SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Remash *et al*., 2026
doi: 10.21276/SSR-IIJLS.2026.12.1.4

Original Article

open access

Clinical Characteristics and Outcomes of Patients Undergoing Primary PCI for Acute Myocardial Infarction in a Tertiary Care Teaching Institution in North Kerala

Remash K[1], Arundas H[2]*, Jifi Mathai Saji[3]

[1]Asst. Professor, Department of Cardiology, Malabar Medical College Hospital & Research Centre, Ulliyeri, Kerala, India
[2]Assistant Professor, Department of PSM, PSP Medical College, Chennai, India
[3]Junior Resident, Department of Emergency, Aster Medcity, Kochi, India

***Address for Correspondence:** Dr Arundas H, Assistant Professor, Department of PSM, PSP Medical College, Chennai, India
E-mail: drarundasmediwell@gmail.com

Received: 22 Aug 2025/ Revised: 08 Oct 2025/ Accepted: 23 Dec 2025

ABSTRACT

Background: Acute myocardial infarction (AMI) remains a leading cause of morbidity and mortality worldwide. Primary percutaneous coronary intervention (PCI) is the gold standard for treatment of ST-segment elevation myocardial infarction (STEMI). This study aims to assess the clinical characteristics, procedural success, and outcomes of patients undergoing primary PCI for AMI in a tertiary care teaching hospital in north Kerala, India.

Methods: A retrospective study included 306 patients undergoing primary PCI for acute myocardial infarction at Malabar Medical College Hospital, Kozhikode (July 2023–June 2024). Data on demographics, comorbidities, procedures, and in-hospital outcomes were collected. Primary endpoints were in-hospital mortality, major adverse cardiovascular events (MACE), and procedural complications. Descriptive and inferential statistics were used to analyze associations between clinical characteristics and outcomes.

Results: The mean age of participants was 58.5±12.3 years, with 65% male and 35% female. Hypertension, diabetes mellitus, and hyperlipidemia were present in 68%, 56%, and 44% of the cohort, respectively. The in-hospital mortality rate was 5%, and the MACE rate was 8%. Diabetes mellitus (OR 3.22, 95% CI 1.21–8.53), multivessel disease (OR 2.56, 95% CI 1.04–6.33), and delayed presentation by more than 6 hours (OR 2.89, 95% CI 1.08–7.70) were identified as independent predictors of adverse outcomes.

Conclusion: Primary PCI remains an effective intervention for AMI, with a reasonable in-hospital mortality rate. However, higher comorbidity burden and delayed presentation for primary PCI are significant predictors of poorer outcomes. Timely intervention and optimal management of risk factors are crucial for improving patient outcomes.

Key-words: Acute Myocardial Infarction, Major Adverse Cardiovascular Events (MACE), Multivessel Disease, Primary Percutaneous Coronary Intervention (PCI), Timely Intervention

INTRODUCTION

Acute myocardial infarction (AMI), commonly known as a heart attack, remains one of the leading causes of morbidity and mortality worldwide.

How to cite this article
Remash K, Arundas H, Saji JM. Clinical Characteristics and Outcomes of Patients Undergoing Primary PCI for Acute Myocardial Infarction in a Tertiary Care Teaching Institution in North Kerala. SSR Inst Int J Life Sci., 2026; 12(1): 8991-8996.

Access this article online
https://iijls.com/

AMI occurs when there is a sudden reduction or complete blockage of blood flow to the heart muscle, leading to ischemia and subsequent tissue damage [1]. The early recognition and prompt treatment of AMI are essential to minimize the extent of myocardial injury and improve clinical outcomes. Primary percutaneous coronary intervention (PCI) has become the gold standard for the management of patients with ST-segment elevation myocardial infarction (STEMI), a subtype of AMI, due to its ability to restore coronary blood flow and reduce mortality rapidly [2].

doi: 10.21276/SSR-IIJLS.2026.12.1.4

Primary PCI involves mechanically opening the obstructed coronary artery using a catheter, typically accompanied by stent placement to maintain arterial patency [3]. This intervention has proven to be superior to fibrinolytic therapy in improving survival and reducing the incidence of heart failure, arrhythmias, and reinfarction in patients with STEMI. However, despite the significant advancements in PCI techniques and the availability of adjunctive therapies, outcomes can vary widely among patients due to several clinical, demographic, and procedural factors [4].

