Clinical Outcomes and Associated Factors in Patients Who Successfully Underwent Percutaneous Coronary Intervention: A 5-Year Multicenter Retrospective Crossectional Study

BY: Wondimu Melesse (B. Pharm)

A Thesis Submitted to the Department of Pharmacology and Clinical Pharmacy, School of Pharmacy, College of Health Sciences, Addis Ababa University in Partial Fulfillment for the Requirements of a Master of Science Degree in Pharmacy Practice

June, 2023

Addis Ababa, Ethiopia

Addis Ababa University College of Health Sciences School of Pharmacy
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June, 2023

Addis Ababa, Ethiopia

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This is to certify that the thesis prepared by Wondimu Melesse Tona, entitled: **"*Clinical Outcomes and Associated Factors in Patients Who Successfully Underwent Percutaneous Coronary Intervention: A 5-Year Multicenter Retrospective Crossectional Study*"** and submitted in partial fulfillment of the requirements for the Degree of Master of Pharmacy in Pharmacy Practice complies with the regulations of the University and meets the accepted standards concerning originality and quality.

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Abstract

Background: Myocardial infarction (MI) is the leading cause of death globally, with the majority of death occurring in low-and middle-income countries (LMICs). Percutaneous coronary intervention (PCI) became a standard management modality to improve patients' quality of life and reduce mortality when combined with pharmacologic therapy. However, the PCI service was not well-practiced in Ethiopian health facilities and also poor outcomes had previously been reported.

Objective: To assess the clinical outcomes and associated factors among myocardial infarction patients who underwent successful PCI in Addis Ababa, Ethiopia.

Methods: A retrospective crossectional study was conducted at three healthcare facilities from March 01 to May 31, 2022. A total of 241 MI patients who underwent successful PCI between January 1, 2017, and December 31, 2021, were included. The outcome measures were in-hospital mortality, non-fatal major adverse cardiac and cerebrovascular events (MACCEs) and complication rates. Data were analyzed using SPSS version 21.0. Multivariable Cox-regression was carried out to identify predictors of in-hospital mortality. Variable with p -a value < 0.05 was considered statistically significant. Kaplan Meier analyses were also used to determine overall survival rates and median survival time.

Results: Out of 241 participants, 194 (80.5%) were males and the mean age was57.2 ± 10.6 years. One hundred eight-three (75.9%) patients had ST-elevated myocardial infarction (STEMI). Dyslipidemia 198 (82.2%) was the leading risk factor for MI. One twenty three (51%) patients received pharmaco-invasive PCI and drug-eluting stent (DES) implantation (181, 75.1%) was the most commonly used reperfusion method in the study settings. The most commonly used medications in these patients were statins (100%) and aspirin (92.6%), followed by clopidogrel (88.4%). In-hospital mortality and non-fatal MACCEs rates were 3.7% and 24.1%, respectively. The predictors for in-hospital mortality were being female (AHR=8.39, 95% CI: 1.20-58.68, P= 0.03), pre-procedural obesity (AHR=6.54, 95% CI: 1.10-40.60, P=0.04), previous MI (AHR=9.68, 95% CI: 1.66-56.31, P=0.01), chronic heart failure (AHR=9.21, 95% CI: 1.38-61.78, P=0.02) and having previous history of stroke (AHR=18.99, 95% CI: 1.59-227.58, P=0.02). The overall estimated 1-year survival rate of MI patients who underwent successful PCI was 96.3%.

Conclusion and recommendation: Pharmaco-invasive PCI was the most commonly deployed intervention in patients with myocardial infraction. The overall in-hospital mortality rate was low and about a quarter of study patients developed non-fatal MACCEs. The estimated one-year survival rate was higher. Although the current study's findings appear to be better, there is still improvement to be made in terms of providing essential medications, proper documentation of patient data, and expanding access of reperfusion therapy in the country.

Keywords: Percutaneous coronary intervention, successful PCI, clinical outcomes, myocardial infarction, major adverse cardiac and cerebrovascular events

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Acronyms and Abbreviations

ACC/AHA	American College of Cardiology/American Heart Association
ACEI	Angiotensin converting enzyme inhibitor
ACS	Acute coronary syndrome
AMI	Acute myocardial infarction
AOR	Adjusted odds ratio
ARBs	Angiotensin II receptor blockers
ASH	Ayder Specialized Hospital
CABG	Coronary artery by-pass surgery
CAD	Coronary artery disease
CHD	Coronary heart disease
CI	Confidence interval
CVD	Cardiovascular disease
DAPT	Dual antiplatelet therapy
DES	Drug Eluting Stent
ECG	Electrocardiogram
EFMOH	Ethiopian Federal Minister of Health
ESC	European Society of Cardiology
GRACE	Global Registry of Acute Coronary Events
GSCMC	Gesund Specialized Cardiac and Medical Center
IHD	Ischemic heart disease
IRA	Infarct-related artery
LAD	Left anterior descending
LMCA	Left main coronary artery
MACCEs	Major adverse-cardiovascular and cerebrovascular events
MI	Myocardial infarction
NSTEMI	Non-ST segment elevation myocardial infarction
PCI	Percutaneous coronary intervention
RCA	Right coronary artery
SCAI	Society for Cardiovascular Angiography and Interventions
SPHMMC	Saint Paul Hospital Millennium Medical College

SPSH	Saint Peter’s Specialized Hospital
SPSS	Statistical Package for Social Sciences
STEMI	ST segment Elevation Myocardial Infarction
TASH	Tikur Anbessa Specialized Hospital
TIMI	Thrombolysis in Myocardial Infarction
WHO	World Health Organization

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1. Introduction

1.1. Background

Coronary heart disease (CHD) is a group of chronic disorders defined by coronary artery damage and subsequent myocardial ischemia (1). CHD has become a major threat to a long-term development in the twenty-first century (2). There are over three million people with CHD worldwide, and more than one million deaths in the United States of America (USA) per year (3). Myocardial infarction (MI) is the frequent form of CHD (4). Studies have shown that at least one-third of patients with MI die before coming to the hospital, and another 40-50% are died upon arrival. Another 5-10% of patients die within the first 12 months of their illness (5–7). The majority of these deaths occurred in low and middle income countries (LMICs) (8) with more than half occurred in individuals aged greater than70 years (9). In addition to very high mortality of MI, number of individuals with non-fatal CHD with chronic disabilities and impaired quality of life is also increasing rapidly (10).

The rising incidence of CHD in LMICs is expected to continue, owing not only to the high prevalence of modifiable risk factors such as obesity, diabetes, and metabolic syndrome, but also to rapid urbanization and globalization(11).

Acute MI (AMI) is a life-threatening emergency condition which needs urgent revascularization with available treatment options(12,13). There are two clinical classification of AMI: ST-segment elevation myocardial infarction (STEMI) and non-ST elevation myocardial infarction (NSTEMI). The STEMI is identified by specific changes in electrocardiography (ECG) (14,15), elevation in the "ST segment. On the other hand, NSTEMI is confirmed by the absence of ST-segment elevation and the presence of a positive cardiac biomarker such as troponin (16). MI is treated by Conservative medication therapy, thrombolytic, and percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) surgery (12,13,17,18).

PCI is a non-surgical invasive technique that uses a catheter to place a small structure, stent, to open up blood vessels in the heart that have been narrowed by plaque (19,20). It is used for treating obstructive coronary artery disease, including myocardial infarction (MI), multivessel coronary artery disease and others (21). It can be performed electively and in emergencies to restore blood flow, bringing oxygen to the heart (22). PCI can be primary, pharmaco-invasive, or ischemia-guided depending on availability and patient’s disease condition (21). Based on the

characteristics of devices placed inside the infarct related artery (IRA), balloon angioplasty, bare metal stents (BMS), drug-eluting stents (DES), and drug-eluting balloons (DEB) frequently used (19,22). Balloon angioplasty involves inserting a tiny balloon catheter into a blocked blood vessel to help widen it and improve blood flow to the heart. BMS is small wire mesh tube of nickel-titanium alloy, whereas DES is similar to BMS but also contains immunosuppressive and anti-proliferative drugs such as Sirolimus, paclitaxel, and everolimus(22,23).

PCI is indicated primarily in STEMI and as an urgent procedure in NSTEMI to improve survival and subsequent events significantly, with high-risk patients (4). Primary PCI is usually less urgent for NSTEMI than in STEMI due to higher culprit artery patency rates and typically can be performed within 48 hours of symptoms onset (12). The PCI after AMI has recently been observed to improve patients' quality of life and mortality (22,24). According to data from a study done among STEMI patients, a 30-day mortality rate of 13% with medical therapy alone, 6 to 7% with optimal fibrinolytic therapy, and as low as 3 to 5% with primary PCI performed within two hours of symptom onset to hospital arrival (25).

Thrombolysis is contraindicated in NSTEMI due to lack of benefit and increased risk of complications. This may be due to different culprit artery patency rates as well as different pathophysiological processes between STEMI and NSTEMI, including differences in thrombus composition and mechanisms of ischemia (24). Other standard ancillary medication therapies include antiplatelets, beta-blockers, anticoagulants, statins, angiotensin converting enzyme inhibitors/angiotensin II receptor blockers (ACEIs/ARBs)and others (17,19,24).

