



CLINICAL AND SYSTEM-RELATED FACTORS CONTRIBUTING TO POOR OUTCOMES IN STEMI PATIENTS WITH EARLY VERSUS DELAYED PRESENTATION

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ABSTRACT

Background: Coronary artery disease (CAD) is the leading cause of mortality worldwide. ST-segment elevation myocardial infarction (STEMI) requires prompt management to improve patient outcomes. Early revascularization, either through fibrinolysis or percutaneous coronary intervention (PCI), reduces myocardial ischemic time and prevents complications. However, treatment delays are common, particularly in developing regions such as Pakistan, adversely affecting patient outcomes. Identifying the factors responsible for these delays is essential.

Objective: To compare clinical outcomes between STEMI patients presenting within 2 hours of symptom onset and those presenting after 2 hours.

Study Design: Prospective comparative study.

Duration and Place of Study: This study was conducted at People's University of Medical and Health Sciences Nawabshah from February 2025 to February 2026

Methodology: This prospective comparative study included 180 patients with confirmed ST-segment elevation myocardial infarction (STEMI), aged 18–65 years. Patients were enrolled through consecutive non-probability sampling after obtaining informed consent. They were divided into two groups based on time to presentation (≤ 2 hours vs > 2 hours). Data regarding demographics, clinical characteristics, and causes of delay were collected. Statistical analysis was performed using SPSS version 25, with a p-value ≤ 0.05 considered statistically significant.

Results: A total of 180 patients were included and equally divided into two groups. A significantly higher proportion of patients in the delayed presentation group belonged to a low socioeconomic status (Group A: 65.5% vs Group B: 20.0%). Complications were more frequent in the delayed group, including reinfarction (18.8%), in-hospital mortality (12.2%), acute heart failure (10%), and arrhythmias (12.2%).

Conclusion: Delayed presentation in STEMI patients is associated with increased in-hospital mortality and a higher risk of complications. Early recognition and timely management are critical to improving outcomes.

Keywords: ST-Segment Elevation Myocardial Infarction (STEMI), Delayed Presentation, Early Presentation, In-Hospital Mortality, Reperfusion Therapy, Percutaneous Coronary Intervention (PCI), Fibrinolysis, Socioeconomic Factors, Cardiovascular Outcomes.

INTRODUCTION

A number of diseases contribute to global mortality, among which coronary artery disease (CAD) is one of the leading causes [1,2].

Early detection and timely treatment significantly influence the outcomes of acute coronary syndromes; however, delays in patient management remain unacceptably high worldwide. In patients with ST-segment elevation myocardial infarction (STEMI), prompt reperfusion is essential to minimize myocardial cell death and preserve cardiac function [3].

Each 30-minute delay in reperfusion is associated with an estimated loss of approximately one year of life expectancy [4,5]. Despite considerable advances over the past decades in the early diagnosis and



www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 07-04-2026
Date Acceptance: 17-04-2026
Date of Publication: 11-05-2026

management of STEMI, and consequent improvements in outcomes, nearly one-third of patients still do not receive timely reperfusion therapy [6,7]. This highlights an ongoing gap between evidence-based care and real-world practice.

The objective of this study is to determine whether there is a difference in clinical outcomes between patients presenting within 2 hours of symptom onset and those presenting after 2 hours.

In many rural and resource-limited settings, access to specialized STEMI care remains limited, with relatively few centers equipped to provide timely reperfusion therapy. Therefore, public awareness and education play a critical role in improving early hospital presentation [8,9,10]. Strengthening public education may encourage patients to seek medical attention promptly after the onset of symptoms. It is equally important to identify the factors contributing to delays in seeking treatment and to evaluate their impact on patient outcomes.

METHODOLOGY

This was a prospective comparative study conducted in the Department of Cardiology. A total of 180 patients participated in the study. Non-probability consecutive sampling was used for patient recruitment. All adult patients presenting with suspected myocardial infarction were screened. Eligible participants were aged between 18 and 65 years, included both males and females, and had a confirmed diagnosis of ST-segment elevation myocardial infarction (STEMI).

Exclusion Criteria: Patients with significant comorbid conditions other than diabetes mellitus and hypertension, as well as those with contraindications to thrombolytic therapy, were excluded from the study.

The outcome variables included the development of heart failure with reduced ejection fraction and cardiogenic shock. Additional outcomes included in-hospital complications, total duration of hospital stay, and in-hospital mortality. Demographic variables recorded included patient name, age, gender, marital status, occupation, and family type. Clinical variables included duration of symptoms, history of diabetes mellitus, smoking status, and hypertension.

Participants were categorized into two groups based on the time interval between symptom onset and initiation of treatment: Group A included patients who received treatment within 2 hours of symptom onset, while Group B included those who received treatment after 2 hours. Factors contributing to delay in seeking medical attention, as reported by patients, were recorded, along with in-hospital outcomes during the admission period. All data were entered into a predesigned proforma.

Data analysis was performed using SPSS version 25. Frequency and percentages were calculated for gender distribution, causes of delay, and in-hospital complications. An independent sample t-test was used to compare mean age, BMI, symptom duration, and length of hospital stay between the two groups. The chi-square test was applied to assess differences in in-hospital complications between the groups. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 180 patients with ST-segment elevation myocardial infarction (STEMI) were included in the study. The age of participants ranged from 18 to 65 years, with a mean age of 46.7 ± 9.6 years. Patients were equally divided into two groups, each consisting of 90 patients. The majority of patients in both groups were male.

