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General Medicine

GLYCAEMIC PROFILE AND IN-HOSPITAL CLINICAL OUTCOMES AMONG PATIENTS WITH ACUTE ST-ELEVATION MYOCARDIAL INFARCTION: AN OBSERVATIONAL STUDY.

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ABSTRACT **Background:** Dysglycaemia is common in acute ST-elevation myocardial infarction (STEMI). Admission blood glucose reflects acute glycaemic disturbance, whereas glycated haemoglobin (HbA1c) reflects preceding glycaemic status. **Objectives:** To assess the glycaemic profile and in-hospital clinical outcomes of patients with acute STEMI and determine the association of diabetes mellitus with major in-hospital complications. **Methods:** This observational study included 300 patients with acute STEMI admitted to a tertiary-care centre between March 2024 and September 2025. Admission glucose, HbA1c, cardiovascular risk factors, clinical characteristics, complications and in-hospital outcomes were recorded and analysed. **Results:** Of 300 patients, 72% were male, 42% had diabetes, 54% had hypertension and 46% were smokers. Admission glucose was ≥140 mg/dL in 72% of patients, while 45% had HbA1c ≥6.5%. Mean admission glucose and HbA1c were 178.6 ± 52.4 mg/dL and 6.9 ± 1.4%, respectively. Rhythm disturbances occurred in 44%, acute left ventricular failure in 15%, cardiogenic shock in 10%, recurrent myocardial infarction in 4% and in-hospital mortality was 12%. Diabetes mellitus was significantly associated with in-hospital complications ($p<0.001$). **Conclusion:** Dysglycaemia was highly prevalent among patients with acute STEMI. Diabetes mellitus was significantly associated with a greater burden of major in-hospital cardiovascular complications. Assessment of admission glucose and HbA1c provides useful information regarding acute and chronic glycaemic status in STEMI.

KEYWORDS : STEMI; admission glucose; HbA1c; diabetes mellitus; hyperglycaemia; in-hospital outcomes.

INTRODUCTION

Diabetes mellitus (DM) represents a major and increasing global health problem and is strongly associated with cardiovascular morbidity and mortality. Cardiovascular disease constitutes an important cause of adverse outcomes among patients with diabetes, with coronary artery disease and acute coronary syndromes (ACS) contributing substantially to this burden. [1–3]

Diabetes is associated with both microvascular and macrovascular abnormalities. Insulin resistance, endothelial dysfunction, accelerated atherosclerosis, altered plaque characteristics, enhanced platelet activation, inflammation and a procoagulant state contribute to the development and progression of coronary artery disease [4–6]. These abnormalities may also adversely influence myocardial perfusion and recovery following an acute coronary event.

Patients with diabetes constitute an important proportion of individuals admitted with ACS and generally experience worse cardiovascular outcomes than patients without diabetes [1–3]. The adverse effect of disturbed glucose metabolism, however, is not restricted to patients with previously diagnosed diabetes.

Hyperglycaemia is frequently observed during acute myocardial infarction (AMI), including among patients without known diabetes. Acute illness produces a neuroendocrine stress response characterized by sympathetic activation, release of catecholamines and other counter regulatory hormones, increased hepatic glucose production and peripheral insulin resistance. Consequently, elevated admission blood glucose may represent previously unrecognized glucose intolerance, established diabetes, acute stress hyperglycaemia, or a combination of these processes [7,8].

Admission glucose and HbA1c provide different but complementary information. Admission glucose reflects glycaemic status at the time of the acute coronary event and may be substantially influenced by the physiological stress response. HbA1c, in contrast, reflects average glycaemic exposure over the preceding several weeks and is relatively less influenced by acute fluctuations in glucose concentration.

Several studies have examined the clinical significance of these glycaemic indices in acute myocardial infarction. Hartopo et al. evaluated HbA1c, admission random blood glucose and fasting blood glucose among STEMI patients and found fasting blood glucose to be an independent predictor of in-hospital adverse cardiac events [9]. Orellana-Barrios et al. demonstrated an association between acute glycaemic derangement and in-hospital mortality in STEMI. [10]

Mouhat et al., in a large cohort of non-diabetic patients with AMI, reported that elevated plasma glucose was independently associated with hospital mortality, while HbA1c provided additional information regarding longer-term cardiovascular mortality [11]. These observations suggest that acute and chronic glycaemic abnormalities may reflect different dimensions of cardiovascular risk.

