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ORIGINAL RESEARCH

Short and long-term prognosis of admission hyperglycemia in patients with and without diabetes after acute myocardial infarction: A retrospective cohort study

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ABSTRACT

Background: Admission hyperglycemia is a common finding in patients with acute myocardial infarction (AMI) and is associated with adverse outcomes. However, its prognostic significance in patients with and without diabetes remains unclear. **Methods:** This retrospective cohort study included 198 patients hospitalized with AMI. Patients were categorized based on diabetes status and the presence of admission hyperglycemia (blood glucose >180 mg/dL). Primary outcomes included mortality and major adverse cardiovascular events (MACE) within 12 months. Kaplan-Meier survival analysis and Cox proportional hazards modeling were used to assess the impact of hyperglycemia on outcomes. **Results:** Admission hyperglycemia was observed in 53% of patients. Mortality was significantly higher in hyperglycemic patients (22%) compared to normoglycemic patients (8%) ($p < 0.05$). MACE occurred in 40% of hyperglycemic patients versus 24% of normoglycemic patients ($p < 0.05$). Diabetic patients with hyperglycemia had the highest MACE incidence (45%). Cox regression analysis showed that admission hyperglycemia was an independent predictor of mortality (HR 2.4, 95% CI 1.3-4.5, $p < 0.01$). **Conclusion:** Admission hyperglycemia is a significant predictor of mortality and MACE in AMI patients, with a stronger impact in diabetics. Early glycemic management may improve outcomes.

Keywords: Hyperglycemia, Myocardial infarction, Diabetes, Prognosis

INTRODUCTION

Regardless of whether they have diabetes or not, patients who have an acute myocardial infarction (AMI) frequently have admission hyperglycemia, which is defined as elevated blood glucose levels at the time of hospital admission [1]. Because it has been linked to negative outcomes and higher death rates in both diabetes and non-diabetic populations, this phenomenon has attracted attention. It is believed that increased myocardial damage, thrombotic activity, and heightened inflammatory responses are the underlying processes [2,3]. There is still a lack of knowledge regarding the long-term consequences of myocardial infarction in patients who appear with admission hyperglycemia, even though several research have demonstrated the prognostic relevance of hyperglycemia in the acute setting of AMI [4].

Because the pathophysiological effects of acute hyperglycemia may vary between people with established diabetes and those without a history of the disease, it is crucial to distinguish between the two groups [6]. Hyperglycemia at admission may indicate a persistent dysregulation of glucose metabolism in patients with pre-existing diabetes, which has specific consequences for cardiac recovery and rehabilitation [7]. Stress-induced hyperglycemia, on the other hand, maybe a temporary but strong metabolic reaction to acute sickness in non-diabetic people. This reaction may go away after recovery, but it still contains important prognostic information [8].Given these subtleties, a thorough retrospective cohort investigation may shed light on how admission hyperglycemia affects both diabetic and non-diabetic patients' short- and long-term outcomes after AMI [9]. Comprehending these differences is essential for customizing post-infarction care plans and enhancing prognostic evaluations in this heterogeneous patient group [10].

Assessing the short- and long-term prognoses of patients with and without diabetes who had hyperglycemia at the time of admission for an acute myocardial infarction is the main goal of this

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investigation. This study aims to investigate potential variations in outcomes depending on pre-existing diabetic conditions and to ascertain the degree to which early hyperglycemia predicts mortality and cardiovascular events after discharge.

MATERIALS AND METHODS

Study Design and Setting: This study was a retrospective cohort analysis conducted at a tertiary care hospital. It involved reviewing the medical records of patients admitted with acute myocardial infarction (AMI) from January 2018 to December 2019.

Participants: A total of 198 patients who presented with AMI during the study period were included. Patients were stratified into two groups based on their diabetes status: 98 patients with a pre-existing diagnosis of diabetes and 100 patients without any prior history of diabetes.

Data Collection: Patient data were extracted from electronic health records. Collected information included demographic details (age, sex), clinical parameters (blood pressure, heart rate), laboratory results at admission (blood glucose levels, lipid profile), and medical history (presence of hypertension, dyslipidemia, and previous cardiac events).

Outcome Measures: The primary outcomes of the study were mortality and major adverse cardiovascular events (MACE), which included recurrent myocardial infarction, stroke, and hospital readmission for heart failure within 12 months after the initial AMI.

Statistical Analysis: Descriptive statistics were used to summarize the data. Categorical variables were compared using the Chi-square test, while continuous variables were analyzed using the Mann-Whitney U test. Survival analysis was performed using the Kaplan-Meier method, and differences between survival curves were tested with the log-rank test. Cox proportional hazards models were utilized to adjust for confounders and to determine the impact of admission hyperglycemia on the outcomes. Statistical significance was set at a p-value less than 0.05. All analyses were conducted using SPSS software, version 25.

RESULTS

We identified 100 patients without a history of diabetes and 98 patients with diabetes in our retrospective cohort analysis, which included 198 patients admitted with acute myocardial infarction. Of these, hyperglycemia was evident upon admission in 49% of non-diabetic patients and 56% of diabetic patients. Twelve months was the median follow-up duration. The overall mortality rate throughout the follow-up was 15%. Patients who had admission hyperglycemia had a considerably greater mortality rate (22%) than those who did not ($p < 0.05$). The incidence of major adverse cardiovascular events (MACE) was higher in the hyperglycaemic group (40%) than in the normoglycemic group (24%), with 32% of the cohort experiencing MACE ($p < 0.05$). Interestingly, the highest incidence of MACE (45%) was found in diabetic patients with entry hyperglycemia, compared to 35% in diabetic patients without hyperglycemia and 25% in non-diabetic hyperglycaemic individuals.

