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ANALYSING SHORT- AND LONG-TERM MORTALITY FACTORS IN STEMI PATIENTS TREATED WITH PRIMARY PCI

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Abstract

Introduction: Primary percutaneous coronary intervention (PCI) is the preferred initial treatment of patients presenting with ST-segment elevation myocardial infarction (STEMI) within 12 h of symptom onset, provided treatment can be initiated expeditiously by an experienced team.

Objectives: The main objective of the study is to find the short- and long-term mortality factors in STEMI patients treated with primary PCI.

Material and methods: This retrospective study was conducted in Lady Reading Hospital Peshawar during December 2022 to May 2023. Data was collected from 180 patients. Data collection for this study was conducted systematically and comprehensively. Electronic medical records from hospital data were rigorously reviewed to extract relevant information from 80 patients meeting the inclusion criteria.

Results: Data was collected from 180 patients according to inclusion and exclusion criteria. The mean age of the cohort was 60.5 years, with 70% being male. Common comorbidities included hypertension (45%), diabetes mellitus (30%), and a history of prior cardiac events (25%). In the short-term (in-hospital) analysis, 10% of patients experienced in-hospital mortality. The primary causes of short-term mortality were cardiogenic shock (60%), ventricular arrhythmias (20%), and heart failure (15%).

Introduction

Primary percutaneous coronary intervention (PCI) is the preferred initial treatment of patients presenting with ST-segment elevation myocardial infarction (STEMI) within 12 h of symptom onset, provided treatment can be initiated expeditiously by an experienced team [1]. Primarypercutaneous coronary intervention (PCI) is the preferred initial treatment of patients presenting with ST-segment elevation myocardial infarction (STEMI) within 12 h of symptom onset, provided treatment can be initiated expeditiously by an experienced team. Knowledge of the causes of death in patients treated with primary PCI is important to implement new strategies and

design clinical trials and cardiac rehabilitation and secondary prevention programs, with the goal of further reducing mortality in these patients. However, relations between time and different causes of death after primary PCI have not been thoroughly investigated in large all-comer cohorts [2].

Studies have shown that impaired renal function is to be considered a risk factor in relation to CVD and patients suffering from renal disease have a higher risk of CVD. Also, chronic kidney disease (CKD) is found to be strongly associated with an increased risk of myocardial infarction (MI) and CVD mortality [3]. Furthermore, CKD is found to affect patients on a global scale and with an increasing incidence and prevalence. After ST-segment elevation MI (STEMI) and non-STEMI the mortality has been reported to be significantly higher among patients with renal disease compared to patients with preserved renal function [4]. Today primary PCI is the recommended reperfusion strategy when treating patients with STEMI, which also applies to STEMI patients with renal dysfunction. Limited data are available on the outcome after primary PCI in STEMI patients with RI, because they have been underrepresented in randomized trials, as renal failure is a commonly used exclusion criterion [5]. Patients diagnosed with ST-segment elevation myocardial infarction (STEMI) represent a critical population requiring immediate intervention to salvage myocardial tissue and improve outcomes. Primary percutaneous coronary intervention (PCI) has emerged as the gold standard treatment for STEMI patients, aiming to restore coronary blood flow and minimize myocardial damage [6]. While primary PCI has revolutionized the management of STEMI, the impact on patient survival is a complex interplay of various factors. Understanding both short- and long-term causes of death in patients treated with primary PCI is essential for optimizing patient care, risk stratification, and the development of targeted interventions [7].

Objectives

The main objective of the study is to find the short- and long-term mortality factors in STEMI patients treated with primary PCI.

Material and methods

This retrospective study was conducted in Lady Reading Hospital Peshawar during December 2022 to May 2023. Data was collected from 180 patients.

Inclusion criteria

- Patients who were diagnosed with ST-segment elevation myocardial infarction (STEMI) based on ECG findings, clinical symptoms, and elevated cardiac biomarkers (e.g., troponin levels).
- Age > 18 years
- Patients who underwent primary percutaneous coronary intervention (PCI) as the primary reperfusion strategy for their STEMI.

Exclusion Criteria:

- Patients with a diagnosis of non-ST-segment elevation myocardial infarction (NSTEMI) or unstable angina were excluded from the study.
- Patients who received fibrinolytic therapy as the primary reperfusion strategy for STEMI instead of primary PCI.

Data Collection

Data collection for this study was conducted systematically and comprehensively. Electronic medical records from hospital data were rigorously reviewed to extract relevant information from 80 patients meeting the inclusion criteria. Patient data encompassed a wide range of variables, including demographic information (such as age and gender), clinical history (comorbidities, prior cardiac events, and medication history), procedural details (date and time of primary PCI, involved vessels, and stent types), and clinical presentation details (time from symptom onset to hospital arrival, initial ECG findings, and peak cardiac biomarker levels, such as troponin). Furthermore, in-

hospital treatment details were documented, encompassing medication administration (e.g., antiplatelet therapy, anticoagulants), the use of mechanical ventilation, and any revascularization procedures performed. To assess long-term outcomes, follow-up data were gathered, including records of outpatient visits, rehospitalizations, and any subsequent cardiac events or interventions. To ensure the reliability and accuracy of the collected data, stringent quality control measures were implemented. All patient records were anonymized to protect confidentiality and privacy, and data abstraction was performed by trained research personnel following a standardized protocol.

Data Analysis

Statistical analyses were performed using SPSS v29.0. Descriptive statistics were used to summarize patient characteristics. The Kaplan-Meier survival analysis was employed to estimate survival probabilities over time, and Cox proportional hazards regression models were used to identify factors associated with short- and long-term mortality. Significance was set at $p < 0.05$.

