Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i18.3444

IN-HOSPITAL OUTCOMES OF PATIENTS WITH STEMI AND ITS CORRELATION WITH ADMISSION GLUCOSE LEVEL

Muhammad Khalil[1]*, Muhammad Shafique Arshad[2], Asma Zafar Khawaja[3], Mahboob Ur Rehman[4], Hidayatullah[5], Sumeet Kumar[6], Shoaib Ahmed[7],

[1]*Post Graduate Resident, Department of Cardiology, PIMS, Islamabad.
Email: M.Khalil329@Yahoo.Com, Cell: 0306 8681729
[2]Professor, Department of Cardiology, PIMS, Islamabad
[3]Medical Officer, Department of Cardiology, Federal General Polyclinic Hospital, Islamabad
[4]Associate Professor, Department of Cardiology, PIMS, Islamabad
[5]Postgraduate Resident, Department of Cardiology, PIMS, Islamabad
[6]House Officer, Department of Cardiology, PIMS, Islamabad
[7]Assistant Laboratory Technician, PIMS, Islamabad

***Corresponding Author:** Muhammad Khalil
*Post graduate resident, department of cardiology, PIMS, Islamabad
Email: m.khalil329@yahoo.com, cell: 0306 8681729

Abstract:
Objective: To determine the in-hospital outcomes of patients with STEMI and its correlation with admission glucose level.

Methodology: The study comprised of 280 patients diagnosed with ST-elevation myocardial infarction (STEMI) enrolled during the period March 2023 till September 2023. Admission glucose levels and clinical and biochemical parameters were noted. Hyperglycemia was defined as blood glucose levels more than 140 mg/dl in our study. Hypertension was defined as systolic blood pressure more than 140 mmHg or diastolic blood pressure greater than 90 mmHg. Outcomes were noted in terms of mortality and compared with admission glycemia.

Results: 192 (68.57%) were male and 88 (31.43%) were female, with a mean age of 59.8 ±12 years. The hyperglycemic group included 106 patients (78 males, 73.58%; 28 female, 26.42%) and the euglycemic group 174 (114 male, 65.52%; 60 female, 34.48%; p = 0.03). 110 (39.28%) had hypertension. Of 98 (35.9%) diabetic patients hospitalized, 82 (77.36%) had hyperglycemia and 16 (22.64%) had euglycemia. Overall mortality was 7.71 (n = 16), 14 patients (17.07) among hyperglycemics and 02 (8.0%) among euglycemics.

Conclusion: In patients with STEMI, hyperglycemia significantly worsens in-hospital outcomes for patients. Higher death rates are seen in STEMI patients who had hyperglycemia at hospital admission.

Keywords: ST-elevation myocardial infarction (STEMI), Admission Glucose Level, In-Hospital Outcomes, Hyperglycemia, Euglycemia

INTRODUCTION

ST-elevation myocardial infarction (STEMI) is one of the cardiovascular emergencies characterised by an abrupt blockage of a coronary artery, resulting in ischemia and damage to the heart muscle. It has a high incidence of morbidity and death, making it a major worldwide health problem. Improving the prognosis of STEMI patients requires prompt diagnosis and efficient treatment.

The World Health Organisation reports that the adult prevalence of diabetes developed from 4.7% in 1980 to 8.5% in 2014 [1]. The incidence has been sharply rising in emerging nations such as Pakistan. Acute coronary syndrome (ACS) and diabetes mellitus are strongly correlated; among patients with type 2 diabetes mellitus, the incidence of ACS increased from 18% in 1997 to 22.6% in 2018 [2,3]. Females are more likely than males (20.8%) to have diabetes (26.3%) [4]. Patients with ACS had a greater risk of atherosclerosis, myocardial infarction, and a poorer prognosis when compared to persons without diabetes. Individuals diagnosed with ST-elevated myocardial infarction (STEMI) and identified with hyperglycemia upon hospital admission present a greater treatment challenge in terms of achieving the desired outcomes following thrombolysis or percutaneous coronary intervention (PCI)[5,6].

While prompt reperfusion methods have typically been the major emphasis in the care of STEMI patients, new research shows that other parameters, such as admission glucose levels, may play a role in impacting hospital outcomes. Elevated glucose levels upon admission have been linked to unfavorable cardiovascular outcomes in a variety of patient categories, including those suffering from acute coronary syndrome.

We want to give useful insights into the possible function of admission glucose levels as a predictor of outcomes in this particular patient group by evaluating a cohort of 280 STEMI patients treated at a tertiary care hospital over a one-year period.