The PCI service was not commonly practiced in Ethiopian health facilities and also poor outcome was reported. In the retrospective studies conducted in PCI non-available settings, in-hospital mortality was recorded as 27.4% (26) and 20.4% (27). In contrast, only 1% of in-hospital mortality was recorded in another Ethiopian study conducted in a PCI-accessible setting (28).This study was aimed to assess clinical outcome and determinant factors that influence the outcome of patients who underwent PCI for a myocardial infarction.

1.2. Statement of problem

Ischemic heart disease (IHD) is one of the single largest cause of death in developed nations (29). Similarly, it is the leading causes of disease burden in low and middle-income countries (LMICs) (11). Ethiopia is one of the low-income countries with increased morbidity and mortality from acute IHD (26,30), with limited access to hospitals capable of providing timely

diagnosis and management of AMI (27). Furthermore, many AMI cases were left undiagnosed and/or not managed per recommended standards due to a variety of factors, including inadequate transportation, financial constraints, lack of awareness about the disease manifestations, and the fact that the majority of the population lives in rural areas (27,28,30). Patients with STEMI reach late to the emergency clinic, even after their arrival to emergency room, the diagnosis as well as reperfusion therapy, preferably via percutaneous coronary intervention (PCI) is delayed (19). Hence, more than 70% of AMI patients in our country do not receive any form of reperfusion therapy (26,30). Finally, this contributes to poor clinical outcomes such as the development of different complications, non-fatal MACCEs, and increased mortality from AMI.

Furthermore, there has been limited information on PCI service and its outcome of MI (22). A study showed that quality of care provided to these patients was far from evidence-based recommendations. According to this finding, only 57% of study participants used guideline-directed medications within the first 24 hours of hospitalization, less than 7.3% underwent PCI, and none received thrombolytic medications during hospitalization (27). Another study conducted at Ayder Specialized Hospital (ASH) found that only a small percentage of total eligible study participants were managed with standard medications, with less than 6.4% receiving streptokinase and nearly 3.9% receiving PCI in the emergency room. Major complications such as heart failure (42.4%), cardiogenic shock (29.8%), recurrent MI (14.6%), major arrhythmia (11.3%), and in-hospital mortality (25.4%) were found to be very common among all hospitalizations(30). A similar study carried out at Tikur Anbessa Specialized Hospital revealed that all study participants were managed with conservative medication therapy and none of them received reperfusion therapy. As a result, in-hospital mortality has to be estimated at 27.4% (26).

Moreover, there is scarcity of studies in this area that include both government and private institutions. Hence, the significance of this study was to narrow these gaps and overall, to assess clinical outcomes and determinant factors that influence the outcomes of patients who underwent PCI for myocardial infarction.

1.3. Significance of the study

Over the past decades, survival rates and quality of life among MI patients have increased in developed and recently developing countries. Advances in AMI management, as well as the use of highly enhanced, evidence-based invasive and non-invasive treatment approaches such as

PCI, are the primary justifications. However, in low-income countries such as Ethiopia, the practice of PCI is very limited and studies on this topic, particularly with MI, are scarce.

Therefore, the result of this study will provide a relevant contribution for patients, health practitioners, researchers and policy makers by assessing the outcomes and factors that are significantly associated with the in-hospital mortality. First, the information may provide a solid foundation for patients to place their trust in the new treatment modality and may encourage them to use this alternative method of revascularization in addition to conservative medical therapy in order to improve their survival and quality of life. Second, the data from this study may help health care providers identify gaps in care and reshape patient management to improve care and, ultimately, clinical outcomes. Third, this study may also serve as source of information for other researchers doing on the same subject area. Fourth, policy-makers generally need information about the effectiveness of an intervention in relation to patients' survival and improvement in the health related quality of life to assess whether an intervention provides good value for reimbursement or implementation in the whole health care system. Hence, data from this study may act as the eye opener information among politicians and decision-makers to undergo inclusive decision.

2. Literature Review

2.1. Prevalence and burden of myocardial infarction

Cardiovascular diseases (CVD) are the number one cause of mortality and approximately one third of deaths worldwide (2). According to the World Health Organization (WHO) estimation data, nearly 7.4 million deaths were due to coronary heart disease (CHD) in 2015. Out of those 82% of deaths were mainly in low- and middle-income countries(LMICs) (4). This CHD ranks as the most prevalent and myocardial infarction (MI) is a critical presentation of this disease, owing to its high case-fatality (31). In addition to very high mortality of MI, number of individuals with non-fatal CHD live with chronic disabilities and impaired quality of life also raising rapidly (32).

Traditionally, CHD was seen as a disease of high-income and western countries, but the recent trends have shown that an increasing incidence and a major shift in burden of the disease now occurring in LMICs like sub-Saharan Africa (SSA) (33).In SSA, the magnitude of and trends in CVD deaths remain incompletely understood. The African regional office of the WHO has stated that CVDs are 'increasing rapidly in Africa, and it is now a public health problem throughout the African region (34). Similarly, a report from a systematic review conducted in five SSA in 2019, the countries are facing an epidemiological shift from infectious disease to chronic diseases, such as CVDs (35).

At present, MI is becoming highly prevalent acute CHD in Ethiopia. A cross-sectional study conducted in Tikur Anbessa Specialized Hospital (TASH) shown that nearly 88.7% of cases admitted to emergency department were MI and the in-hospital mortality accounts 27.4%(26).A similar study done in Ayder Specialized Hospital revealed that, among 151 patients' medical records reviewed, 133 (88.1%) were diagnosis of MI and the death rate was 24.5% (30).

2.2. Risk factors of myocardial infarction

Even though acute CHD is the most complicated condition and worldwide health problem that affect all ethnic groups, it has a predictable risk factor profiles for its occurrence (14).The initiating factors are categorized as modifiable risk factors which represent over 90% of the risk for acute MI. whereas; non-modifiable factors are mainly associated with advanced age and genetic correlation (4).

In the presence of one or more above conditions the primary pathological process that leads to CHD is atherosclerosis, an inflammatory disease of the arteries associated with lipid deposition and metabolic alterations due to multiple risk factors. More than 70% of at-risk individuals have multiple risk factors for CHD, and only 2-7% of the general population has no risk factors (36). The increasing occurrence of CHD is expected to continue, due not only to the increased prevalence of obesity, diabetes, and metabolic syndrome but also will increase in parallel with population aging (2,37,38). The incidence of age-specific MI extends from 0.06% of men <45 years of age to 2.46% of those ≥75 years old (4).

2.3. Management of myocardial infarction

The management of acute myocardial infarction involves either pharmacologic, non-pharmacologic or both simultaneously especially in STEMI (24). For initiation of reperfusion therapy ECG may be helpful in the estimation of size of myocardium at risk for necrosis. The number of leads showing ST-segment deviation (elevation or depression) and the magnitude of the ST-segment deviation are associated with the size of the ischemic myocardium and with prognosis (24). The final infarct size, however, also depends on the timing and the efficacy of the reperfusion therapy. The extent of resolution of ST-segment elevation is a marker of successful reperfusion either with thrombolytics or with percutaneous coronary intervention (PCI) (24,39).

The historical non-invasive coronary intervention strategies include primary PCI, facilitated-PCI, rescue PCI, elective PCI, ischemia-guided PCI, and the post-thrombolytic PCI (13). In patients diagnosed with STEMI, primary PCI should be performed within 90 min after first medical contact (FMC) in all cases. In patients presenting early, with a large amount of myocardium at risk, the delay should be shorter (60 min). In patients presenting directly in a PCI-capable hospital, the goal should also be to achieve primary PCI within 60 min of FMC. Although no specific studies have been performed, a maximum delay of only 90 min after FMC seems a reasonable goal in these patients (22,24).

In unstable patients (e.g., severe heart failure or cardiogenic shock, hemodynamically compromising ventricular arrhythmias) not treated initially with primary PCI, a strategy of immediate coronary angiography with intent to perform PCI is implemented if invasive treatment is considered to be producing no useful result. Whereas, in stable STEMI, Patients are treated with fibrinolytic therapy and if there is evidence for infarct artery reocclusion after

thrombolytics or reperfusion failure a rescue PCI will be performed to improve patient's outcome (13).

In patients with Non-STEMI the management modality is little beat different from STEMI cases. There is no role for thrombolytic therapy in patients with NSTEMI and medical therapy with anti-thrombotic, analgesics, nitrates, and other agents is the initial treatment choice unless high risk patients who need immediate reperfusion with non-invasive procedure (13,16). Those patients with non-ST elevated MI who need PCI include 1) fail medical therapy (refractory angina or angina at rest or with minimal activity despite vigorous medical therapy), 2) have objective evidence of ischemia (dynamic electrocardiographic changes, myocardial perfusion defect) as identified on a noninvasive stress test, or 3) have clinical indicators of very high prognostic risk (eg, high TIMI or GRACE scores). The optimal timing of angiography has not been conclusively defined. In general, two options have emerged: early invasive (ie, within 24 hours) or delayed invasive (ie, within 25 to 72 hours). In most studies using the invasive strategy, angiography was deferred for 12 to 72 hours while antithrombotic and anti-ischemic therapies were intensified (16,23).

2.4. Treatment outcome/s after PCI and the Predictors in patients with MI

Improvement in patients' quality of life and mortality after acute myocardial infarction has recently observed from the increased practice of PCI besides medical therapy like use of fibrinolytics, aspirin, ACE inhibitors, statins, beta blockers and others (22,24).