The hyperglycaemic group's survival rate free from MACE was considerably lower than that of the normoglycemic group, according to Kaplan-Meier analysis (log-rank $p < 0.01$). After controlling for age, sex, body mass index, and infarction severity, Cox proportional hazards modelling verified that admission hyperglycemia was a significant predictor of both MACE (hazard ratio 1.8, 95% CI 1.1-2.9, $p < 0.05$) and death (hazard ratio 2.4, 95% CI 1.3-4.5, $p < 0.01$). According to these results, after an acute myocardial infarction, admission hyperglycemia is a significant predictor of both short-term and long-term unfavourable outcomes in patients with and without diabetes. The information emphasises how crucial it is to control excessive blood sugar levels upon admission in order to possibly enhance cardiovascular outcomes for this high-risk patient group.

Table 1: Patient Characteristics and Hyperglycemia Status

Patient Group	Total Patients	Patients with Hyperglycemia	Patients without Hyperglycemia
Diabetic	98	55 (56%)	43 (44%)
Non-Diabetic	100	49 (49%)	51 (51%)
Total	**198**	**104 (53%)**	**94 (47%)**

Table 2: Mortality and Major Adverse Cardiovascular Events (MACE) by Hyperglycemia Status

Outcome	Hyperglycemic Patients	Normoglycemic Patients	p-value
Mortality	22% (23/104)	8% (8/94)	< 0.05
Major Adverse Cardiovascular Events (MACE)	40% (42/104)	24% (23/94)	< 0.05

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Table 3: Mortality and MACE in Diabetic Patients by Hyperglycemia Status

Outcome	Diabetic with Hyperglycemia	Diabetic without Hyperglycemia
Mortality	27% (15/55)	19% (8/43)
Major Adverse Cardiovascular Events (MACE)	45% (25/55)	35% (15/43)

Table 4: Kaplan-Meier Survival Analysis

Group	Survival Free from MACE (%)	p-value
Hyperglycemic Patients	60%	< 0.01
Normoglycemic Patients	76%	< 0.01

Table 5: Cox Proportional Hazards Model for Mortality and MACE

Predictor	Hazard Ratio (95% CI)	p-value
Admission Hyperglycemia	2.4 (1.3-4.5)	< 0.01
MACE	1.8 (1.1-2.9)	< 0.05

These tables collectively present a detailed view of the correlation between hyperglycemia at admission and subsequent outcomes in myocardial infarction patients. The statistical analysis indicates significant differences in outcomes based on the presence of hyperglycemia at the time of admission.

DISCUSSION

Regardless of whether a patient has diabetes or not, our research revealed that admission hyperglycemia had a substantial impact on both short-term and long-term outcomes in patients with acute myocardial infarction (AMI). Compared to their normoglycemic counterparts, patients with entry hyperglycemia had a greater mortality and major adverse cardiovascular events (MACE) risk. These results are in line with other studies that showed hyperglycemia upon hospital admission is linked to elevated oxidative stress and inflammatory responses, which may worsen cardiac damage and result in worse outcomes [11]. Significantly, individuals with pre-existing diabetes showed a more marked difference in outcomes, indicating that chronic hyperglycemia may increase the likelihood of severe events following AMI. The results of Capes et al., who found that hyperglycemia at admission was a higher predictor of death and heart failure in diabetic patients, are consistent with this subgroup study [12]. On the other hand, non-diabetic patients' hyperglycaemic response might be a transient stress reaction that is more responsive to acute glycaemic control measures, even though it is still harmful.

The mechanisms underlying the effects of hyperglycemia may differ between patients with and without diabetes, according to comparative studies like those conducted by Ishihara [13]. This could be because of variations in endothelial dysfunction, insulin resistance, and the capacity to mount a sufficient ischaemic preconditioning response. Thus, our research lends credence to the idea that tailored glycaemic control plans during the acute stage of myocardial infarction could be advantageous and ought to take the patient's diabetes condition into account. Our study's retrospective design and limited sample size are among its limitations, which could limit how broadly the findings can be applied. Furthermore, differences in how hyperglycemia is managed during hospitalisation were not taken into consideration, which can have an impact on results [14,15].

CONCLUSION

In patients with acute myocardial infarction, our study demonstrates the substantial predictive influence of admission hyperglycemia on mortality and severe adverse cardiovascular events, with the effects being particularly noticeable in individuals with diabetes. These results highlight the need for prompt and efficient glycaemic care in AMI patients and imply that hyperglycemia at the time of hospital admission is a critical indicator for unfavourable outcomes. Personalised approaches to blood glucose management during the acute period may have potential advantages in improving cardiovascular outcomes, given the varying effects depending on pre-existing diabetes status. In order to improve patient recovery and lower the risk of recurrent cardiovascular events, this study thus advocates for a focused approach in the treatment protocols for AMI patients with and without diabetes, highlighting the significance of incorporating glycaemic management into the standard care procedures.

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