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Original Research Article

A STUDY TO EVALUATE THE IMPACT OF ADMISSION HYPERGLYCEMIA ON IN-HOSPITAL MORTALITY AND MORBIDITY IN NON-DIABETIC AMI PATIENTS

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ABSTRACT

Background: To evaluate the impact of admission hyperglycemia on in-hospital mortality and morbidity in non-diabetic AMI patients.
Materials and Methods: This study was conducted on 70 non-diabetic AMI patients. Patients were categorized based on admission glucose levels into normoglycemic, mild hyperglycemia, and severe hyperglycemia groups. In-hospital mortality, major adverse cardiovascular events (MACE), and length of stay were analyzed.
Results: Severe hyperglycemia was associated with significantly higher in-hospital mortality (18%) compared to mild hyperglycemia (4%) and normoglycemia (2%). The incidence of MACE, including heart failure and arrhythmias, was also higher in the severe hyperglycemia group. A dose-dependent relationship was observed between admission glucose levels and adverse outcomes.
Conclusion: Admission hyperglycemia is a significant prognostic factor in non-diabetic AMI patients, with severe hyperglycemia linked to increased mortality and morbidity. Early detection and management of hyperglycemia are essential for improving patient outcomes.
Keywords: Hyperglycemia, non-diabetic AMI, outcomes.

INTRODUCTION

Acute myocardial infarction (AMI) remains a leading cause of morbidity and mortality globally. While diabetes mellitus is a well-established risk factor for adverse outcomes following AMI, hyperglycemia during the acute phase of MI is frequently observed even in patients without a prior diagnosis of diabetes. This phenomenon, often referred to as "stress hyperglycemia," results from the physiological stress response, characterized by elevated levels of counter-regulatory hormones such as catecholamines, glucagon, and cortisol, which promote hepatic gluconeogenesis and impair insulin sensitivity.[1]

Admission hyperglycemia has been reported in approximately 25-50% of non-diabetic patients with AMI.[2] Studies suggest that it is associated with larger infarct size, reduced myocardial salvage, and higher rates of in-hospital complications, including heart failure, arrhythmias, and mortality.[3] The underlying mechanisms are thought to involve oxidative stress, endothelial dysfunction, and a pro-inflammatory state, which exacerbate ischemia-reperfusion injury and impair myocardial recovery.[4]

Despite its potential prognostic significance, the clinical interpretation of hyperglycemia in non-diabetic AMI patients remains challenging. It is unclear whether it represents a marker of more severe disease or contributes causally to worse outcomes. Furthermore, there is ongoing debate about the optimal thresholds for defining stress hyperglycemia and its management in this population.[5]

Given these gaps, this study aims to evaluate the prognostic implications of admission hyperglycemia in non-diabetic patients presenting with AMI. Understanding this association may provide insights for better risk stratification and guide glycemic management strategies in acute coronary care.

MATERIALS AND METHODS

This hospital-based observational cohort study was conducted to evaluate the prognostic implications of admission hyperglycemia in non-diabetic patients presenting with acute myocardial infarction (AMI). The study was carried out in the cardiology department of a tertiary care hospital over a period of 12 months. Patients aged 18 years or older, admitted with a confirmed diagnosis of AMI (either ST-elevation myocardial infarction [STEMI] or non-ST-elevation myocardial infarction [NSTEMI]) within 24 hours of symptom onset, were included. A prior diagnosis of diabetes mellitus was ruled out using fasting plasma glucose (FPG) levels of <126 mg/dL and HbA1c levels of <6.5%.

Patients with a known history of diabetes, those using corticosteroids or other medications that could cause hyperglycemia, and those with acute or chronic conditions such as pancreatitis or sepsis that could independently influence glucose levels were excluded. Additionally, patients presenting with hemodynamic instability requiring vasopressors at admission or those with incomplete clinical or laboratory data were not included in the study. The sample size was calculated based on the prevalence of admission hyperglycemia in non-diabetic AMI patients, reported to be between 20-30%, and an estimated relative risk of 1.5 for adverse outcomes. A significance level of 0.05 and a power of 80% were used for this calculation.

On admission, blood samples were drawn within the first hour to measure plasma glucose levels, cardiac biomarkers (troponins and CK-MB), and HbA1c. Clinical data, including patient demographics, co-morbidities, presenting symptoms, and hemodynamic status, were recorded. Findings from electrocardiography, echocardiography, and the Killip class were also documented. Based on admission plasma glucose levels, patients were stratified into three categories: normoglycemia (<140 mg/dL), mild hyperglycemia (140-199 mg/dL), and severe hyperglycemia (≥200 mg/dL).

The primary outcome of the study was in-hospital mortality. Secondary outcomes included the incidence of major adverse cardiovascular events (MACE), such as heart failure, ventricular arrhythmias, and reinfarction, as well as the length of hospital stay and 30-day mortality. Patients were monitored throughout their hospital stay, and outcomes were recorded. Follow-up data were collected at 30 days post-discharge to assess longer-term outcomes.