A data from study done among patients with STEMI, a 30-day mortality rates were 13% with medical therapy alone, 6 to 7% with optimal fibrinolytic therapy, and as low as 3 to 5% with primary PCI when performed within two hours of symptom onset to hospital arrival (25). Another study conducted in the Tertiary Care Center in Bosnia and Herzegovina also reveals that all-cause mortality nearly 3.1%, which is very low when compared to previously recorded findings on different standard guidelines. The occurrence of post-procedural angiographic no-reflow was 6.7% (22,40). A prospective cohort study carried out in the tertiary care center in India from February, 2013 to May, 2015 on 371 patients, the total in-hospital mortality was observed to be 12.9%. Factors significantly associated with mortality were the KILLIP class, door to balloon time, the final TIMI flow and presence of severe left ventricular (LV) dysfunction. Those in KILLIP class four had eight-fold higher risk of mortality as compared to others. Increase in the door to balloon time by one minute lead to 2% increase in mortality rates. Final TIMI 3 flow was associated with almost 60% lower mortality as compared to those

without TIMI 3 flow. The risk of death was 22-fold higher in those with severe LV dysfunction (41). Another retrospective study conducted in patients admitted to intensive care unit (ICU) and underwent primary PCI due to STEMI, supports the above findings. In this study the overall ICU mortality was 33.7% and predictors of mortality were to be age, presence of RV dysfunction, and presence of severe LV dysfunction (42).

2.5. Conceptual framework

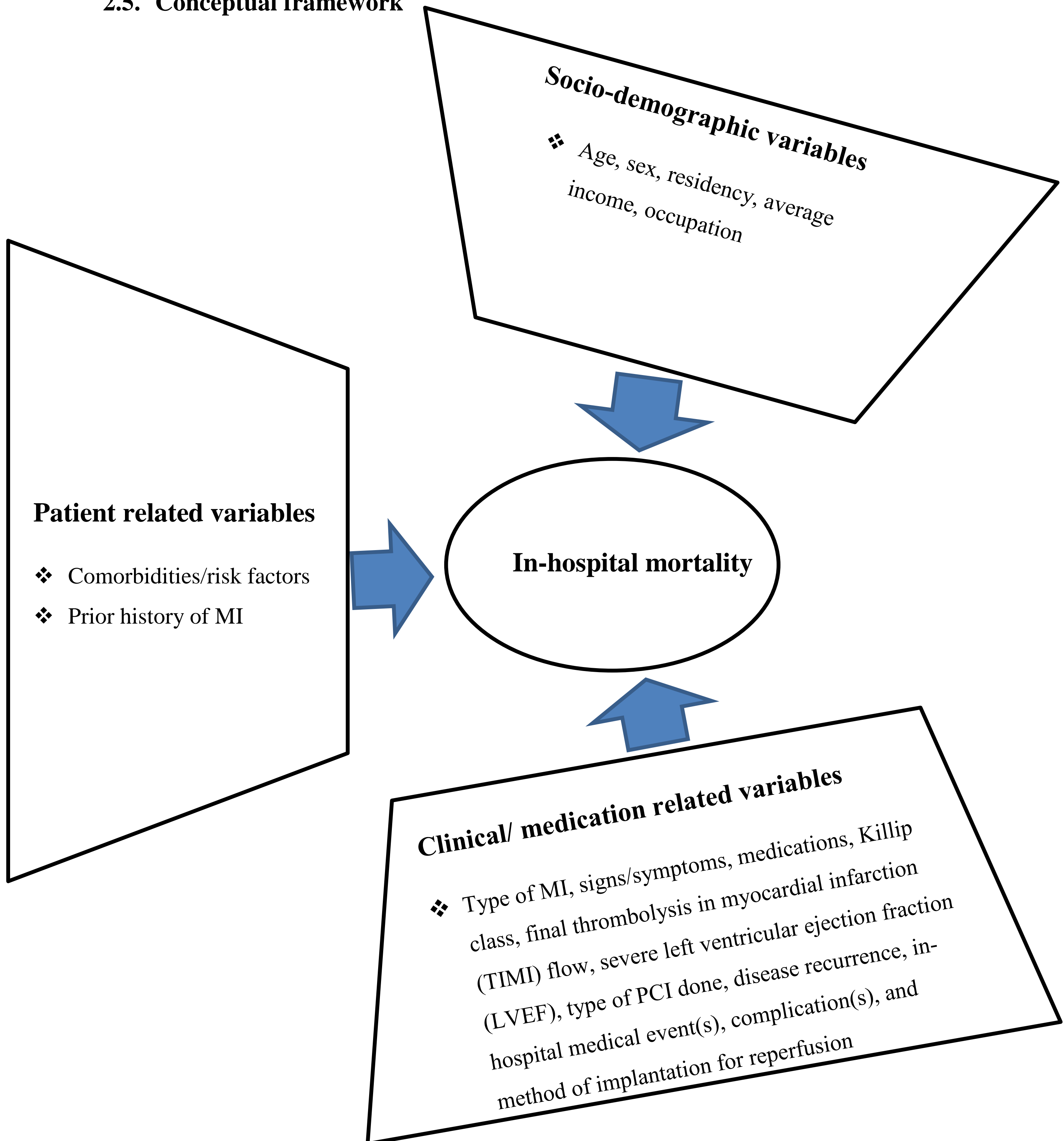


Figure 1: Factors associated with in-hospital mortality: Conceptual framework developed based on Literature review

3. Objectives

3.1. General Objective

- To assess the clinical outcomes and associated factors in patients who underwent successful PCI at selected cardiac centers in Addis Ababa, Ethiopia

3.2. Specific Objective

- To assess the management practice of MI in patients who underwent successful PCI
- To estimate in-hospital mortality in MI patients who underwent successful PCI
- To identify complications related to PCI during hospital stay and follow up in patients who underwent successful PCI
- To identify factors associated with in-hospital mortality in MI patients who underwent successful PCI
- To determine/estimate survival rate MI patients who underwent successful PCI

4. Materials and Methods

4.1. Study settings

This study was conducted at three hospital and medical centers. They are Saint Paul Hospital Millennium Medical College (SPHMMC), Saint Peter Specialized Hospital (SPSH) and Gesund Specialized Cardiac and Medical Center (GSCMC). The SPHMMC was established in 1961 by its original name Saint Paul's Hospital and now governed by the Ethiopian Ministry of Health (EFMOH). It has more than 2800 clinical, academic, administrative and support staff that provide medical specialty services to patients who are referred from all over the country. It also involved in teaching medicine and nursing students and other health sciences graduate students. The inpatient capacity is about 700 beds and approximate of 1200 patients visit its emergency and outpatient departments daily. The SPSH was established in June 1961 and it is also governed by EFMOH. It mainly specialized in tuberculosis management. However, since January, 2017 it was serving as one wing for SPHMMC in its cardiology service especially for patients that need cardiovascular intervention. The data from these two-government hospital showed that approximately 413 patients underwent PCI procedures during five years(January01, 2017 to December31, 2021).Gesund Specialized Cardiac and Medical Center (GSCMC) is qualified cardiac specialized private medical center found in Addis Ababa, Ethiopia and it was established in2017. Since its establishment a total of 326 patients received PCI procedures. Hence, the total number of patients who underwent PCI across the three study settings was 739.

4.2. Study design and period

A retrospective cohort study was carried out among patients who underwent successful PCI between January 1, 2017 and December 31, 2021 (five years) by reviewing medical records. Data was collected between March 01, 2022 and May 31, 2022.

4.3. Population

4.3.1. Source population

All adult patients with MI who underwent PCI between January 01, 2017 and December 31, 2021 were considered the source population.

4.3.2. Study population

- All patients who underwent successful PCI for diagnosis of MI between January 01, 2017 and December 31, 2021

4.4. Eligibility Criteria

4.4.1. Inclusion

- Patients age of 18 years or above
- Patients with MI who underwent successful PCI
- Patients with full information/medical records

4.4.2. Exclusion

- Patients coming for a second time during the study period whose medical records had previously been reviewed
- PCI done for other indication(s) than MI
- Failed PCI procedure

4.5. Sample size determination and Sampling technique

Between January 01, 2017 and December 31, 2021, a total of 739 patients underwent PCI at three cardiac centers in Addis Ababa. All patients' charts at the SPMMC, SPCSH and GSCMC over five year's period were reviewed for the study. From those only 241 patients' medical records met the inclusion criteria and were included in the final analysis (Figure 2).