As clinical practices continue to evolve, understanding the clinical characteristics and predictors of outcomes in primary PCI patients is vital for optimizing treatment protocols and improving patient prognosis [5]. Despite the general success of PCI, a subset of patients may still experience poor outcomes, including death, recurrent infarction, or heart failure, particularly among those with multiple comorbidities or delayed presentation to the hospital. Therefore, identifying at-risk populations and establishing strategies to enhance care are crucial for improving the effectiveness of PCI interventions [6].

This retrospective analysis aims to explore the clinical characteristics and outcomes of patients undergoing primary PCI for acute myocardial infarction. By examining a cohort of patients who underwent primary PCI, this study seeks to identify factors associated with short-term and long-term outcomes, including in-hospital mortality, complications, and the incidence of adverse cardiac events. These outcomes are influenced by variables such as the patient's age, sex, comorbid conditions, the timing of intervention, the presence of collateral circulation, and procedural success. Additionally, this study will assess the impact of various treatment strategies, including antiplatelet agents, anticoagulants, and optimal PCI timing, on patient outcomes [7].

This research will provide valuable insights into ongoing efforts to refine clinical practices for the management of AMI and enhance patient care. By analyzing outcomes in a real-world setting, the study will provide a comprehensive understanding of the clinical course of patients undergoing primary PCI, shedding light on factors that influence recovery and guiding future research and clinical decision-making.

MATERIALS AND METHODS

This study adopts a retrospective, observational design to examine the clinical characteristics and outcomes of patients undergoing primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI). Data for this analysis were collected from the medical records of patients treated at Malabar Medical College Hospital and Research Institute, Ulliyeri, Kozhikode. The study aims to investigate factors influencing short- and long-term outcomes of primary PCI, including in-hospital mortality, complications, and post-procedural events**.**

Sample Size- The study included 306 patients diagnosed with acute myocardial infarction who underwent primary PCI during July 2023 to June 2024.

Inclusion Criteria

1. Age: Patients aged 18 years or older.
2. Diagnosis of Acute Myocardial Infarction: Patients with a confirmed diagnosis of acute myocardial infarction based on clinical presentation, electrocardiogram (ECG) findings, and elevated cardiac biomarkers.
3. Underwent Primary PCI: Patients who received primary PCI within 12 hours of symptom onset for STEMI or non-ST-segment elevation myocardial infarction (NSTEMI) with significant coronary artery obstruction.
4. Availability of Complete Medical Records: Patients whose medical records contained sufficient data on baseline characteristics, procedural details, and follow-up outcomes.

Exclusion Criteria- Patients were excluded if they had a history of previous coronary artery bypass grafting (CABG), were enrolled in other experimental treatments during the study period, or had incomplete medical records. Patients with a contraindication to PCI or those who received fibrinolytic therapy instead of PCI were also excluded from the research.

Data Collection- Data were extracted from the hospital's electronic medical records and patient charts. The following clinical and demographic data were collected for each participant:

1. Demographic Information: Age, gender, and comorbidities (e.g., diabetes, hypertension, smoking, hyperlipidemia).

doi: 10.21276/SSR-IIJLS.2026.12.1.4

2. Clinical Presentation: Time from symptom onset to hospital arrival, initial ECG findings, and serum cardiac biomarker levels (e.g., troponin I, creatine kinase-MB).
3. Procedural Details: Time from hospital arrival to PCI, procedural success (defined as achieving Thrombolysis in Myocardial Infarction (TIMI) grade 3 flow), the type of coronary lesion (e.g., single vessel, two vessel or multi-vessel disease), and the use of stents (types of drug-eluting stents).
4. Adjuvant Therapy: The use of antiplatelet agents (IV GP IIb /IIIa receptor antagonists, aspirin, Ticagrelor and clopidogrel), anticoagulants, and statins during the hospital stay.
5. Outcomes: In-hospital mortality, major adverse cardiovascular events (MACE), including recurrent myocardial infarction, stroke, or revascularization procedures, and complications such as bleeding or arrhythmias.