METHODOLOGY:

Study Design:

This study is focused on STEMI patients who were hospitalized to tertiary care hospital, PIMS, Islamabad, between March 2023 and September 2023. Patients who were older than 20 years old were included in the study. STEMI was diagnosed based on the presence of at least one elevated biomarker (creatine kinase or troponin I), ST-elevation >0.1 mV in two contiguous electrocardiography leads, and chest pain lasting longer than 30 minutes.

Study Population:

A total of 280 patients who fulfilled the inclusion criteria within the designated period were registered. A blood glucose test was performed to each patient on arrival to hospital. More over 140 mg/dl of blood glucose was considered hyperglycemia. An elevated systolic or diastolic blood pressure of more than 140 mmHg or 90 mmHg was classified as hypertension. A 48-hour period of increasing elevation in serum creatinine > 0.3 mg/dl was used to characterize acute renal failure.

Data Collection:

Admission Glucose Levels: Every patient glucose level was noted at the time of hospital presentation. The cut off for hyperglycemia was set serum glucose level more than 140mg/dl. Less than 140 mg/dl was called euglycemia.

Clinical Parameters: Pertinent clinical measures (such as blood pressure, heart rate, and lipid profile) as well as demographic information (age and gender) and medical history (comorbidities such diabetes mellitus) were noted.

Statistical Analysis:
The clinical data, admission glucose levels, and patient demographics were compiled using descriptive statistics. Initially, univariate analysis was used to investigate the relationship between admission glucose levels and hospital outcomes. Relevant statistical tests were used, such as t-tests or non-parametric testing for continuous variables and chi-squared tests for categorical data. At $p \leq 0.05$, statistical significance was established.

Ethical Considerations:
The Institutional Review Board (IRB) or Ethics Committee of the hospital granted clearance for this research, which complied with ethical standards. To preserve patient privacy and adhere to data protection laws, patient data were anonymized and kept in a safe location.

RESULTS
There were 280 patients in this study. Mean age was 59.8 ±12years. 192 (68.57%) were male and 88 (31.43%) were female. The hyperglycemic group included 106 patients (78 males, 73.58%; 28 female, 26.42%), whereas the euglycemic group had 174 (114 male, 65.52%; 60 female, 34.48%; p = 0.03). Hypertension was seen in 110 patients (39.28%). A total of 98 patients (35.9%) were hospitalized with known diabetes, with 82 (77.36%) having hyperglycemia and 16 (22.64%) having euglycemia (p = 0.001). In-hospital mortality was greater in the hyperglycemic group 14(17.07%) than in the euglycemic group 2(8.0%; p = 0.01). Table-I.
Atrial fibrillation occurred in 8.57% of patients, with hyperglycemia at 33.33% and euglycemia at 66.67%. In hyperglycemia, 27.08% underwent thrombolytic treatment, and 72.92% in euglycemia. A higher proportion of euglycemic individuals received thrombolytic treatment (p = 0.003).
Primary PCI was performed in 29.29%, 39.02% in hyperglycemia, and 60.98% in euglycemia. 38.57% of patients, 36.19% in the hyperglycemia group, and 74.07% in the euglycemia group chose conservative medical care. Though not statistically significant (p = 0.12), more euglycemic people received conservative medical care.
In 4.29% of patients, hyperglycemia (58.33%) caused bleeding, compared to 41.67% in euglycemia. Not much different. 2.5% of patients died post-thrombolytically, 57.14% in hyperglycemia and 42.86% in euglycemia. The post-thrombolytic mortality difference was not significant (p = 0.21). Hyperglycemia and euglycemia treatment methods and clinical results in the study population are shown in Table-II.