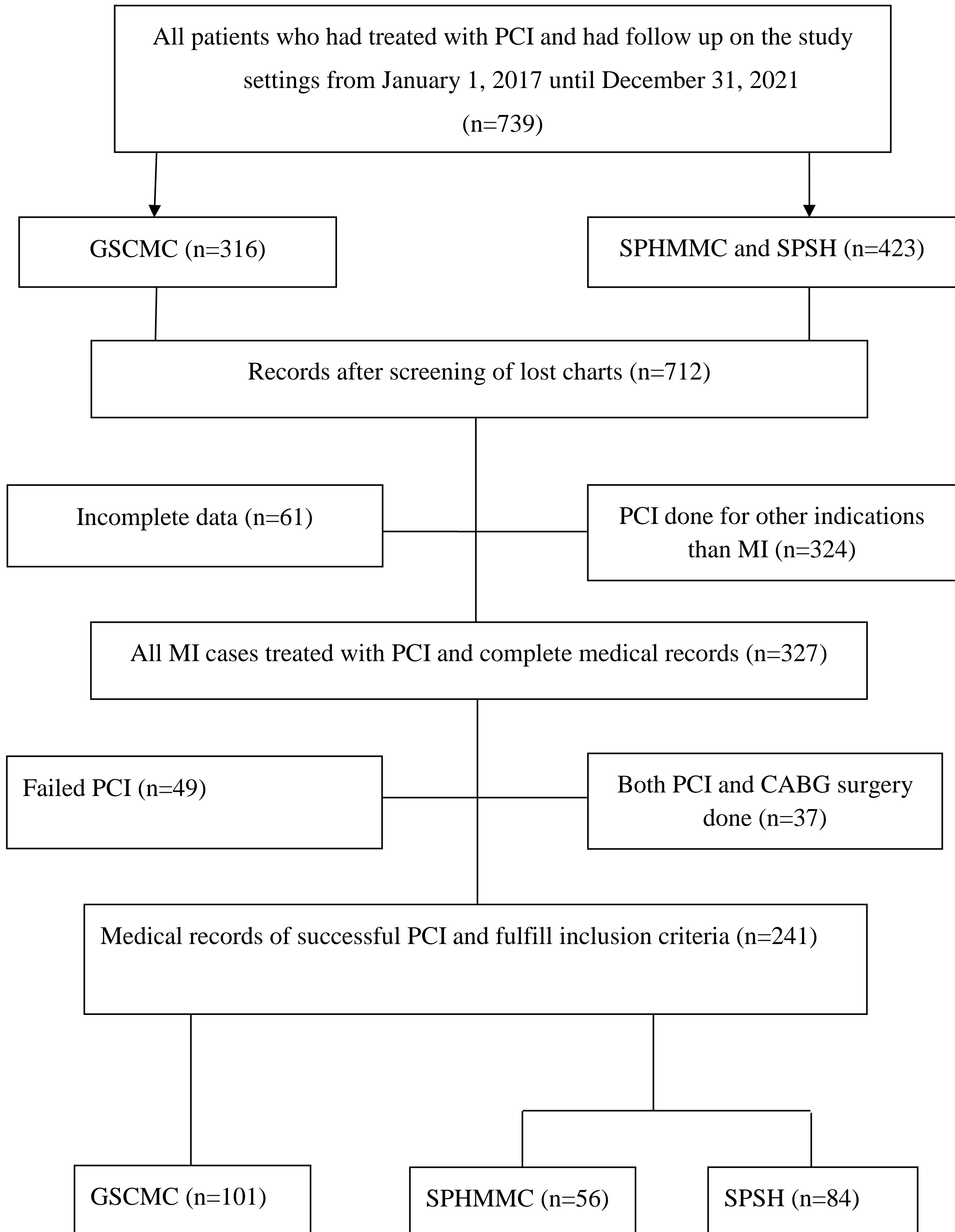


Figure 2: Flow chart of patients' chart selection from March 01, 2022 to May 31, 2022

4.6. Variables

4.6.1. Dependent Variables

- In-hospital mortality
- Non-fatal major adverse cardiac and cerebrovascular events (MACCEs)
- Post-procedural complications

4.6.2. Independent Variables

Socio-demographic related variables

- Age, sex, residency, average income, occupation

Clinical/ medication related variables

- Type of MI, signs/symptoms, medications, Killip class, final thrombolysis in myocardial infarction (TIMI) flow, severe left ventricular ejection fraction(LVEF), type of PCI done, disease recurrence, in-hospital medical event(s), procedural complication(s), and method of implantation for reperfusion

Patient related variables

- Comorbidities/risk factors and prior history of MI

4.7. Data collection instruments/tools

A semi structured questionnaire was adopted. The instrument was prepared after reviewing many international guidelines such as American College of Cardiology/American Heart Association/Society for Cardiovascular Angiography and Interventions (ACC/AHA/SCAI)practice guidelines for PCI, STEMI, and NSTEMI, European Society of Cardiology (ESC),Global Registry of Acute Coronary Events (GRACEs), Taiwan Society of Cardiology, Taiwan Society of Emergency Medicine and Taiwan Society of Cardiovascular Interventions for the management acute coronary syndrome and others(13,14,17,22,43), and also from pervious similar articles and previously prepared sample questionnaires and data on patients' medical chart such as body mass index, sign/symptoms, comorbidity, working diagnosis and so on. The data collection tool includes baseline and clinical characteristics (sex, age, working diagnosis, comorbidities, Killip class, echocardiography, and electrocardiography), angiographic and procedural characteristics (degree of infarct related artery stenosis, number of

infarct related coronary artery, type of PCI done, and method of infarct-related artery implantation), standard-directed medications therapy at discharge and during follow up, in-hospital mortality, in-hospital post-procedural outcomes (nonfatal major adverse cardiac and cerebro-vascular events (MACCEs), and complications).

4.8. Data collection and quality management

A tool was pre-tested in 10% of study population and modification was made to final data collection instrument in this study. The data collectors were trained on how to collect the necessary data from patient's chart, keep ethical principles of confidentiality and data management prior to their involvement on data collection. One trained nurse and two pharmacists collected data from patients' medical charts.

4.9. Data Analysis and interpretation

The collected data were checked for completeness, clarity, and accuracy. Data was entered into Epidata version 4.6 and analyzed using Statistical Package for Social Science (SPSS) version 21.0. Categorical variables were presented by frequencies and percentage. Continuous variables were summarized as means, standard deviations, and minimum and maximum values.

Cox proportional hazards models was used to estimate the predictors of in-hospital mortality. Univariate Cox-regression analysis was done to determine the association of different variables with survival. Then multivariate analysis was performed on variables that have a p-value of <0.25. Estimation of hazard ratio (HR) at a 95% confidence level was done using the Cox regression model. Finally, a p-value <0.05 was considered statistically significant.

Kaplan Meier analyses were also used to determine overall survival rates and median survival time. The Log Rank test was used to compare survival probability curves generated from Kaplan Meier in-hospital mortality for independent predictors.

4.10. Study outcome measures

The outcomes assessed were all cause in hospital mortality, mortality associated variables, non-fatal MACCE and post-procedural complication rate.

4.11. Ethical Consideration

The study protocol was approved by the Ethical Review Committee of School of Pharmacy (SoP) College of Health of Sciences (CHS) Addis Ababa University (AAU)(ERB/SOP/249/13/2021). Then, support letter was written from Department of Pharmacology and Clinical Pharmacy, SoP, CHS, AAU to study settings and verbal permission was obtained from Directors of SPSH and GSCMC. Besides, the Institutional Review Board of SPHMMC approved the study protocol (PM23/85). As patients were not interviewed in this study, there was no need of obtaining informed consent. Instead, a permission to access each patient record was obtained from the medical director, head of departments and medical record manager of each healthcare facility. Personal identifiers like names were no used and data were analysed in aggregate.

4.12. Operational definitions

Clinical outcomes: clinical outcomes of patients who underwent successful PCI is explained mainly by MACCEs, in-hospital death, development of complications, reperfusion (degree of IRA stenosis dilation) and improvement of anginal symptoms.

In-hospital mortality: is defined as dying during hospital stay i.e., at initial or readmission phases.

In-hospital post-procedural outcomes: include non-fatal major adverse cerebrovascular and cardiovascular events (MACCEs) and complications.

Non-fatal MACCEs: defined as a composite of stroke, re-infarction, cardiogenic shock and stent thrombosis.

Complications: the development of new onset venous thromboembolism (VTE), bleeding, acute renal failure, left ventricular thrombosis, acute heart failure, pericarditis, post-infarct angina, and valvular abnormalities.

Standard-directed discharge medications: They include antiplatelet therapy (aspirin, P2Y12 inhibitor or DAPT), statins, ACE inhibitors/ARBs and beta-blockers.

Killip class: is the indicator of heart failure severity in patients with AMI. Accordingly, Killip I: no clinical signs of heart failure; Killip II: rales in the lungs, third heart sound (S3), and elevated jugular venous pressure; Killip III: acute pulmonary edema and Killip IV: cardiogenic shock or

arterial hypotension (measured as SBP<90 mmHg), and evidence of peripheral vasoconstriction (oliguria, cyanosis, and diaphoresis).

Infarct related artery (IRA) stenosis: the degree or percentage of coronary artery occlusion secondary to atherosclerotic plaques.

Thrombolysis in myocardial infarction (TIMI) flow grade: a method which assesses the degree of blood flow in infarcted coronary arteries in patients with MI. Based on the flow it is graded from 0 to 3.

- **Grade 0** (no perfusion): There is no antegrade flow beyond the point of occlusion
- **Grade 1** perfusion without penetration): contrast material passes beyond the area of obstruction but fails to opacify the entire coronary bed distal to obstruction.
- **Grade 2** (partial perfusion): contrast material passes across the obstruction and opacifies the coronary artery distal to the obstruction. However, the rate of entry of contrast material into the vessel distal to the obstruction is slow
- **Grade 3** (complete perfusion): antegrade flow into the bed distal to the obstruction occurs as easily as antegrade flow into the bed proximal to the obstruction.

Re-infarction: recurrence of ischemic symptoms with new ECG changes and cardiac biomarkers suggestive of re-infarction.