Statistical Analysis- Data were analyzed using descriptive and inferential statistics. Continuous variables were expressed as mean±SD and categorical variables as frequencies/percentages. Associations between clinical characteristics and outcomes were assessed using chi-square, t-tests, or Mann-Whitney U tests. Multivariable logistic regression identified independent predictors, adjusting for confounders. A p-value <0.05 was considered significant. Analyses were performed using SPSS.

RESULTS

This study included 306 patients who underwent primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI) at Malabar Medical College Hospital and Research Centre, Ulliyeri, Kozhikode, from July 2023 to June 2024. The clinical characteristics and procedural outcomes of this cohort are summarized below.

The mean age of the patients was 58.5±12.3 years, ranging from 35 to 85 years, with 65% males and 35% females. Hypertension was the most common comorbidity, affecting 68% of patients, followed by diabetes mellitus in 56% and hyperlipidemia in 44%. A history of smoking was reported by 36% of participants. The prevalence of obesity among the cohort is detailed in Table 1.

Table 1: Demographic and Clinical Characteristics of Patients

Characteristic	N (%)
Mean Age (years)	58.5±12.3
Gender	
Male	199 (65%)
Female	107 (35%)
Hypertension	208 (68%)
Diabetes Mellitus	171 (56%)
Hyperlipidemia	135 (44%)
Smoking History	110 (36%)
Obesity	77 (25%)

The mean time from symptom onset to hospital arrival was 240±52.4 minutes, and the median door-to-balloon time was 52 minutes (range 45–120 minutes). Successful PCI, defined as achieving TIMI grade 3 flow, was attained in 92% of cases. Procedural characteristics of the cohort are summarized in Table 2.

Table 2: Procedural Characteristics

Characteristic	N (%)
Time from Symptom Onset to Arrival (min)	240±52.4
Time from Arrival to PCI (min) / Door-to-balloon time	52 (45-120)
Success Rate (TIMI Grade 3 Flow)	281 (92%)
Coronary Lesion Type	
Single Vessel Disease	123 (40%)
Two Vessel Disease	86 (28%)
Multi-Vessel Disease	97 (32%)
Drug Stent Types Used	
Sirolimus Eluting Stents	184 (60%)
Everolimus Eluting Stents	92 (30%)
Zotarolimus Eluting Stents	31 (10%)

The in-hospital mortality was 5% (15/306 patients), primarily due to cardiogenic shock and multi-organ failure. Major adverse cardiovascular events (MACE) occurred in 8% of patients, including recurrent myocardial infarction in 7 patients and repeat revascularization in 6 patients. Bleeding complications, both major and minor, were observed in 4% of patients,

doi: 10.21276/SSR-IIJLS.2026.12.1.4

and arrhythmias occurred in 12% of the cohort. In-hospital outcomes are summarized in Table 3.

Table 3: In-Hospital Outcomes

Outcome	N (%)
In-Hospital Mortality	15 (5%)
Major Adverse Cardiovascular Events (MACE)	24 (8%)
Recurrent Myocardial Infarction	10 (3.3%)
Repeat Revascularization	8 (2.6%)
Stroke	6 (2.0%)
Bleeding Complications	12 (4%)
Arrhythmias	37 (12%)

Multivariable logistic regression analysis revealed that the presence of diabetes mellitus (OR 3.22, 95% CI 1.21-8.53), delayed presentation for primary PCI (more than 6 hours from symptom onset) (OR 2.89, 95% CI 1.08-7.70), and multi-vessel disease (OR 2.56, 95% CI 1.04-6.33) were significant predictors of in-hospital mortality and major adverse cardiovascular events (MACE). Patients with a history of diabetes mellitus had a significantly higher risk of adverse outcomes, as shown in Table 4.

