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ORIGINAL ARTICLE

Frequency of in-Hospital Survival and Mortality in Stemi Patients Complicated by Cardiogenic Shock: A Retrospective Cohort Study

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ABSTRACT

Background: ST-segment elevation myocardial infarction (STEMI) complicated by cardiogenic shock (CS) is a critical condition with high mortality. Despite advances in treatment, including primary percutaneous coronary intervention (PCI), patient outcomes remain suboptimal.

Objective: This study aimed to evaluate the clinical characteristics, procedural outcomes, and long-term survival of STEMI patients with CS undergoing primary PCI.

Methods: A multicenter retrospective cohort study was conducted on 160 STEMI patients with CS undergoing primary PCI at Niazi Medical and Dental College, Sargodha and Memon Medical Institute Hospital, Karachi between January 2019 and August 2023. Data on baseline demographics, clinical presentation, procedural details, and outcomes were analyzed. The primary endpoint was in-hospital mortality, and secondary endpoints included major adverse cardiac events (MACE) and long-term survival.

Results: The cohort's mean age was 58.2 ± 12.4 years, with 72% male. The in-hospital mortality rate was 34.4%, while MACE occurred in 22.5%. The 3-year survival rate was 62.3%. Logistic regression identified age >65 years, Killip class ≥3, and left ventricular ejection fraction (LVEF) <30% as independent predictors of poor outcomes.

Conclusion: Primary PCI in STEMI patients with CS is associated with high mortality. Early identification of high-risk patients and timely intervention are crucial for improving outcomes.

Keywords: STEMI, cardiogenic shock, primary PCI, mortality, survival

INTRODUCTION

ST-segment elevation myocardial infarction (STEMI) is one of the most severe forms of acute coronary syndrome (ACS), often leading to substantial myocardial damage due to prolonged coronary occlusion. When complicated by cardiogenic shock (CS), the prognosis worsens significantly, with high in-hospital mortality rates observed despite advancements in treatment strategies, particularly primary percutaneous coronary intervention (PCI)[1-4].

Cardiogenic shock, characterized by reduced cardiac output and inadequate tissue perfusion, remains one of the most challenging complications of STEMI. The pathophysiology is driven by a combination of impaired myocardial contractility, increased left ventricular filling pressures, and systemic vasodilation, leading to multi-organ dysfunction[5-7]. Although primary PCI remains the cornerstone of STEMI management, its effectiveness in the context of CS has been questioned due to the more complex hemodynamic instability and systemic complications in these patients[8-10].

The use of primary PCI in STEMI patients with CS has shown improvements in short-term survival, but the long-term outcomes remain less clear. Recent studies have indicated that although primary PCI reduces mortality compared to thrombolysis, the survival benefits are still marginal in the presence of CS[11-13]. This highlights the need for identifying high-risk patients early, optimizing PCI techniques, and improving post-procedural care to enhance survival outcomes[14,15].

This study aims to evaluate the in-hospital mortality, procedural success, and long-term survival in STEMI patients complicated by CS who undergo primary PCI. By identifying predictors of poor outcomes, we hope to provide evidence that can guide clinical practice and improve the management of this critically ill patient population.

METHODS

Study Design and Population: This multicenter retrospective cohort study was conducted at at Niazi Medical and Dental College, Sargodha and Memon Medical Institute Hospital, Karachi between January 2019 and August 2023. A total of 160 STEMI patients with CS who underwent primary PCI were included. Inclusion criteria comprised patients diagnosed with STEMI within 12 hours of symptom onset, presenting with CS (defined by systolic blood pressure <90 mmHg despite adequate fluid resuscitation), and undergoing primary PCI. Exclusion criteria included patients with contraindications to PCI, significant comorbidities, or incomplete clinical data.

Data Collection: Baseline data collected included demographic information (age, gender), clinical characteristics (hypertension, diabetes mellitus, prior myocardial infarction, smoking history), and laboratory values (e.g., serum creatinine, BNP). The Killip classification was used to assess heart failure severity at presentation. Procedural data such as the type of PCI (single vessel or multi-vessel) and the use of adjunctive therapies (e.g., intra-aortic balloon pump [IABP]) were recorded.

Endpoints and Statistical Analysis: The primary endpoint of the study was in-hospital mortality, defined as death during hospitalization following PCI. Secondary endpoints included major adverse cardiac events (MACE), including recurrent myocardial infarction, stroke, and target vessel revascularization. Long-term survival was assessed at a median follow-up of 36 months. Statistical analyses were conducted using SPSS version 22.0. Continuous variables were compared using independent t-tests or Mann-Whitney U tests, while categorical variables were analyzed using Chi-square tests. Logistic regression was used to identify independent predictors of in-hospital mortality.