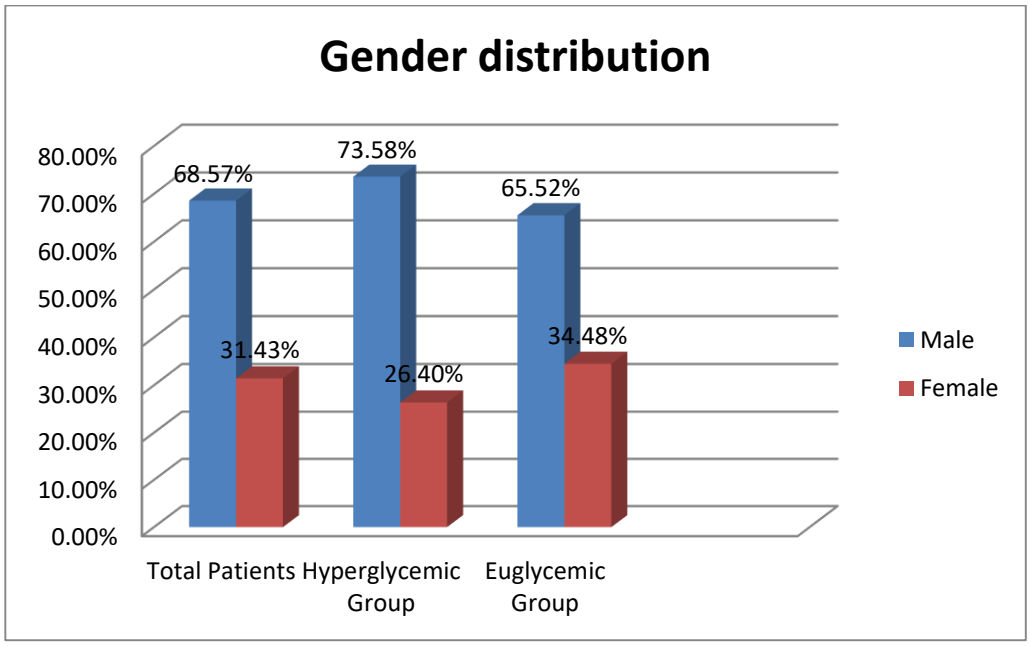

Table-I: Demographic Characteristics and clinical data

Characteristic	Total Patients (n=280)	Hyperglycemic Group (n=106)	Euglycemic Group (n=174)	*p*-value
Gender Male Female	 192 (68.57%) 88(31.43%)	 78 (73.58%) 28(26.42%)	 114 (65.5%) 60(34.48%)	$p = 0.03$
Age (Mean ± SD) years	59.8 ± 12			
Hypertension	110 (39.28%)			
Diabetes Mellitus	98 (35.0%)	82 (77.36%)	16 (22.64%)	$p = 0.001$
Post-PCI Mortality	8(2.86%)	7 (8.53%)	1 (4%)	$p = 0.02$
Smoker	188(67.14%)	82(43.61%)	108(57.39%)	
History of CAD	39 (13.92%)	13(33.33%)	26 (66.67%)	
Heart failure on admission	67 (23.93%)	39 (58.20%)	28 (41.80%)	
Acute renal failure	28 (10%)	15(53.57%)	13 (46.43%)	
In hospital mortality	16(5.71%)	14(17.07%)	2(8%)	$p = 0.01$

Table-II: Treatment measures and results

Characteristic	Total Patients (n=280)	Hyperglycemia group (n=106)	Euglycemia group (n=174)	*P*-value
Atrial fibrillation	24 (8.57%)	8 (33.33%)	16(66.67%)	
Thrombolytic treatment	96 (34.29%)	26 (27.08%)	70(72.92%)	$P=0.003$
Primary PCI	82 (29.29%)	32 (39.02%)	50(60.98%)	
Conservative Rx	108 (38.57%)	38 (36.19%)	80(74.07%)	$P=0.12$
Bleeding	12 (4.29%)	7 (58.33%)	5 (41.67%)	
Post-thrombolysis Death	7 (2.5%)	4 (57.14%)	3 (42.86%)	$P=0.21$
Cardiogenic shock	9(3.21%)	4 (44.44%)	5 (55.56%)	

CONCLUSION

The European Society of Cardiology and the European Association for the Study of Diabetes issued guidelines for glycemic management in patients with heart disease in 2013, with a major emphasis on improving treatment for patients with STEMI [7]. We analyzed the burden of hyperglycemia among STEMI patients in the current research, together with the risks for in-hospital death that go along with it. Poor in-hospital outcomes are strongly predicted with hyperglycemia in patients with STEMI[8]. Compared to STEMI patients who are euglycemic, we discovered that individuals with hyperglycemia have a higher rate of sequelae such atherosclerosis, cardiogenic shock, and heart failure. Contemporary anti-hyperglycemic medications work well to treat high blood sugar, but they can have negative effects on the cardiovascular system [9,10].