Table 4: Predictors of Adverse Outcomes

Predictor	Odds Ratio (OR)	95% Confidence Interval (CI)
Diabetes Mellitus	3.22	1.21-8.53
Delayed presentation >6 hrs	2.89	1.08-7.70
Multi-Vessel Disease	2.56	1.04-6.33

DISCUSSION

In this study of 306 patients who underwent primary percutaneous coronary intervention (PCI) for acute myocardial infarction (AMI), several important findings emerged. The in-hospital mortality rate was 5%, and the major adverse cardiovascular event (MACE) rate was 8%. Additionally, diabetes mellitus, multi-vessel coronary artery disease, and delayed presentation of more than 6 hours were identified as significant predictors of adverse outcomes. These observations are broadly consistent with previously published literature, although some differences are notable.

The meta-analysis by Vis *et al.* [8], which evaluated 30-day mortality following primary PCI, reported mortality rates ranging from 5% to 8% across contemporary PCI systems. Our observed mortality of 5% aligns with the lower end of this spectrum, suggesting that our institutional outcomes are comparable to those of established primary PCI centers. Similarly, a MACE rate of 8% is in line with rates reported in other large observational cohorts and meta-analyses.

The observational study by Jahic *et al.* [9] from Bosnia and Herzegovina, involving 549 STEMI patients, reported a lower in-hospital mortality rate of 3.1%. This discrepancy may be attributable to differences in patient characteristics and risk profiles. Our cohort had a considerable comorbidity burden, including diabetes mellitus (56%), hypertension (68%), and hyperlipidemia (44%), all of which have been shown to influence PCI outcomes adversely. Furthermore, their center reported a shorter mean door-to-balloon time (37±11 minutes), which may partially explain their lower mortality rates.

The study by Tobbia *et al.* [10] compared adverse event rates following primary PCI at US and non-US hospitals and highlighted the influence of multivessel disease, procedural characteristics, and system-level variations on clinical outcomes. Our finding that multivessel coronary artery disease significantly predicted poorer outcomes is consistent with these observations and underscores the importance of coronary disease complexity in determining post-PCI prognosis.

Similarly, Saada *et al.* [11] demonstrated that comorbidity burden and delayed intervention amplify risk even in modern PCI practice, in their evaluation of outcomes among elderly patients undergoing PCI for AMI. Although our study population was younger (mean age 58.5±12.3 years), the association between diabetes mellitus and adverse outcomes reinforces the well-established role of comorbid metabolic disease in complicating AMI presentations and recovery trajectories.

The recent work by Nozaki *et al.* [12] examined outcomes in patients with STEMI complicated by cardiogenic shock and emphasized the detrimental impact of delayed reperfusion and poor initial coronary flow. While our study did not focus exclusively on cardiogenic shock, the underlying pathophysiological principle remains applicable: delayed presentation (>6 hours) was a significant predictor of MACE in our cohort, reaffirming the critical importance of timely reperfusion. These

doi: 10.21276/SSR-IIJLS.2026.12.1.4

findings echo the long-standing maxim that *"time is muscle"* in the management of AMI.

SUMMARY

In summary, our findings align with existing evidence that primary PCI is an effective intervention for acute myocardial infarction, yielding low in-hospital mortality when performed promptly by skilled teams. However, adverse outcomes are more likely in patients with high-risk features such as diabetes, multi-vessel disease, or delayed presentation, highlighting the importance of early intervention and careful risk stratification.

LIMITATIONS

While we identified predictors (diabetes, multi-vessel disease, PCI delay), we did not stratify by more granular variables such as access route (radial vs femoral), stent type (bare-metal vs drug-eluting), or adjunctive therapies—factors examined in consensus documents such as the CVIT expert consensus document on primary PCI, which emphasises radial access and drug-eluting stents. Future work might more directly match our cohort against these parameters and larger registries.

CONCLUSIONS

The present study demonstrates that primary PCI is an effective and life-saving intervention for acute myocardial infarction, achieving an in-hospital mortality rate of 5% and a MACE rate of 8% in our patient population. These outcomes fall within expected benchmarks for contemporary primary PCI programs. However, the study highlights that patients with diabetes mellitus, multi-vessel coronary artery disease, and delayed presentation (>6 hours) remain at significantly increased risk for adverse outcomes. Early recognition of symptoms, rapid activation of PCI pathways, and aggressive management of cardiovascular risk factors are therefore essential components of optimizing patient survival and recovery.