Severe LV dysfunction: It was defined as left ventricular ejection fraction ≤30% by echocardiography.

Diseased artery is defend as stenosis (≥50%) in at least one coronary artery (46).

5. Results

5.1. Socio-demographic and clinical characteristics

Overall, only 241 patient charts were identified as a diagnosis of myocardial infarction and qualified the inclusion criteria for the study. Majority of the patients 193 (80.5%) were males and the mean (±SD) age was 57.2 ± 10.6 years that ranged from 29 to 85 years. The mean (SD) systolic and diastolic blood pressure (during admission was 133.5 [± 31.96 mmHg] and 82.2 ± 14.28 mmHg], respectively. None of the study participants had recorded times from symptoms onset to hospital admission. Chest pain 226 (93.8%) was the frequent symptom causing emergency department visits. The average (SD) body mass index (BMI) was 28.3 (3.79) Kg/m^{2}. As shown in Table 1, Of the 241 MI patients who underwent PCI, majority of them (75.9%) had STEMI. Echocardiography was done for all patients. Severely reduced left ventricular ejection fraction (LVEF) (< 30%) was seen in 15.4% of patients. A relatively high percentage of patients (48.5%) were in Killip class II at presentation based on pre-procedural evaluation documents on patients' medical charts. Dyslipidemia was the most common clinical risk factor for MI accounting for 198 of total study participants (Table 1).

Table 1: Baseline and clinical characteristics of Study participants (N=241)

Variables	Category	n (%)
Age in years	18-45	28 (11.6)
	46-64	134(55.6)
	≥ 65	79(32.8)
Sex	Male	194(80.5)
	Female	47 (19.5)
Body mass index (BMI) (N=171)	18.5-24.9	32 (18.7)
	25-30	69 (40.4)
	≥30	70 (40.9)
Symptoms during Emergency department visit	Chest pain	226 (93.8)
	Shortness of breath	198 (82.2)
	Nausea/vomiting	142 (58.9)

	Diaphoresis	157 (65.1)
	Fatigue	45 (18.7)
	Others*	11 (4.6)
Systolic blood pressure (mmHg) during admission	<130	121 (50.2)
	130-139	20 (8.3)
	140-159	50 (20.7)
	≥160	50 (20.7)
Diastolic blood pressure (mmHg)during admission	<85	140 (58.1)
	85-89	10 (4.1)
	90-99	68 (28.2)
	≥100	23 (9.5)
Risk factors	Dyslipidemia	198 (82.2)
	Hypertension	140 (58.1)
	Diabetes mellitus	135 (56.0)
	Obesity	75 (31.1)
	Smoking	55 (22.8)
	Previous MI	37 (15.4)
	Chronic heart failure	36 (14.9)
	Renal disease	22 (9.1)
	History of stroke	9 (3.7)
Type of myocardial infarction	STEMI	183 (75.9)
	NSTEMI	58 (24.1)
Left ventricular ejection fraction (%)	<30	37 (15.4)
	30-39	54 (22.4)
	40-49	63 (26.1)
	50-75	87 (36.1)
Killip class	I	59 (24.5)
	II	117 (48.5)
	III	61 (25.3)
	IV	4 (1.7)

*includes body swelling, orthopnea, and weakness

5.2. Angiographic and procedural characteristics

All procedures were performed via trans-femoral vascular access. Left anterior descending coronary artery (LAD) (84.6%), was the most common infarct-related artery IRA followed by right coronary artery (41.9%). A single- diseased artery was present in 116 (48.1%) patients. In terms of stenosis severity; practically every patient had a major infarct related blockage, with 179 patients having severe (75-99%). A baseline thrombolysis in myocardial infarction (TIMI) from 0 to 1 flow was present in 85.5% of study patients. As shown in the Table 2 below, in some patients, more than one method of implantation of IRA was done based on number of narrowed vessels**.** Among methods of reperfusion performed, 181 (75.1%) patients received drug-eluting stents (DES) and post-PCI TIMI III flow was achieved in all of the study patients treated with PCI. The infarct related artery conditions data were summarized in Table 2.

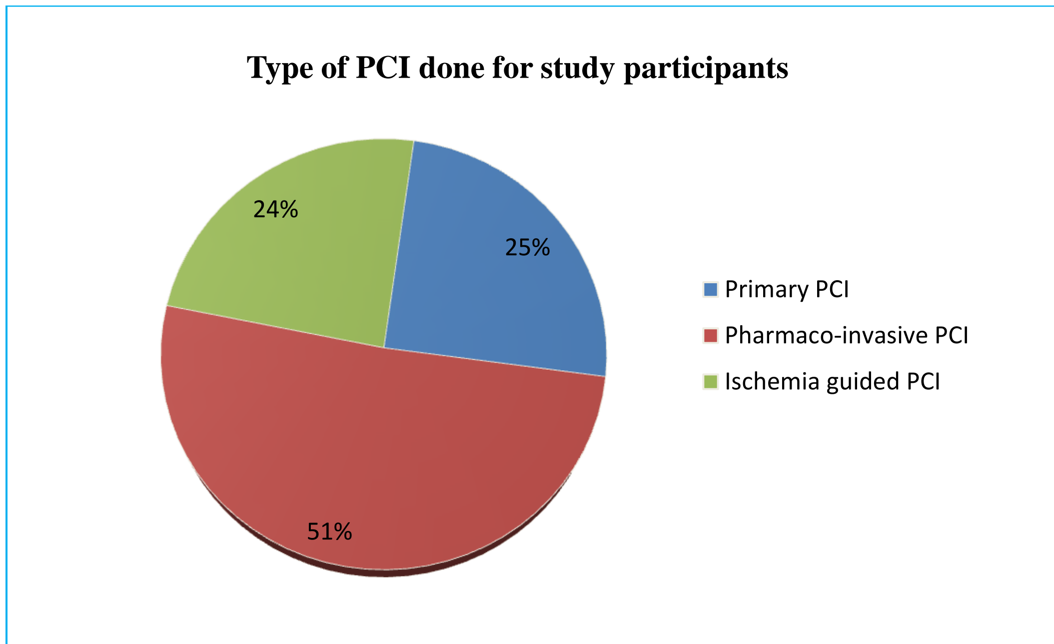
Table 2: Infarction related artery conditions of study participants (N=241)

Variables		n (%)
Infarct related coronary arteries	Right coronary (RCA)	101 (41.9)
	Left main coronary (LMCA)	13 (5.4)
	Ramus circumflex	8 (3.3)
	Left anterior descending (LAD)	204 84.6)
	Left circumflex	80 (33.2)
Number of diseased artery	Single	116 (48.1)
	Double	90 (37.3)
	Triple	35 (14.6)
Degree of infarct related artery stenosis (%)	50-75	71 (29.5)
	75-99	179 (74.3)
	100	93 (38.6)
Baseline Thrombolysis in Myocardial Infarction (TIMI) flow	TIMI 0-1	206 (85.5)
	TIMI 2	35 (14.5)
Implantation methods of infarct-related artery	Drug eluting stent	181 (75.1)
	Bare metal stent	48 (19.9)
	Balloon angiography	35 14.5)

5.3. Management practices of myocardial infarction

5.3.1. In hospital reperfusion (revascularization) therapy

Twenty six patients were treated with thrombolysis. Streptokinase was the only agent used in the all study settings. It was only administered for STEMI patients. One hundred twenty three (51%) study participants received pharmaco-invasive PCI (Figure 3).



PCI: percutaneous coronary intervention

Figure 3: Type of PCI done for patients with myocardial infarction (N=241)

5.3.2. The medication therapy provided for the study participants

The standard medical therapy of MI patients' in the study settings after discharge and at the time of follow up, include beta-blockers (86.7%), statins (100%), angiotensin converting enzyme inhibitors (43.2%), aspirin(92.5%), and clopidogrel (88.4%). About 73 (30.3%) patients had received anticoagulants during their hospital visit. Enalapril and lisinopril were the only ACEIs prescribed for management of MI in this study (Table 3).

The use of CCBs and antidiabetics among patients with acute myocardial infarction was 38 (15.8%) and 90 (37.3%), respectively. ARBs were started for 20.3% of patients during their hospital visit. Oral nitrate was indicated in 11.6% of study participants (Table 3).