The prognostic significance of HbA1c during the acute phase remains less consistent. Li et al., in a meta-analysis involving 19 prospective studies and 35,994 STEMI patients, reported that elevated HbA1c was not significantly associated with in-hospital mortality but was associated with increased 30-day and long-term mortality [12]. Other studies have similarly reported varying relationships between HbA1c and cardiovascular outcomes [13–16].

Routine measurement of both admission blood glucose and HbA1c may therefore provide a broader assessment of glucose metabolism in patients presenting with STEMI. It may identify acute hyperglycaemia, previously unrecognized chronic dysglycaemia and patients with established diabetes who constitute a clinically important high-risk population.

The present study was undertaken to characterize the admission glycaemic profile of patients with acute STEMI, describe their clinical presentation and in-hospital outcomes and assess the relationship between diabetes mellitus and major in-hospital cardiovascular complications.

MATERIALS AND METHODS

Study Design and Setting

This observational study was conducted in the General Medicine Department, including the ward and intensive care unit and the Cardiology Department of a tertiary-care centre.

Study Period

The study was conducted from March 2024 to September 2025.

Study Population

A total of 300 adult patients diagnosed with acute ST-elevation myocardial infarction were included in the study.

Eligibility

Adult patients aged ≥18 years with a confirmed diagnosis of acute STEMI and available admission blood glucose and HbA1c measurements were included according to the study protocol.

Patients fulfilling the exclusion criteria specified in the dissertation protocol, including those with incomplete diagnostic evaluation, unavailable admission glucose or HbA1c values and specified severe

comorbid conditions, were excluded.

Data Collection

A detailed clinical assessment was performed for each participant. Demographic information and major cardiovascular risk factors were documented, including:

- age and sex;
- diabetes mellitus;
- hypertension; and
- smoking status.

Admission blood glucose and HbA1c were measured. Patients were categorized according to admission glucose as <140 mg/dL, 140–199 mg/dL and ≥200 mg/dL. HbA1c was categorized as <5.7%, 5.7–6.4% and ≥6.5%. Clinical severity was assessed using Killip classification. The anatomical location of myocardial infarction and occurrence of rhythm disturbances were recorded. Major in-hospital complications included acute LV failure, cardiogenic shock and recurrent myocardial infarction. Final in-hospital outcome was documented as discharge in stable condition or death. Cardiac biomarkers and other relevant laboratory parameters were also assessed.

Statistical Analysis

Categorical variables were summarized using frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. The association between diabetes mellitus and in-hospital cardiovascular complications was evaluated statistically. A p value <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics

A total of 300 patients with acute STEMI were included. The 51–60-year age group constituted the largest proportion, comprising 102 (34%) patients. This was followed by 41–50 years and 61–70 years, with 66 (22%) patients in each group. Thirty-six (12%) patients were aged 18–40 years and 30 (10%) were older than 70 years. There was a marked male predominance, with 216 (72%) males and 84 (28%) females. Among the major cardiovascular risk factors, hypertension was present in 162 (54%), diabetes mellitus in 126 (42%) and smoking in 138 (46%) patients.

Table 1. Baseline Characteristics of Patients with Stemi (n=300)

Characteristic	n (%)
Age group	
18–40 years	36 (12.0)
41–50 years	66 (22.0)
51–60 years	102 (34.0)
61–70 years	66 (22.0)
>70 years	30 (10.0)
Sex	
Male	216 (72.0)
Female	84 (28.0)
Major risk factors	
Diabetes mellitus	126 (42.0)
Hypertension	162 (54.0)
Smoking	138 (46.0)

Glycaemic Profile

Admission blood glucose demonstrated a high burden of hyperglycaemia. Only 84 (28%) patients had admission glucose <140 mg/dL. A further 108 (36%) had glucose between 140 and 199 mg/dL, while 108 (36%) had glucose ≥200 mg/dL. Thus, 216 of 300 patients (72%) had admission glucose ≥140 mg/dL. The HbA1c distribution also demonstrated substantial chronic dysglycaemia. HbA1c was <5.7% in 69 (23%), 5.7–6.4% in 96 (32%) and ≥6.5% in 135 (45%) patients. Mean admission glucose was 178.6 ± 52.4 mg/dL, with a range of 92–348 mg/dL. Mean HbA1c was 6.9 ± 1.4%, with values ranging from 4.8% to 11.2%.