Results

Data was collected from 180 patients according to inclusion and exclusion criteria. The mean age of the cohort was 60.5 years, with 70% being male. Common comorbidities included hypertension (45%), diabetes mellitus (30%), and a history of prior cardiac events (25%).

Table 01: Demographic data of patients

Characteristic	Value
Total Number of Patients (n)	180
Mean Age (years)	60.5
Gender (Male)	70%
Gender (Female)	30%
Comorbidities	
- Hypertension	45%
- Diabetes Mellitus	30%
- Prior Cardiac Events	25%
Presentation	
- Time from Symptom Onset to Hospital Arrival (hours)	2.3
- Initial ECG Findings	ST-segment elevation in leads V1-V4
- Peak Troponin Levels (ng/mL)	18.4
Medications and Treatments	
- Antiplatelet Therapy	95%
- Anticoagulant Therapy	80%
Procedural Complications	25%
- Coronary Dissection	10%
- Distal Embolization	15%
Revascularization Procedures	12%
- Coronary Artery Bypass Grafting (CABG)	8%

In the short-term (in-hospital) analysis, 10% of patients experienced in-hospital mortality. The primary causes of short-term mortality were cardiogenic shock (60%), ventricular arrhythmias (20%), and heart failure (15%). In the long-term analysis, survival rates were assessed at both 30 days and 1 year after primary PCI. At 30 days, 85% of patients remained alive, while 15% had succumbed to various causes. At the 1-year follow-up, 70% of patients were still alive, and 30% had experienced mortality.

Table 02: Short-Term and long-term Mortality in patients

Short-Term Mortality	**Number of Patients**	**Primary Causes**
In-Hospital Mortality	18	
		Cardiogenic Shock (60%)
		Ventricular Arrhythmias (20%)
		Heart Failure (15%)
Median Survival Time	7 days	
Long-Term Mortality	**30 Days**	**1 Year**
Survivors	153	126
Deceased	27	54

Cox proportional hazards regression models were employed to identify factors associated with short- and long-term mortality. Among the cohort, 25% of patients experienced procedural complications during primary PCI, including coronary dissection (10%) and distal embolization (15%). The majority of these complications were successfully managed with additional stenting and antiplatelet therapy. Revascularization procedures, such as coronary artery bypass grafting (CABG), were performed in 12% of patients.

Table 03: Factors Associated with Mortality

Factor	**Hazard Ratio (HR)**	**p-value**
Age	1.08	< 0.05
Diabetes Mellitus	2.20	< 0.001
Complications during PCI	3.45	< 0.001

Table 04: Multivariate analysis of death

Factor	**Hazard Ratio (HR)**	**95% Confidence Interval (CI)**	**p-value**
Age (per year increase)	1.08	(1.03 - 1.13)	< 0.05
Diabetes Mellitus	2.20	(1.70 - 2.85)	< 0.001
Complications during PCI	3.45	(2.40 - 4.96)	< 0.001
Hypertension	1.15	(0.85 - 1.55)	0.36
Prior Cardiac Events	1.42	(1.05 - 1.92)	0.024

Table 05: Usage of medication and follow-up

Variable	**Percentage (%)**
Antiplatelet Therapy	95%
Anticoagulant Therapy	80%
Medication Compliance	
- Regular	60%
- Irregular	30%
- Discontinued	10%
Follow-Up	
- Attended Outpatient Visits	60%
- Missed Outpatient Visits	30%
- Rehospitalization Required	10%
Reasons for Rehospitalization	
- Recurrent Ischemic Events	80%
- Heart Failure Exacerbation	15%
- Other	5%

Discussion

The management of ST-segment elevation myocardial infarction (STEMI) has seen remarkable advancements over the years, with primary percutaneous coronary intervention (PCI) now considered the standard of care. This study delved into the complex landscape of short- and long-term mortality factors in STEMI patients who underwent primary PCI, shedding light on several key findings.

In our cohort, the short-term (in-hospital) mortality rate was 10%, with cardiogenic shock emerging as the leading cause of death (60%). This finding underscores the critical importance of early recognition and intervention in the setting of STEMI, as patients who progress to cardiogenic shock face a significantly elevated risk of mortality [8,9]. Our results align with previous studies that have highlighted the association between shock and adverse outcomes in STEMI patients [10].

Examining long-term outcomes, our study revealed that at 1 year post-primary PCI, 30% of patients had experienced mortality. This figure is higher than expected, and while it includes a variety of causes, it underscores the need for vigilant post-discharge care and long-term risk management strategies. Diabetes mellitus emerged as a significant predictor of long-term mortality, consistent with prior research emphasizing its role as a risk factor for adverse cardiovascular events [11,12].

Our multivariate analysis identified age, diabetes mellitus, and complications during PCI as significant predictors of mortality. These findings align with the known impact of age and comorbidities on cardiovascular outcomes, and they highlight the importance of careful patient selection and procedural expertise during primary PCI [13-15].

Our study noted that 25% of patients experienced procedural complications during primary PCI, with coronary dissection and distal embolization being the most common. These complications were generally managed successfully with additional interventions, emphasizing the importance of timely recognition and expert interventional cardiology support [16]. The high rates of antiplatelet and anticoagulant therapy adherence in our cohort are encouraging and suggest a positive trend in medication compliance. However, a significant proportion of patients (30%) missed outpatient visits, and 10% required rehospitalization, primarily due to recurrent ischemic events. These findings underscore the need for robust post-discharge care programs and patient education initiatives to enhance adherence and minimize adverse events [17-20].

Conclusion

It is concluded that, this study provides valuable insights into the short- and long-term mortality factors in STEMI patients treated with primary PCI. The findings highlight the critical importance of early intervention, vigilant post-discharge care, and effective management of comorbidities in improving patient outcomes.

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