In this study, even after reperfusion, the mortality rate for hyperglycemic STEMI patients was greater than that for euglycemic STEMI patients at the time of hospital admission. The effectiveness of the reperfusion technique does not appear to affect how hyperglycemia affects in-hospital outcomes. According to Planer et al., cardiac crisis of myocardial re-infarction and haemorrhage after PCI were brought on by hyperglycemia [11]. According to Malmberg et al., hyperglycemia was linked to a greater fatality rate in STEMI patients stabilized by thrombolysis when compared to euglycemic patients. According to a Japanese study, individuals with STEMI who had hyperglycemia had greater rates of in-hospital mortality and major infarct morbidity than those who had euglycemia [12]. Controlling blood glucose levels can improve the outcomes of STEMI in diabetic patients [13]. In patients with hyperglycemia, our results showed that heart failure, renal failure, diabetes and patient age of 60 years or older were the major risk factors of in-hospital mortality. Anaemia, heart failure, cardiogenic shock, hemorrhage, age ≥75 years, renal failure, and heart failure were all identified by Jomaa et al. as independent predictors of death in diabetic patients who presented with hyperglycemia and acute MI [14].

CONCLUSION

The evaluation of the relationship between in-hospital outcomes and admission glucose levels in patients with STEMI was attempted in this study and grave in-hospital outcomes were found associated with hyperglycemia. Higher death rates are seen in STEMI patients who had hyperglycemia at hospital admission. It was shown that thrombolysis and PCI reduced the frequency of grave outcomes but could not eliminate it.

REFERENCES

1. World Health Organization (WHO). (2016). Global Report on Diabetes. http://www.who.int/publications/i/item/9789241565257.
2. Babes EE, Bustea C, Behl T, Abdel-Daim MM, Nechifor AC, Stoicescu M, et al. Acute coronary syndromes in diabetic patients, outcome, revascularization, and antithrombotic therapy. Biomed Pharmacother. 2022; 148:112772.
3. Muacevic A, Adler JR, Shahid M, Zarif HMA, Farid MS, Muhammad Shoaib Abid MS, et al. Prognostic Value of Hyperglycemia on Admission on In-hospital Outcomes in Patients Presenting with ST-elevation Myocardial Infarction. Cureus. 2020; 12(2): e7024.
4. Ali J, Haider SMS, Ali MS, Haider T, Anwar A, and Hashmi AA, Overall Clinical Features of Type 2 Diabetes Mellitus With Respect to Gender. Cureus. 2023; 15(3): e35771.
5. Zhou M, Liu J, Hao Y, Liu J, Huo Y, Smith SC, et al. Prevalence and in-hospital outcomes of diabetes among patients with acute coronary syndrome in China: findings from the Improving Care for Cardiovascular Disease in China-Acute Coronary Syndrome Project. Cardiovasc Diabetol 2018; 17: 147.
6. Takada JY, Ramos RB, Roza LC, Avakian SD, Ramires JA, Mansur Ade P. In-hospital death in acute coronary syndrome was related to admission glucose in men but not in women. Cardiovasc Diabetol. 2018; 11:47.
7. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. ESC Scientific Document Group. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018;39(2):119-177.
8. Khalfallah M, Abdelmageed R, Elgendy E, Hafez YM. Incidence, predictors and outcomes of stress hyperglycemia in patients with ST elevation myocardial infarction undergoing primary percutaneous coronary intervention. Diab Vasc Dis Res. 2020;17(1):1479164119883983.
9. Grodzinsky A, Arnold SV, Jacob D, Draznin B, Kosiborod M. The impact of cardiovascular drugs on glycemic control: a review. Endocr pract. 2017;23(3):363-371.
10. Triggle CR, Ding H. Cardiovascular impact of drugs used in the treatment of diabetes. Ther Adv Chronic Dis. 2018;5(6):245-68.
11. Kewcharoen J, Ali M, Trongtorsak A, Mekraksakit P, Vutthikraivit W, Kanjanauthai S. Admission hyperglycemia is associated with reperfusion failure in patients with ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention: a systematic review and meta-analysis. Am J Cardiovasc Dis. 2021;11(3):348-359.
12. Nishihira K, Kojima S, Takegami M, Honda S, Nakao YM, Takahashi J, et al. Clinical Characteristics and In-Hospital Mortality According to Left Main and Non-Left Main Culprit Lesions - Report From the Japan Acute Myocardial Infarction Registry (JAMIR). Circ Rep. 2019;1(12):601-609.
13. Sasso FC, Rinaldi L, Lascar N, Marrone A, Pafundi PC, Adinolfi LE, et al. Role of Tight Glycemic Control during Acute Coronary Syndrome on CV Outcome in Type 2 Diabetes. J Diabetes Res. 2018; 2018:3106056.
14. Savonitto S, Morici N, De Servi S. Update: acute coronary syndromes (VI): treatment of acute coronary syndromes in the elderly and in patients with comorbidities. Rev Esp Cardiol (Engl Ed). 2019;67(7):564-73.