Table 3: Medications given for study patients who underwent successful PCI (N=241)

Class of medications	Overall (%)	Category	STEMI	NSTEMI
Antiplatelets	223 (92.5%)	Aspirin	168 (75.3%)	55 (24.7%)
	213 (88.4%)	Clopidogrel	163 (76.5%)	50 (23.5%)
	207 (86%)	DAPT (aspirin & clopidogrel)	157 (75.8%)	50 (24.2%)
	7 (2.9%)	Ticagrelor	6 (85.7%)	1 (14.3%)
Beta-antagonists	209 (86.7%)	Metoprolol succinate	83 (39.7%)	28 (13.4%)
		Bisoprolol	51 (24.4%)	20 (9.6%)
		Carvedilol	21 (10%)	4 (1.9%)
		Others*	1 (0.5%)	1 (0.5%)
Angiotensin-converting enzyme inhibitors	104 (43.2%)	Enalapril	82 (78.8%)	16 (15.4%)
		Lisinopril	6 (5.8%)	0(0)
Angiotensin II receptor blockers	49 (20.3%)	Candesartan	11 (22.4%)	13 (26.5%)
		Losartan	14 (28.6%)	5 (10.2%)
		Valsartan	3 (6.1%)	1 (2.1%)
		Irbesartan	2 (4.1%)	0(0)
Statins	241 (100%)	Atorvastatin	153 (63.5%)	49 (20.3%)
		Rosuvastatin	27 (11.2%)	7 (2.9%)
		Simvastatin	3 (1.2%)	2 (0.9%)
Nitrates (oral)	28 (11.6%)	(ISDN, NTG)	22 (78.6%)	6 (21.4%)
Calcium channel blockers	38 (15.8%)	Amlodipine	19 (50%)	15 (39.5%)
		Nifedipine	2 (5.3%)	1 (2.6%)
		Felodipine	1 (2.6%)	0(0)
Anticoagulants	73 (30.3%)	Enoxaparin	27 (37%)	7 (9.6%)
		Unfractionated Heparin	15 (20.5%)	4 (5.5%)
		Warfarin	16 (21.9%)	1 (1.4%)

		Rivaroxaban	3 (4.1%)	0(0)
Diuretics	139 (57.7%)	Furosemide	86 (61.9%)	17 (12.2%)
		Furosemide & spironolactone	32 (23%)	20 (14.4%)
		Hydrochlorothiazide	5 (3.6%)	4 (2.9%)
Hypoglycemic agents	90 (37.5%)	Oral hypoglycemic agents	72 (80%)	16 (17.8%)
		Insulin	8 (8.9%)	2 (2.2%)
Other Agents	28 (11.6%)	Allopurinol	9 (32.1%)	4 (14.3%)
		HAART	6 (21.4%)	4 (14.3%)
		Others**	3 (10.7%)	2 (7.1%)

DAPT indicates dual antiplatelet therapy; ISDN, isosorbide dinitrate; NTG, nitroglycerin; and HAART, highly active antiretroviral therapy. ***includes** atenolol and nebivolol, ** **includes** amiodarone, carbamazepine, ezetimibe, levothyroxine, and propylthiouracil.

5.4. Post-PCI in-hospital and post-discharge outcomes

The rate of non-fatal MACCEs (re-infarction, stroke, stent thrombosis and cardiogenic shock) was 24.1%. As show in Table 4, the most common nonfatal event recorded in study participants was stent thrombosis (10.8%) Table 4.

Table 4: Non-fatal cardiac and cerebrovascular events among the study patients (N=241)

Variables	**n (%)**	**STEMI (%)**	**NSTEMI (%)**
Nonfatal MACCEs	58 (24.1)	42 (72.4)	16 (27.6)
Stent thrombosis	26 (10.8)	18 (69.2)	8 (30.8)
Stroke	17 (7.4)	8 (47.1)	9 (52.9)
Cardiogenic shock	5 (2.1)	4 (80)	1(20)
Recurrent MI	18 (7.5)	11 (61.1)	7 (38.9)

MACCEs: Major adverse cardiac and cerebrovascular events; STEMI, ST elevated myocardial infarction; NSTEMI, Non-ST elevated myocardial infarction.

Venous thromboembolism (VTE) (8.3%), post-infarct angina (6.6%), and acute renal failure (6.2%), were the most common MI-related post-PCI complications in study patients (Table 5).

Table 5: Post-procedural complications of study participants (N=241)

Complications	**n (%)**
New-onset venous thromboembolism (VTE)	20 (8.3)
Nonvascular access site bleeding	11 (4.6)
Left ventricular thrombosis	11 (4.6)
Acute renal failure	15 (6.2)
Post-PCI pericarditis	8 (3.3)
Vascular access site bleeding	12 (5.0)
Post-infarct angina	16 (6.6)
Valvular regurgitation	6 (2.5)
Acute heart failure	10 (4.1)

5.5. In-hospital mortality

Total all cause in-hospital mortality was 3.7% (9 deaths) and 8 deaths were occurred in STEMI patients. The most common cause of death was cardiogenic shock (n=4), followed by non-cardiogenic shock (n=2) and pulmonary embolism (n=2). One patient died from hemorrhagic stroke.

5.6. Predictors of in-hospital mortality

Proportional hazards regression was performed to determine the predictors of in-hospital mortality. Univariate Cox-regression analysis was done separately for each independent variable using recorded time for event (mortality). All variables with a p-value of <0.25 were identified and transferred to multivariate Cox regression analysis and further computed together with the outcome (mortality). Confounding factors were eliminated during the analysis, and only ten variables were included in the final multivariate Cox regression analysis. Accordingly, being female (AHR=8.39, 95% CI: 1.20-58.68, P= 0.03), pre-procedural obesity (AHR=6.54, 95% CI: 1.10-40.60, P=0.04), previous MI (AHR=9.68, 95% CI: 1.66-56.31, P=0.01), chronic heart failure (AHR=9.21, 95% CI: 1.38-61.78, P=0.02) and having previous history of stroke

(AHR=18.99, 95% CI: 1.59-227.58, P=0.02) were significantly associated with in-hospital mortality (Table 6).

Table 6: Univariate and multi-variate Cox-regression analysis (N=241)

Variables	Category	Death		Unadjusted HR (95% CI)	P-value	Adjusted HR (95% CI)	P-value
		Yes	No				
Sex	Female	6	41	8.78 (2.20-35.10)	0.00	8.39 (1.20-58.68)	**0.03***
	Male**	3	191				
Diaphoresis	Yes	8	149	4.32 (0.54-34.53)	0.17	4.22 (0.35-50.54)	0.85
	No**	1	82				
Bare metal stent	Yes	3	45	6.60 (1.65-26.43)	0.00	0.78 (0.06-10.04)	0.49
	No**	6	187				
Previous myocardial infarction	Yes	5	32	7.12 (1.91-26.52)	0.00	9.68 (1.66-56.31)	**0.01***
	No**	4	199				
Heart failure	Yes	4	32	4.76 (1.28-17.72)	0.02	9.21 (1.38-61.78)	**0.02***
	No**	5	200				
Stroke	Yes	2	7	7.99 (1.66-38.48)	0.01	18.99 (1.59-227.58)	**0.02***
	No**	7	225				
Ramus circumflex	Yes	1	7	5.22 (0.65-41.80)	0.12	10.0 (0.69-146.26)	0.09
	No**	8	225				
Number of infarct related artery	Single	2	114		0.16		0.42
	Double(1)	7	83	4.60 (0.95-22.20)	0.06	4.68 (0.47-46.44)	0.19
	Triple (2)		35		0.99		0.98
Obesity	Yes	5	70	2.84 (0.76-10.56)	0.12	6.54 (1.05-40.58)	**0.04***
	No**	4	162				
Valvular regurgitation	Yes	2	4	12.8 (2.65-61.69)	0.00	4.31 (0.47-39.66)	0.19
	No**	7	228				

* Statistically significant at P-value < 0.05

** Reference

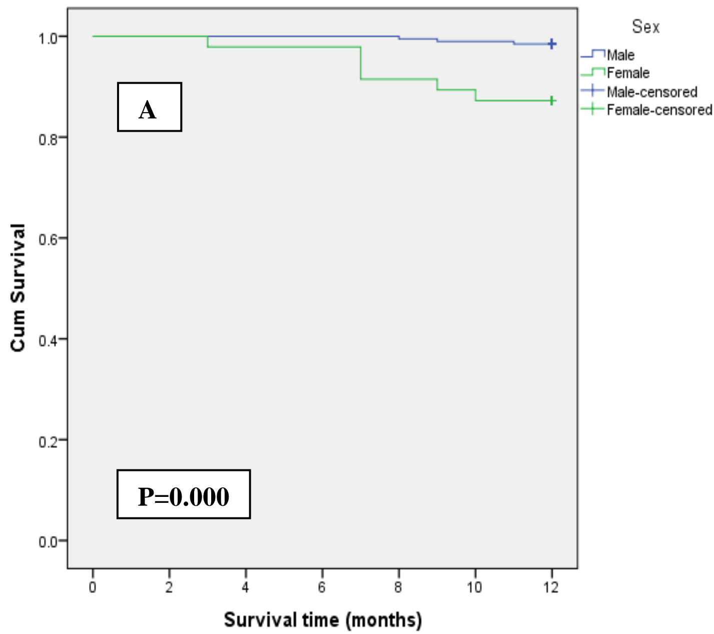
HR: hazard ratio, CI: confidence interval