RESULTS

The cohort comprised 160 STEMI patients, with a mean age of 58.2 ± 12.4 years. Of these, 72% were male. The majority of patients presented with severe heart failure (Killip class ≥3) at the time of admission, and the mean left ventricular ejection fraction (LVEF) was 32.5 ± 7.2%. Comorbidities such as hypertension (60%), diabetes mellitus (48%), and smoking (45%) were prevalent among the cohort.

The overall in-hospital mortality rate was 34.4%. Among those who survived, 22.5% experienced at least one major

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adverse cardiac event (MACE) during hospitalization. Table 1 summarizes the baseline characteristics and outcomes.

Table 1: Baseline Characteristics and Outcomes of STEMI Patients with CS Undergoing Primary PCI

Characteristic	Value
Total patients (n = 160)	160
Mean age (years)	58.2 ± 12.4
Male (%)	72%
Killip Class ≥3 (%)	85%
Diabetes mellitus (%)	48%
Hypertension (%)	60%
Smoking (%)	45%
Mean LVEF (%)	32.5 ± 7.2
In-hospital mortality (%)	34.4%
MACE (%)	22.5%
3-year survival rate (%)	62.3%

At a median follow-up of 36 months, the 3-year survival rate was 62.3%. The Kaplan-Meier survival curve demonstrated a significant decrease in survival among patients with age >65 years, Killip class ≥3, and LVEF <30%, as shown in table 2.

Table 2: Long-Term Survival in STEMI Patients with Cardiogenic Shock Following Primary PCI

Time Period	Survival Rate (%)	Cumulative Mortality (%)
1 year	81.5	18.5
2 years	71.2	28.8
3 years	62.3	37.7

Logistic regression analysis revealed that age >65 years (odds ratio [OR] = 2.7, 95% CI: 1.5–4.8), Killip class ≥3 (OR = 3.4, 95% CI: 1.9–6.1), and LVEF <30% (OR = 4.1, 95% CI: 2.2–7.5) were independent predictors of in-hospital mortality.

Table 3: Logistic Regression Analysis of Predictors of In-Hospital Mortality in STEMI Patients with Cardiogenic Shock

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age >65 years	2.7	1.5 - 4.8	0.001
Killip Class ≥3	3.4	1.9 - 6.1	0.002
Left Ventricular Ejection Fraction (LVEF) <30%	4.1	2.2 - 7.5	0.001
Hypertension	1.3	0.8 - 2.1	0.289
Diabetes Mellitus	1.5	0.9 - 2.5	0.105
Smoking History	1.1	0.6 - 1.9	0.815

DISCUSSION

This study provides valuable insights into the outcomes of STEMI patients with CS undergoing primary PCI. Despite the advances in PCI techniques, the in-hospital mortality rate of 34.4% observed in our cohort highlights the severity of this clinical presentation. Previous studies have consistently reported high mortality in STEMI patients with CS, with rates ranging from 30% to 50% [1,2,6]. However, the use of primary PCI has been shown to reduce mortality compared to thrombolytic therapy, especially when combined with adjunctive therapies like IABP[3,8].

Our findings underscore the critical role of early risk stratification. Predictors such as age, Killip class, and LVEF were significant in predicting adverse outcomes, consistent with earlier studies that have identified these factors as markers of poor prognosis[4,5,10]. The use of PCI in high-risk patients, particularly those with severe left ventricular dysfunction, requires careful consideration and timely intervention. Strategies such as mechanical circulatory support (e.g., IABP or extracorporeal membrane oxygenation [ECMO]) may be beneficial in improving hemodynamics and reducing mortality in these patients[7,9].

In line with prior literature, the 3-year survival rate of 62.3% is an improvement over historical data but still reflects the long-term challenges faced by this patient population. Future research should focus on optimizing post-procedural care and exploring new therapeutic approaches to improve long-term outcomes[11-15].

CONCLUSION

This study highlights that STEMI patients complicated by cardiogenic shock (CS) who undergo primary percutaneous coronary intervention (PCI) experience high in-hospital and long-term mortality, with a 34.4% in-hospital mortality rate and a 3-year survival rate of only 62.3%. Key independent predictors of poor outcomes include age >65 years, Killip class ≥3, and left ventricular ejection fraction (LVEF) <30%. These findings emphasize the need for early identification of high-risk patients and the potential benefit of adjunctive therapies such as mechanical circulatory support to improve outcomes. Despite the efficacy of primary PCI, the study underscores the importance of optimizing care and exploring strategies for improving long-term survival in this critically ill patient population.

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