. Ischemia and reperfusion damage to the heart can be worsened by acute hyperglycemia because it worsens endothelial dysfunction, increases oxidative stress, activates platelets more effectively, and hinders fibrinolysis. In addition, the intensity of the acute sickness may be indicated by stress hyperglycemia, which may be a sign of neurohormonal activation and an increased inflammatory response. Accordingly, hyperglycemia in non-diabetic AMI patients might represent a proxy for the degree of myocardial injury and systemic stress rather than just a passing metabolic reaction [19, 20].

Our results also show that problems including arrhythmias, left ventricular dysfunction, and longer hospital stays are more common in patients with entry hyperglycemia, which is rather interesting. This is in line with other research showing that post-infarction hemodynamic instability and heart failure are more common in patients with stress hyperglycemia. In order to identify patients at high risk of AMI who may need closer monitoring and more aggressive care, glucose measurement at admission could be a simple, cost-effective, and easily accessible method [21, 22].

Conclusion

Hospital consequences such as cardiogenic shock, arrhythmias, and AV block are more common in non-diabetic patients admitted with acute ST elevation myocardial infarction who have hyperglycemia upon admission. A high blood sugar level upon admission is a robust indicator of early death while in the hospital. While high blood sugar levels at admission do increase the risk of complications and death while hospitalized, they do not stand alone as a predictor of these outcomes. Admission heart rate is higher and systolic and diastolic blood pressure are considerably lower in patients with stress hyperglycemia.

Funding

None.

Conflict of Interest

None.

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