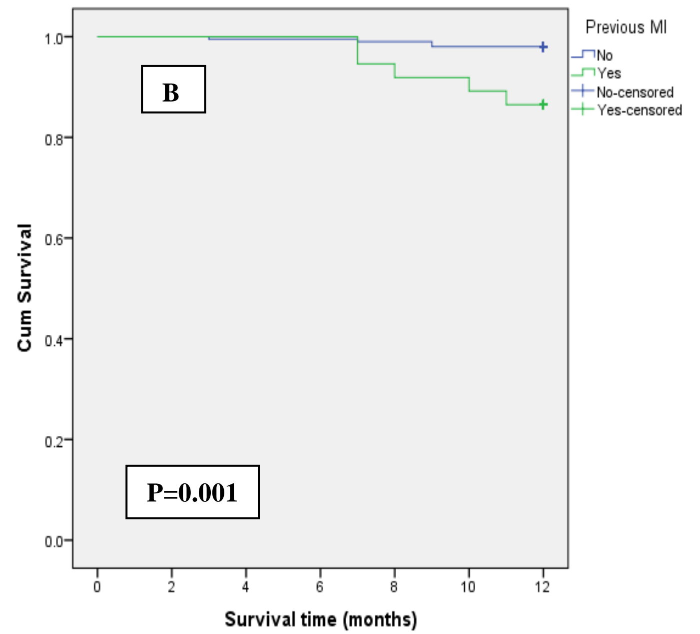
5.7. Kaplan Meier survival estimates

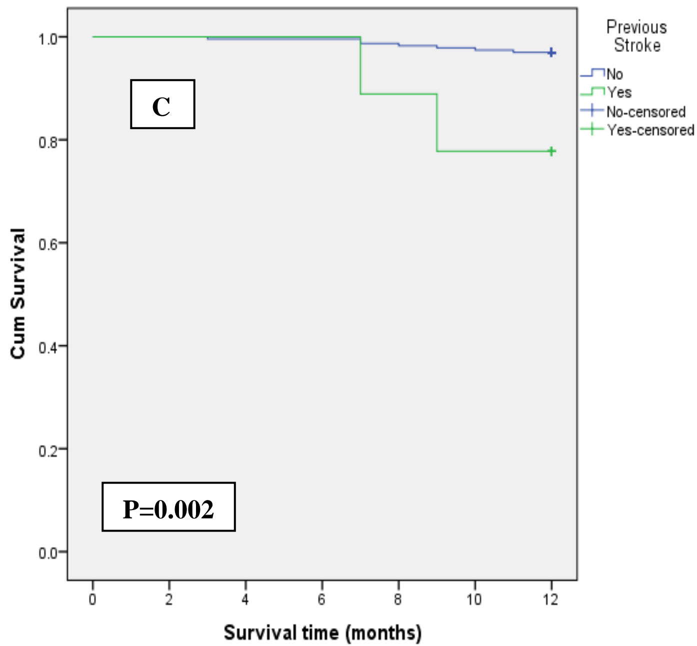
Male patients had a longer mean survival time than female patients (11.38 months) (95% CI: 10.87-11.90). Patients with a history of previous MI had a lower chance of surviving than those with no prior MI (11.90 months) (95% CI: 11.79-12.0) (Figure 4).As shown in Table 7**,** there was no statistically significant difference in mortality among previously obese patients (Log rank=2.65, P=0.10) (Table 7**).** The overall estimated 1-year survival rate of MI patients who underwent successful PCI was 96.3%.

Table 7: Kaplan – Meier Estimate of Survivor Function (N=241)

Variables	Category	Mean survival time in month (95% CI)	Log Rank value	P-value
Sex	Male	11.96 (11.91-12.01)	13.82	0.00
	Female	11.38 (10.87-11.90)		
Previous myocardial infarction	Yes	11.54 (11.12-11.96)	11.73	0.00
	No	11.90 (11.79-12.01)		
Previous history of stroke	Yes	11.11 (9.98-12.24)	9.53	0.00
	No	11.88 (11.77-11.98)		
Chronic heart failure	Yes	11.53 (11.08-11.97)	6.61	0.01
	No	11.90 (11.80-12.01)		
Obesity	Yes	11.68 (11.38-11.99)	2.65	0.10
	No	11.92 (11.74-11.96)		







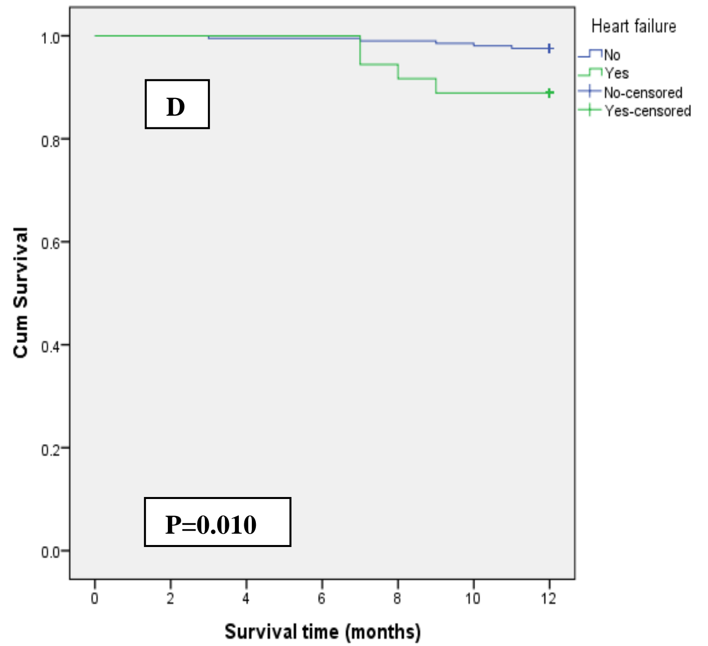


Figure 4: Kaplan Meier survival curves for sex (A), previous MI (B), previous history of stroke (C), and chronic heart failure (D).

6. Discussion

In this study, the mean age of patients was 57.2 ± 10.6 years, which is slightly higher than other observational studies in Ethiopia (27,47) and comparable to study conducted in University teaching hospital in Ethiopia (26,48). However, this value is lower as compared to Global Registry of Acute Coronary Events (GRACE) 64.9 ±12.6 years (43). The possible explanation for this large age gap in occurrence of AMI could be differences in sample size. In addition, MI is more common in male than female which was similar to other findings from Ethiopian tertiary hospitals (27,28,30), India (49,50) and Saudi Arabia (51).

In the current study, the rate of STEMI was higher than NSTEMI. Similar findings was reported in a retrospective and prospective studies in different part of Ethiopia (26–28,30,47), Nepal (52), China (53)**,** and Czech Republic (54).

Dyslipidemia was the most common conventional risk factor followed by hypertension and diabetes mellitus. These have already been identified as important risk factors for CHD, including myocardial infarction, in a previous study (48).

Concerning to revascularization therapy, fibrinolysis (10.8%) was commonly used in the current study than previous reports from Ethiopia (6.3%) (30).However, it is extremely lower in comparison to a studies conducted in Djibouti (73%) (55), Egypt (43.1%) (56), Pakistan (29%) (57), and GRACE (32.5%) (43).This might be the result of a lag between the onset of symptoms and admission. Patients' insufficient knowledge of the signs and symptoms of AMI and/or issues with patient transportation to a medical facility may be contributing factors in the time delay. Another possible reason might be that patients' socio-economic status does not allow for adequate medication accessibility and affordability. In our study, the most frequently performed procedure was pharmaco-invasive PCI. However, many studies have shown that primary or emergency PCI has been the main revascularization technique, particularly in patients with STEMI (19,24,56).The main limitation of primary PCI is its availability.

Regarding to medications used, aspirin was given to 92.5 percent of AMI patients, and clopidogrel to 88.4 percent, which is slightly lower than findings of prior studies in Ethiopia (26,30), Korea (58), and GRACE (43). This lower percentage could be due to the inaccessibility and or problems on documentation of medication in study settings. Beta blockers were started in

86.7% of cases, which is comparable to findings from Ethiopian tertiary hospitals (86.7%)(30), (88.1%) (26) and greater than that of Korea (78.2%), Czech-Republic (77.5%), OPERA registry (79%) and GRACE (80%) (43,54,58,59). Use of ACEIs in the present study was 43.2% which was very low compared with studies conducted in Tikur Anbessa Specialized Hospital (TASH) (77.8%), Ayder Specialized Hospital (ASH) (79.8%), Egypt (84.8%) and Korea (85.4%) (26,30,56,58). All the study participants used statins in the current study, which is similar to 94.7%, and 99.8%, in previous studies in ASH (30), and Egypt (56) respectively.

The overall non-fatal MACCE in the current study was 24.1%. This is comparable to a prospective study conducted in 2021 in two Ethiopian tertiary hospitals, where the rate was 25% (27). However, the rate of non-fatal MACCE documented in our study was higher compared to a retrospective cohort study from China (60), a comparative finding from Turkey (61), a prospective observational study from India (62), and Kerala-ACS registry (63). The higher rate of non-fatal MACE among the participants in our study could be related to factors such as inadequate access to and affordability of reperfusion therapy, there might be prolonged pre-hospital delays at presentation, and medications that were not administered as recommended by guidelines.

The overall in-hospital mortality documented in our study was significantly lower than other studies conducted in Ethiopia which reported a 10% to 27.4% in-hospital mortality (26,27,30).The possible explanations for low in-hospital mortality may be all the study participants had a better access to revascularization therapy especially PCI. Similarly, lower rate of all-cause in-hospital mortality was reported in the present study when compared to reports from other part of world (4.6-15.1%) (41,43,56,64). In contrast to studies done outside of the country, the low level of in-hospital mortality may be associated with small sample size. The death rate recorded in our study is consistent with data from other centers (40,58).Cardiogenic shock was the leading cause of death among the study participants, which is consistent with other previous findings (40,41,62).

In case of predictors for in-hospital mortality, female gender, chronic heart failure (CHF), stroke, previous MI, and obesity were significantly associated with in-hospital mortality in the current study. In this study, female patients were about 8-to-9-times high risk to die than those of males. Previous studies on PCI and MI from Croatia (AOR=1.56, 95% CI: 1.35-2.58) (65) and Serbia

(AOR=1.97, 95% CI: 1.28–3.01) (66), found significant agreement when mortality is stratified by gender. The higher mortality after PCI in women might be associated with baseline age and greater comorbidities burden. It may also be related to differences in myocardial blood flow in women compared to men. Moreover, hormonal-mediated differences might be another contributing factor to sex-related differences in mortality rate.