Future research with larger samples and extended follow-up may provide deeper insights into long-term outcomes and facilitate the development of refined risk-stratification tools tailored to the regional population.

CONTRIBUTION OF AUTHORS

Research concept- Remash K, Jifi Mathai Saji
Research design- Remash K, Arundas H
Supervision- Arundas H
Materials- Remash K, Jifi Mathai Saji
Data collection- Arundas H, Jifi Mathai Saji
Data analysis and interpretation- Arundas H
Literature search- Remash K, Jifi Mathai Saji
Writing article- Arundas H, Jifi Mathai Saji
Critical review- Arundas H
Article editing- Remash K, Jifi Mathai Saji
Final approval- Arundas H

REFERENCES

[1] Zhakhina G, Gaipov A, Salustri A, Gusmanov A, Sakko Y, et al. Incidence, mortality and disability-adjusted life years of acute myocardial infarction in Kazakhstan: data from unified national electronic healthcare system 2014–2019. Front Cardiovasc Med., 2023; 10: 1127320.

[2] Mechanic OJ, Gavin M, Grossman SA. Acute myocardial infarction. StatPearls, 2025; 1: 1–12.

[3] Huynh T, Perron S, O'Loughlin J, Joseph L, Labrecque M, et al. Comparison of primary percutaneous coronary intervention and fibrinolytic therapy in ST-segment-elevation myocardial infarction: Bayesian hierarchical meta-analyses of randomized controlled trials and observational studies. Circ., 2009; 119: 3101–09.

[4] Yanamala CM, Bundhun PK, Ahmed A. Comparing mortality between fibrinolysis and primary percutaneous coronary intervention in acute myocardial infarction: a systematic review and meta-analysis of 27 randomized-controlled trials. Coron Artery Dis., 2017; 28: 315–25.

[5] Gao N, Qi X, Dang Y, et al. Establishment and validation of a risk model for prediction of in-hospital mortality in patients with acute ST-elevation myocardial infarction after primary PCI. BMC Cardiovasc Disord., 2020; 20: 513–20.

[6] Choi S. Predictors of recurrent acute myocardial infarction despite initially successful percutaneous coronary intervention: back to the basic. Korean J Intern Med., 2022; 37: 740–41.

[7] Bhat R, Shanbhag P. Knowledge, attitude, and practice study on cardiovascular disease risk factors in the Mangalore community. Oral Sphere J Dent Health Sci., 2025; 1: 19–28.

[8] Vis M, Beijk M, Grundeken M, et al. A systematic review and meta-analysis on primary percutaneous coronary intervention of an unprotected left main

doi: 10.21276/SSR-IIJLS.2026.12.1.4

coronary artery culprit lesion in acute myocardial infarction. J Am Coll Cardiol Intv., 2013; 6: 317–24.

[9] Jahic E. Experience and outcomes of primary percutaneous coronary intervention for patients with ST-segment elevation myocardial infarction of tertiary care center in Bosnia and Herzegovina. Med Arch., 2017; 71: 183–87.

[10]Tobbia P, Brodie BR, et al. Adverse event rates following primary PCI for STEMI at US and non-US hospitals: three-year analysis from the HORIZONS-AMI trial. EuroIntervention., 2013; 8: 1134–42.

[11]Saada M, Kobo O, Polad J, et al. Prognosis of PCI in AMI setting in the elderly population: outcomes from the multicenter prospective e-ULTIMASTER registry. Clin Cardiol., 2022; 45: 1211–19. doi: 10.1002/clc.23902.

[12]Nozaki YO, Yatsu S, Ogita M, et al. Outcome after primary percutaneous coronary intervention for ST-segment-elevation myocardial infarction complicated by cardiogenic shock. J Cardiol., 2024; 84: 189–94. doi: 10.1016/j.jjcc.2024.02.005.