Table 2. Admission glycaemic profile (N=300)

Parameter	n (%) / Mean ± SD
Admission blood glucose	
<140 mg/dL	84 (28.0)
140–199 mg/dL	108 (36.0)
≥200 mg/dL	108 (36.0)
Admission glucose ≥140 mg/dL	216 (72.0)
Mean admission glucose	178.6 ± 52.4 mg/dL
Range	92–348 mg/dL
HbA1c	
<5.7%	69 (23.0)
5.7–6.4%	96 (32.0)
≥6.5%	135 (45.0)
Mean HbA1c	6.9 ± 1.4%
Range	4.8–11.2%

Clinical Characteristics of STEMI

Anterior-wall myocardial infarction was the commonest anatomical presentation and was observed in 144 (48%) patients. Inferior-wall MI occurred in 96 (32%), while lateral-wall and infero-posterior MI each occurred in 30 (10%) patients. At presentation, 168 (56%) patients were classified as Killip Class I and 72 (24%) as Class II. Forty-two (14%) patients were in Class III and 18 (6%) in Class IV. Therefore, 60 patients (20%) presented in the more severe Killip Classes III–IV.

Rhythm Disturbances

Rhythm disturbances occurred in 132 (44%) patients, while 168 (56%) had no documented rhythm disturbance. Among the 132 patients with arrhythmias, ventricular tachycardia was the commonest rhythm disturbance, occurring in 42 (32%). Atrial fibrillation occurred in 30 (23%), complete heart block in 24 (18%), ventricular fibrillation in 18 (14%), sinus bradycardia in 12 (9%) and other rhythm abnormalities in 6 (4%).

In-Hospital Complications and Outcome

Acute LV failure was the most frequently documented major complication and occurred in 45 (15%) patients. Cardiogenic shock developed in 30 (10%) and recurrent myocardial infarction in 12 (4%). Overall, 213 (71%) patients had none of these recorded complications. Regarding final outcome, 264 (88%) patients were discharged in stable condition, whereas 36 (12%) died during hospitalization.

Table 3. Clinical severity, complications and in-hospital outcome

Clinical variable	n (%)
Location of infarction	
Anterior wall	144 (48.0)
Inferior wall	96 (32.0)
Lateral wall	30 (10.0)
Infero-posterior	30 (10.0)
Killip class	
Class I	168 (56.0)
Class II	72 (24.0)
Class III	42 (14.0)
Class IV	18 (6.0)
Rhythm disturbance present	132 (44.0)
In-hospital complications	
Acute LV failure	45 (15.0)
Cardiogenic shock	30 (10.0)
Recurrent MI	12 (4.0)
No complications	213 (71.0)
Outcome	
Discharged stable	264 (88.0)
Death	36 (12.0)

Diabetes Mellitus and In-Hospital Complications

The most important comparative finding of the study was the association between diabetes mellitus and major in-hospital complications. Among 126 patients with diabetes, cardiogenic shock occurred in 21 (16.7%), compared with only 9 (5.2%) of 174 patients without diabetes. Acute LV failure occurred in 27 (21.4%) diabetic patients compared with 18 (10.3%) non-diabetic patients. Recurrent MI occurred in 9 (7.1%) patients with diabetes compared with 3 (1.7%) patients without diabetes. Conversely, only 69 (54.8%) diabetic patients had an uncomplicated hospital course compared with 144 (82.8%) non-diabetic patients. The overall association between diabetes mellitus and in-hospital complications was statistically significant ($p<0.001$).

Table 4. Association between diabetes mellitus and in-hospital complications (N=300)

Complication	Diabetes (n=126)	Non-diabetes (n=174)	Total
Cardiogenic shock	21 (16.7%)	9 (5.2%)	30
Acute LV failure	27 (21.4%)	18 (10.3%)	45
Recurrent MI	9 (7.1%)	3 (1.7%)	12
No complications	69 (54.8%)	144 (82.8%)	213
Total	126 (100%)	174 (100%)	300 (100%)

Cardiac Biomarkers and Selected Laboratory Parameters

Cardiac biomarkers were markedly elevated. Mean Troponin I was 9.8 ± 6.2 ng/mL, CK-MB was 72.5 ± 38.6 U/L and LDH was 468 ± 142 U/L. Mean haemoglobin was 12.4 ± 1.8 g/dL, total leukocyte count was 10,800 ± 3,200 cells/mm³, serum creatinine was 1.28 ± 0.46 mg/dL and hs-CRP was 8.6 ± 4.2 mg/L. Mean total cholesterol was 198 ± 42 mg/dL, LDL cholesterol 124 ± 36 mg/dL, HDL cholesterol 42 ± 9 mg/dL and triglycerides 168 ± 54 mg/dL. These laboratory parameters provide additional characterization of the STEMI cohort; however, because the principal focus of the present analysis was glycaemic status and in-hospital clinical outcomes, they were not used as primary outcome variables.