Presence of CHF as comorbid condition was also an independent predictor of in-hospital mortality in the present study. This finding is supported by GRACE (HR=3.77, 95% CI: 2.56-5.55)and T. Jeffrey et al (HR=2.4, 95% CI: 1.2–4.7) (43,67). In current study, patients who had a prior MI were 9.7 times more likely to die. This data is in line with findings of other studies looking into predictors of mortality in patients with AMI who undergoing PCI (AOR=92.8, 95% CI: 22.8–379.1) (68). This could be due to its irreversible damage to the heart muscle caused by a lack of oxygen, and patients with a history of prior MI are at a higher risk of sudden cardiac death. A stroke was another predictor of in-hospital mortality in the current study. MI patients who also had a stroke had a 19 times higher risk of death rate than those who did not have a stroke. Patients with a history of TIA or stroke had significantly higher rates of post-PCI adverse outcomes including death (HR=5.6; 95% CI: 3.2–9.8) (67). This could be because a stroke can disrupt central autonomic control, leading to additional myocardial injury, electrocardiographic disturbances, and, eventually, cause sudden death. Obesity was also one of the associated factors of in-hospital mortality among MI patients' who underwent PCI as immediate reperfusion therapy. Obesity was found to contribute 6.5 times more to the in-hospital death rate after PCI. However, some studies conducted in various parts of the world showed a different finding from current data. According to the findings from Dutch (HR = 0.91, 95% CI: 0.87-0.96)(69) and Sweden (HR=0.88, 95% CI: 0.75-1.02) (70), AMI patients who were previously obese had the lowest risk of all-cause mortality following PCI. One possible explanation could be the high prevalence of obesity and overweight among the study participants. Another possibility could be the BMI of many of the study populations might be elevated even after the procedure and had not returned to normal.

The overall estimated one-year survival rate was higher than studies done by S. Mozaffarian et al (88%), Q. Ye et al (91.2%) and S. J. Baart et al (83%) (71–73). The differences in estimated one-

year survival rates mentioned above may be due to differences in study design, sample size, and age category of study participants.

7. Strength and limitation of the study

The key strength of our study being multicenter which participants were included from the private and government cardiac centers. Other significant quality was the inclusion of data spanning several years (five years patients data).

On the other hand, being a retrospective study was one of the main limitations of our study in which the quality of data may be compromised by the way how healthcare professional working in the study settings record patients' data. The relatively small sample size was another major drawback, which might have an effect on the results of the cox survival analysis. Furthermore, there were problems with proper documentation of patient information on medical charts, which might have impact on analysis of the data aggregate.

8. Conclusion

Pharmaco-invasive PCI was the most commonly deployed intervention in patients with myocardial infraction. Higher rate of DES implantation was observed and post-PCI TIMI flow III was achieved in all study participants. The overall in-hospital morality rate was 3.7%. Cardiogenic shock was the leading cause of death in the present study. Thrombotic agents were underutilized and the rate of non-fatal MACCE was higher. Almost seventy six percent of MI patients were diagnosed with STEMI and only 10.8 percent of them received fibrinolysis. Female gender, previous history of stroke, obesity, chronic heart failure, and presence of prior myocardial infarction were found to be independent predictors of in-hospital mortality.

9. Recommendation

- Attention should be given on availability of thrombolysis and conservative medications especially standard medical therapies of acute myocardial infarction.
- Action should be taken in proper documentation of patient information at study settings.
- Aside from a few cardiac centers and healthcare facilities in the capital, PCI service should also be widespread throughout the country.
- There should well-defined guidelines on how to practice percutaneous coronary intervention (PCI), and management of myocardial infarction in the country.
- Because the prevalence of MI has recently increased, there should be increased awareness of the disease's signs and symptoms, as well as its burden and risk factors.
- Early screening for atherosclerosis and education on lifestyle changes should also be prioritized.
- This finding may not reflect actual country's practice, particularly in the most remote and rural areas. As a result, additional research in this area is required for complete information.

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11. Annexes

Annex-I: Data abstraction format

Clinical Outcomes and Associated Factors in Patients Who Underwent Successful Percutaneous Coronary Intervention for Myocardial Infarction: Multicenter Retrospective Crossectional Study in Addis Ababa, Ethiopia

1. Patient's detail and admission information

1.1.Card number______________

1.2.Age___________years

1.3.Sex: F ☐ M ☐

1.4.Date of admission:_______________

1.5.Date of PCI procedure done_______________

1.6.Date of discharge/death after admission: _________________

1.7.Clinical symptoms and physical examination on admission

1.7.1. Symptoms

Chest pain: Yes ☐ No ☐ SOB: Yes ☐ No ☐

Nausea: Yes☐ No ☐ Vomiting: Yes☐ No ☐

Diaphoresis: Yes☐ No ☐ others specify__________________________

1.7.2. Physical examination

BP: _____ HR: _____ RR: _____ BMI: ______

Cardiac Biomarkers

CK-MB_________ Troponin I_________ Troponin T ______

1.8. ECG:____

1.9.Echocardiogram performed: Yes ☐ No ☐ If yes, LVEF___________%

1.20.Working diagnosis(type of index MI)

NSTEMI ☐ STEMI ☐

1.21.Killip class on admission

Killip I ☐ Killip II ☐ Killip III ☐ Killip IV ☐

2. Comorbidities and or risk factors

Comorbidities/ Risk factors	Yes	No
Chronic heart failure		
Diabetes Mellitus(Specify)		
Hypertension		
Chronic renal disease		
Previous MI		
Dyslipidemia		
History of smoking		
Previous stroke(specify)		
Obesity		
Other(s)		

3. Serum Lipid profiles measured during admission

Total cholesterol: Yes☐ No☐ if yes, value__________mg

LDL cholesterol: Yes☐ No☐ if yes, value__________mg

HDL cholesterol: Yes☐ No☐ if yes, value__________mg

Triglyceride: Yes☐ No☐ if yes, value__________mg

4. Numbers of infarct related vessels

Single ☐ Two ☐ Multiple ☐

5. Type(s) of infarct related artery (IRA)

Left anterior descending artery (LAD) ☐ Left circumflex (LCX) ☐

Right coronary artery (RCA) ☐ Ramus circumflexus (RCF) ☐

Left main coronary artery (LMCA) ☐ other (s) _______________

6. The degree of infarct related artery (IRA) stenosis (%)

50-75 ☐ 75-99 ☐ complete occlusion (100) ☐

7. Baseline TIMI flow grade (whether normal or slow coronary flow)

0-1 ☐ 2 ☐ 3 ☐

8. Type of vascular access

Trans-femoral ☐ Trans-radial ☐

9. **Thrombolytic therapy given**: yes☐ No☐

if yes specify name and dose of the drug_______________________________________

10. **PCI procedure**

10.1.Type of PCI done

Primary/Emergency PCI ☐ Post-thrombolysis PCI ☐ Rescue PCI ☐

Facilitated PCI ☐ Ischemia-guided/Elective PCI ☐

10.2.Method of IRA implantation

Balloon angiography ☐ Bare metal stent ☐ Drug-eluting stent ☐

Drug-eluting balloon ☐ Coronary atherectomy with thrombus aspiration ☐

11. **Post-PCI TIMI flow grade**

0-1 ☐ 2 ☐ 3 ☐

12. Type of anti-ischemic, antithrombotic and analgesic medication used

Drug name	Yes (name, dose and frequency)		No
Aspirin	__ (LD: ________mg)	MD: __________mg	
Clopidogrel	__ (LD: _______mg)	MD: __________mg	
BBs			
ACEIs/ARBs			
Nitrates (oral)			
CCBs			
Statins			
Anticoagulants			
Diuretics			
Other(s)			

13. **Dead or discharged alive ________________________________**

14. **In question number 13, if the answer is "dead" then what is/are the cause(s) of death after the procedure**

    14.1. Cardiac related causes

    Cardiogenic shock ☐ acute heart failure☐ Arrhythmia ☐

    Others____________

    14.2. Non-cardiac causes

    VTE/PE ☐ Stroke ☐ Non-cardiogenic shock ☐ If others (specify) _________

15. **Complications developed after the successful procedure**

    15.1. Cardiac complications

    Cardiogenic shock ☐ acute heart failure ☐ RV infarction ☐ Pericarditis☐

    15.2. Mechanical complications

    Septal rupture ☐ Left Ventricle free wall rupture ☐ left Ventricle aneurysm ☐

    Valve regurgitation/ stenosis ☐, which valve (specify) ________________

    15.3. Electrical complications

    Ventricular arrhythmias ☐ atrial fibrillation ☐ AVB☐

    15.4. Ischemic complications

    Reinfarction ☐ Infarct extension ☐ post infarction angina ☐

    If others specify____

    15.5. Embolic and thrombotic

    LV thrombus ☐ Stroke ☐ VTE☐ If others (specify) _______________

    15.6. Bleeding complications

    Vascular access site bleeding after PCI ☐ other than vascular access site specify____

    15.7. Others:

    Acute renal failure ☐ No re-flow ☐ Contrast induced reactions ☐

    If any others please specify______________________________________