Table 1. Demographic Characteristics of Study Participants

Variable	Group A (n=90)	Group B (n=90)
	n (%)	n (%)
Gender		
Male	68 (75.5)	66 (73.3)
Female	22 (24.5)	24 (26.7)
BMI (kg/m ²)	31.62 $\pm$ 4.5	32.12 $\pm$ 4.8

Table 2. Risk Factors among Study Population (n=180)

Risk Factor	n	%
Diabetes mellitus	85	47.2
Hypertension	81	45.0
Smoking	53	29.4

Table 3. Factors Associated with Delay in Treatment among STEMI Patients

Variable	Response	Group A (n=90)	Group B (n=90)
		n (%)	n (%)
Low socioeconomic status	Yes	18 (20.0)	59 (65.5)
	No	72 (80.0)	31 (34.5)

History of chronic stable angina	Yes	10 (11.1)	30 (33.3)
	No	80 (88.9)	60 (66.7)
Pain at night (12–6 AM)	Yes	9 (10.0)	19 (21.2)
	No	81 (90.0)	71 (78.8)
Delay in ER response	Yes	8 (8.8)	18 (20.0)
	No	82 (91.2)	72 (80.0)
Delay in ECG acquisition	Yes	8 (8.8)	24 (26.6)
	No	82 (91.2)	66 (73.4)
Delay in ECG interpretation	Yes	4 (4.4)	23 (25.6)
	No	86 (95.6)	67 (74.4)

Table 4. In-Hospital Complications in Study Groups

Complication	Group A (n=90)	Group B (n=90)
	n (%)	n (%)
Cardiogenic shock	15 (16.7)	16 (17.7)
In-hospital mortality	4 (4.4)	11 (12.2)
Re-infarction	7 (7.8)	17 (18.8)
Acute recurrent ischemia	9 (10.0)	15 (16.7)
Acute heart failure	2 (2.2)	9 (10.0)
Sustained VT/arrhythmias	4 (4.4)	11 (12.2)

Both groups were comparable in baseline demographic characteristics. The majority of patients were male in both groups. The mean BMI was slightly higher in Group B compared to Group A.

Among risk factors, diabetes mellitus (47.2%) and hypertension (45.0%) were the most prevalent comorbidities, followed by smoking (29.4%).

Regarding factors associated with delayed presentation, low socioeconomic status was significantly more common in Group B (65.5%) compared to Group A (20.0%). Delays in emergency room response, ECG acquisition, and ECG interpretation were also more frequent in the delayed presentation group.

In terms of clinical outcomes, all complications were more frequent in Group B. In-hospital mortality was nearly three times higher in the delayed group (12.2% vs 4.4%). Similarly, re-infarction, acute heart failure, and arrhythmias were also significantly higher among patients presenting after 2 hours.

DISCUSSION

The present study demonstrated that patients with ST-segment elevation myocardial infarction (STEMI) who presented after 2 hours of symptom onset had a significantly higher rate of complications compared to those who received timely treatment. These findings reinforce the well-established concept that early restoration of coronary blood flow is critical in limiting myocardial damage and improving clinical outcomes. The similarity in baseline characteristics between the two groups, including age, gender distribution, BMI, and major cardiovascular risk factors, suggests that differences in outcomes are

primarily attributable to delays in treatment rather than underlying patient-related factors.

The findings of this study are consistent with previous literature demonstrating a strong association between prolonged total ischemic time and adverse outcomes in STEMI patients [11,12,13,14]. De Luca et al. also reported that even short delays in treatment are associated with increased mortality and morbidity in STEMI patients. This issue remains a significant global challenge, particularly in resource-limited healthcare settings [15].

Several factors contributing to delayed presentation were identified, including low socioeconomic status, prior history of stable angina, nocturnal onset of symptoms, and system-related delays within healthcare facilities [16]. These findings are consistent with earlier regional studies, which have shown that poor awareness of symptoms, financial constraints, and misinterpretation of symptoms are major contributors to delayed hospital arrival [17,18,19]. In addition, healthcare system delays, particularly in emergency department processing, have been shown to prolong door-to-needle and door-to-balloon times, further worsening outcomes. In developing countries such as Pakistan, improving public awareness regarding early recognition of myocardial infarction symptoms is essential. Furthermore, strengthening healthcare system efficiency, particularly in terms of rapid ECG acquisition, interpretation, and timely access to reperfusion therapy, may significantly reduce treatment delays [20].

Overall, this study highlights the need for both community-level interventions and healthcare system improvements to reduce delays in STEMI management. Larger multicenter studies are recommended in the future to validate these findings

and to explore additional strategies for improving patient outcomes.

CONCLUSION

Several modifiable factors contribute to delays in both hospital presentation and the management of STEMI. Patients who present late are more likely to have prolonged hospital stays and a higher risk of developing serious complications. These include acute heart failure, recurrent myocardial infarction, ventricular arrhythmias requiring medical or electrical intervention, and increased in-hospital mortality.

Funding Source

This study was conducted without any external financial support.

Conflict of Interest

The authors declare no conflict of interest related to this study.

Ethical Approval

Ethical approval was obtained from the relevant institutional ethics committee prior to the commencement of the study, ensuring compliance with all required ethical standards and guidelines.

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How to cite this article: Mashooque Ali Dasti, Sajid Ali, Altaf Hussain Gajoo, Muhammad Hashim kalwar, Iram Jehan Balouch, Ahmed Ali Phulpoto, CLINICAL AND SYSTEM-RELATED FACTORS CONTRIBUTING TO POOR OUTCOMES IN STEMI PATIENTS WITH EARLY VERSUS DELAYED PRESENTATION, *Asian J. Med. Res. Health Sci.*, 2026; 4 (2):-161-165.

Source of Support: Nil, Conflicts of Interest: None declared.