DISCUSSION

The present study demonstrates a considerable burden of abnormalities in glucose metabolism among patients presenting with acute STEMI. Nearly three-fourths of the study population had admission blood glucose ≥140 mg/dL, while 45% had HbA1c ≥6.5%. Diabetes mellitus was documented in 42% of the cohort. The study also demonstrated a substantial burden of in-hospital morbidity, with rhythm disturbances in 44%, acute LV failure in 15%, cardiogenic shock in 10%, recurrent MI in 4% and in-hospital mortality of 12%. Most importantly, patients with established diabetes experienced significantly more major in-hospital cardiovascular complications than patients without diabetes.

In the present study, 72% of patients had admission glucose ≥140 mg/dL and 36% had values ≥200 mg/dL. The mean admission glucose was 178.6 ± 52.4 mg/dL. Hyperglycaemia during acute myocardial infarction may occur through several mechanisms. Acute myocardial injury results in activation of the sympathetic nervous system and hypothalamic-pituitary-adrenal axis, with increased circulating catecholamines and cortisol. These responses increase hepatic glucose production and peripheral insulin resistance. Consequently, admission hyperglycaemia may reflect not only underlying abnormalities of glucose metabolism but also the severity of acute physiological stress.

The importance of acute glycaemic abnormalities in STEMI has been demonstrated in previous studies. Hartopo et al. investigated glycated haemoglobin, admission random glucose and fasting glucose in STEMI and found fasting blood glucose to be an independent predictor of in-hospital adverse cardiac events, with an adjusted odds ratio of 1.010 and an AUC of 64.9%.[9] Orellana-Barrios et al. studied 676 STEMI patients for in-hospital mortality and demonstrated significantly higher admission glucose among non-diabetic patients who died. They further reported that a large HbA1c-derived admission glucose delta was associated with increased in-hospital mortality.[10] These observations support the clinical relevance of acute glucose abnormalities in patients presenting with STEMI.

The second important observation in the present study was the substantial burden of elevated HbA1c. Only 23% of patients had HbA1c <5.7%, while 32% had values between 5.7% and 6.4% and 45% had HbA1c ≥6.5%. Mean HbA1c was 6.9 ± 1.4%. These findings suggest that abnormalities of long-term glycaemic status were common in the study population.

The distinction between admission glucose and HbA1c is clinically important. Admission glucose is susceptible to the acute stress response, whereas HbA1c predominantly reflects preceding glycaemic exposure. Measurement of HbA1c during STEMI admission may therefore help identify chronic dysglycaemia that is not apparent from the patient's previous diagnostic history alone.

Aggarwal et al. demonstrated the utility of HbA1c for identifying previously unrecognized diabetes among patients undergoing primary PCI for STEMI. Their study found that 24% had known diabetes, 7% previously undiagnosed diabetes and 38.7% prediabetes [13]. Elabd et al. reported that higher HbA1c among non-diabetic STEMI patients was associated with more severe coronary artery disease, reduced complete revascularization and a greater incidence of short-term adverse cardiac events [14]. Conversely, El Bordy et al. found that although higher HbA1c was associated with diabetes and hypertension, HbA1c did not correlate significantly with the severity of coronary lesions or short-term prognosis [15]. The literature therefore demonstrates that the prognostic significance of HbA1c in acute STEMI remains heterogeneous.

Several previous studies have attempted to determine whether acute glucose elevation or chronic glycaemic status provides greater prognostic information. Mouhat et al. studied 6,884 non-diabetic patients with AMI. On multivariable analysis, elevated plasma glucose remained an independent predictor of hospital mortality, whereas elevated HbA1c was associated with one-year cardiovascular mortality among survivors [11]. Their findings suggest that acute and chronic glycaemic markers may provide different and potentially complementary information.

Li et al. performed a meta-analysis of 19 prospective studies involving 35,994 STEMI patients. Elevated HbA1c was not significantly associated with in-hospital mortality (RR 1.20; 95% CI 0.95–1.53; p=0.13), but was associated with increased 30-day mortality (RR 1.25; 95% CI 1.03–1.52) and long-term mortality (RR 1.45; 95% CI 1.20–1.76) [12]. Rasoul et al. found a markedly greater 30-day mor-tality among patients with admission glucose ≥11.1 mmol/L than among those with lower values. Admission glucose remained an independent predictor of 30-day mortality after adjustment, whereas HbA1c did not [16].

Similarly, Timmer et al. found that admission glucose was independently associated with mortality in ACS, while HbA1c did not demonstrate an independent association [17]. Taken together, these studies suggest that admission glucose may be particularly informative regarding acute physiological stress and short-term risk, whereas HbA1c primarily characterizes preceding chronic glycaemic exposure and may have different implications for longer-term cardiovascular risk.