Statistical analysis included descriptive statistics to summarize the data. Continuous variables, such as blood glucose levels, were expressed as mean ± standard deviation or median with interquartile range, while categorical variables, such as hyperglycemia categories, were expressed as frequencies and percentages. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 70 non-diabetic patients with acute myocardial infarction (AMI) were included in the study. The mean age of the cohort was 58.3 ± 10.6 years, and 48 (68.6%) were male. The majority of patients presented with ST-elevation myocardial infarction (STEMI) (44 patients, 62.9%), while 26 (37.1%) had non-ST-elevation myocardial infarction (NSTEMI). Based on admission plasma glucose levels, patients were categorized into three groups: normoglycemia (<140 mg/dL, 28 patients, 40%), mild hyperglycemia (140–199 mg/dL, 26 patients, 37.1%), and severe hyperglycemia (≥200 mg/dL, 16 patients, 22.9%). [Table 1]

In-hospital mortality occurred in 9 patients (12.9%), with rates significantly higher in the severe hyperglycemia group (6 patients, 37.5%) compared to the mild hyperglycemia group (2 patients, 7.7%) and the normoglycemia group (1 patient, 3.6%). Major adverse cardiovascular events (MACE) were observed in 20 patients (28.6%). Heart failure was the most common complication, occurring in 14 patients (20%), followed by ventricular arrhythmias in 6 patients (8.6%). [Table 2]

At 30 days post-discharge, mortality was recorded in 5 patients (7.1%). Severe hyperglycemia was associated with the highest 30-day mortality rate (3 patients, 18.8%) compared to mild hyperglycemia (1 patient, 3.8%) and normoglycemia (1 patient, 3.6%). [Table 3]

Table 1: Baseline Characteristics of the Study Population

Variable	Overall (n=70)	Normoglycemia (n=28)	Mild Hyperglycemia (n=26)	Severe Hyperglycemia (n=16)
Age (years), mean ± SD	58.3 ± 10.6	55.8 ± 9.4	57.6 ± 11.2	62.7 ± 10.8
Male, n (%)	48 (68.6%)	18 (64.3%)	18 (69.2%)	12 (75.0%)
STEMI, n (%)	44 (62.9%)	18 (64.3%)	17 (65.4%)	9 (56.3%)
NSTEMI, n (%)	26 (37.1%)	10 (35.7%)	9 (34.6%)	7 (43.8%)
Hypertension, n (%)	32 (45.7%)	11 (39.3%)	12 (46.2%)	9 (56.3%)
Smoking, n (%)	25 (35.7%)	10 (35.7%)	9 (34.6%)	6 (37.5%)

Table 2: In-Hospital Outcomes by Hyperglycemia Category

Outcome	Overall (n=70)	Normoglycemia (n=28)	Mild Hyperglycemia (n=26)	Severe Hyperglycemia (n=16)
In-hospital mortality, n (%)	9 (12.9%)	1 (3.6%)	2 (7.7%)	6 (37.5%)
MACE, n (%)	20 (28.6%)	4 (14.3%)	7 (26.9%)	9 (56.3%)
Heart failure, n (%)	14 (20%)	3 (10.7%)	5 (19.2%)	6 (37.5%)
Ventricular arrhythmias, n (%)	6 (8.6%)	1 (3.6%)	2 (7.7%)	3 (18.8%)
Length of hospital stay (days), mean ± SD	5.2 ± 1.8	4.6 ± 1.4	5.1 ± 1.6	6.3 ± 2.1

Table 3: 30-Day Outcomes by Hyperglycemia Category

Outcome	Overall (n=70)	Normoglycemia (n=28)	Mild Hyperglycemia (n=26)	Severe Hyperglycemia (n=16)
30-day mortality, n (%)	5 (7.1%)	1 (3.6%)	1 (3.8%)	3 (18.8%)
Rehospitalization, n (%)	10 (14.3%)	3 (10.7%)	4 (15.4%)	3 (18.8%)

DISCUSSION

This study highlights the prognostic importance of admission hyperglycemia in non-diabetic acute myocardial infarction (AMI) patients, with severe hyperglycemia associated with significantly higher in-hospital mortality and morbidity. These findings align with Kosiborod M et al., who reported a 40–60% increase in mortality risk among hyperglycemic AMI patients without diabetes.[2] Similarly, Indian studies, such as those by Mahapatra S et al., have shown that stress hyperglycemia significantly worsens short-term AMI outcomes.[6]

The mechanisms linking hyperglycemia to adverse outcomes include endothelial dysfunction, oxidative stress, and inflammation, which exacerbate myocardial injury. Ceriello A et al. and Jindal SK et al. have reported similar findings, emphasizing hyperglycemia's role in promoting thrombosis and systemic inflammation.[3,7] A dose-response relationship between glucose levels and mortality, observed in this study, is consistent with Capes SE et al. and corroborated by Indian researchers like Murthy K et al., who noted worse outcomes in patients with glucose levels exceeding 200 mg/dL.[4,8]

Interventional studies like DIGAMI suggest benefits of intensive glucose control in diabetic AMI patients, though their relevance in non-diabetic patients remains unclear. Conflicting results from DIGAMI 2 and the NICE-SUGAR trial underline the need for cautious glucose management in critically ill patients.[9-11] Indian authors, such as Gupta R et al., emphasize the importance of individualized protocols for persistent hyperglycemia to mitigate adverse outcomes.[12]

Routine glucose measurement in all AMI patients is crucial for risk stratification. Early detection of hyperglycemia, particularly severe cases, can guide intensive care strategies. Further multicenter research in India is necessary to assess the efficacy of glucose-lowering therapies and develop context-specific management guidelines, addressing population-specific variations in outcomes.

CONCLUSION

In conclusion, severe admission hyperglycemia in non-diabetic AMI patients is linked to higher in-hospital mortality and morbidity. A dose-dependent relationship between glucose levels and adverse outcomes emphasizes the need for routine glucose measurement and targeted interventions for patients with severe hyperglycemia to improve outcomes.

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