The present study cannot establish superiority of one marker over the other because the available analysis did not directly compare admission glucose and HbA1c using outcome-specific multivariable models or ROC curves. Nevertheless, the high prevalence of abnormalities in both parameters emphasizes the importance of assessing acute as well as chronic glycaemic status in STEMI.

A particularly important finding of the present study was the significant association between diabetes mellitus and major in-hospital complications (p<0.001). Cardiogenic shock was more than three times as frequent proportionally among diabetic patients compared with non-diabetic patients (16.7% versus 5.2%). Acute LV failure occurred in 21.4% of diabetic compared with 10.3% of non-diabetic patients, while recurrent MI occurred in 7.1% versus 1.7%, respectively.

The difference was also evident when an uncomplicated hospital course was considered: 82.8% of non-diabetic patients experienced none of the recorded complications compared with only 54.8% of diabetic patients. This association is clinically plausible. Diabetes is associated with diffuse and accelerated atherosclerosis, endothelial dysfunction, microvascular disease, impaired coronary vasodilatory reserve, enhanced platelet reactivity, systemic inflammation and a prothrombotic state. These abnormalities may increase myocardial injury and reduce myocardial recovery following coronary occlusion. The present findings therefore reinforce diabetes mellitus as an important marker of clinical vulnerability among patients hospitalized with STEMI.

Anterior-wall MI was the commonest infarct location, accounting for 48% of cases. Although the majority of patients presented in Killip Class I, 20% were in Classes III or IV, demonstrating that a clinically important subgroup presented with significant cardiac dysfunction. Rhythm disturbances were documented in 44% of patients. Ventricular tachycardia was the commonest arrhythmia, followed by atrial fibrillation and complete heart block. These findings are clinically relevant because electrical instability represents an important mechanism of early morbidity and mortality following STEMI and highlights the need for continuous cardiac monitoring during the acute phase.

Acute LV failure was the most frequent major complication and occurred in 15% of patients. Cardiogenic shock occurred in 10%, while recurrent MI occurred in 4%. Although 88% of patients were discharged in stable condition, the observed in-hospital mortality was 12%, demonstrating the continuing severity of STEMI despite advances in cardiovascular management. The coexistence of a high prevalence of dysglycaemia and substantial in-hospital morbidity underscores the importance of comprehensive metabolic and cardiovascular assessment at presentation.

The findings have several practical implications. First, admission blood glucose should be routinely assessed in patients with STEMI because acute hyperglycaemia is extremely common and may represent acute physiological stress, established diabetes or previously unrecognized glucose dysregulation. Second, HbA1c provides

information that admission glucose alone cannot provide. Because it reflects preceding glycaemic exposure, it can assist in identifying chronic dysglycaemia during an acute cardiovascular presentation. Third, patients with known diabetes warrant particularly careful monitoring. In the present study they experienced substantially more cardiogenic shock, LV failure and recurrent MI than non-diabetic patients. The combined evaluation of previous diabetic status, admission glucose and HbA1c therefore provides a more complete metabolic profile than any single parameter considered in isolation.

LIMITATIONS

The study has several limitations. First, it was an observational study conducted at a single tertiary-care centre; therefore, the findings may not be generalizable to all STEMI populations. Second, the study assessed predominantly in-hospital outcomes and did not include systematic long-term follow-up. Consequently, the relationship of glycaemic status with 30-day, one-year or longer-term cardiovascular outcomes could not be determined.

CONCLUSION

Dysglycaemia was highly prevalent among patients presenting with acute ST-elevation myocardial infarction. Nearly three-fourths of patients had admission blood glucose ≥140 mg/dL, while 45% had HbA1c ≥6.5%, demonstrating a substantial burden of both acute and chronic glycaemic abnormalities. Diabetes mellitus was present in 42% of patients and was significantly associated with major in-hospital cardiovascular complications. Diabetic patients experienced higher frequencies of cardiogenic shock, acute LV failure and recurrent myocardial infarction and were substantially less likely to have an uncomplicated hospital course compared with non-diabetic patients. The clinical burden of STEMI was considerable, with rhythm disturbances occurring in 44%, acute LV failure in 15%, cardiogenic shock in 10% and in-hospital mortality in 12%. Admission glucose and HbA1c represent complementary aspects of glucose metabolism: admission glucose characterizes glycaemic status during the acute event, whereas HbA1c reflects preceding chronic glycaemic exposure. Their combined assessment can provide useful metabolic characterization of patients presenting with STEMI.

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