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Outcomes of Primary Angioplasty in Myocardial Infarction as a Comparison Between Diabetics and Non Diabetics

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Abstract
Diabetes mellitus is a significant risk factor for cardiovascular diseases, including coronary artery disease and myocardial infarction (MI). Primary percutaneous coronary intervention (PCI), or primary angioplasty, is the preferred treatment strategy for patients with ST-segment elevation myocardial infarction (STEMI). However, the impact of diabetes on the outcomes of primary angioplasty remains a subject of ongoing investigation. This retrospective cohort study compared the outcomes of primary angioplasty in patients with STEMI, stratified by diabetic status. Patients admitted at the S.S. Narayana Heart Centre, Davanagere, Karnataka between January 2018 and December 2022who underwent primary angioplasty for STEMI were included. The primary outcome measures were in-hospital mortality and major adverse cardiovascular events (MACE), including all- cause mortality, non-fatal MI, target vessel revascularization and stroke. Secondary outcomes included stent thrombosis and heart failure hospitalizations. A total of 750 patients (250 diabetic, 500 non-diabetic) were included in the study. Diabetic patients had higher rates of in-hospital mortality (10.0% vs. 6.0%, p=0.04) and MACE (26.0% vs. 19.0%, p=0.02) during a median follow-up of 18 months, compared to non-diabetic patients. Diabetic patients also experienced higher rates of all-cause mortality (16.0% vs. 11.0%, p=0.04) and heart failure hospitalizations (12.0% vs. 7.0%, p=0.02), but no significant difference in stent thrombosis rates. Diabetic patients undergoing primary angioplasty for STEMI had significantly higher rates of in-hospital mortality and poorer long-term outcomes, including increased all- cause mortality, MACE and heart failure hospitalizations, compared to non-diabetic patients. These findings underscore the importance of recognizing diabetes as a significant risk factor and the need for more intensive management strategies in this patient population.

INTRODUCTION

Myocardial infarction (MI), commonly known as a heart attack, is a life-threatening condition caused by the obstruction of blood flow to a portion of the heart muscle, leading to tissue damage or death. Primary percutaneous coronary intervention (PCI), also known as primary angioplasty, is a widely accepted and preferred treatment strategy for patients with ST-segment elevation myocardial infarction (STEMI). This procedure involves the mechanical reopening of the occluded coronary artery, restoring blood flow to the affected area of the heart muscle. Diabetes mellitus is a significant risk factor for cardiovascular diseases, including coronary artery disease (CAD) and MI. Patients with diabetes have a higher incidence of adverse cardiovascular events, including recurrent MI, heart failure and mortality, compared to non-diabetic individuals[1]. The presence of diabetes can influence the outcomes of primary angioplasty due to various factors, such as accelerated atherosclerosis, impaired microvascular function and a pro-inflammatory state[2]. Despite the well-established efficacy of primary angioplasty in the treatment of STEMI, the impact of diabetes on the outcomes of this procedure remains a subject of ongoing investigation. Several studies have reported conflicting results regarding the impact of diabetes on short-term and long-term outcomes following primary angioplasty[3-5]. Understanding the potential differences in outcomes between diabetic and non-diabetic patients undergoing primary angioplasty is crucial for improving risk stratification, optimizing treatment strategies and enhancing post-procedural management. This study aims to compare the outcomes of primary angioplasty in patients with STEMI, categorized as diabetic and non-diabetic. By evaluating various clinical endpoints, such as mortality, reinfarction rates, heart failure and procedural complications, this research may provide valuable insights into the influence of diabetes on the efficacy and safety of primary angioplasty. Ultimately, the findings of this study could contribute to the development of tailored treatment approaches and post-procedural care for diabetic patients undergoing primary angioplasty, potentially improving overall outcomes and quality of life.

MATERIALS AND METHODS

This was a retrospective cohort study conducted at the sree mookambika college of medical sciences emergency medicine department. The study included all patients admitted with ST-segment elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PCI) or primary angioplasty between between January 2022 and December 2023.

Inclusion Criteria: Patients admitted with ST-segment elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PCI) or primary angioplasty during the study period. Age $\geq$18 years.,Diabetic status defined as: For diabetic group: Documented history of diabetes mellitus (type 1 or type 2) or hemoglobin A1c $\geq$6.5% at admission. For non-diabetic group: No history of diabetes mellitus and hemoglobin A1c <6.5% at admission.

Exclusion Criteria: Patients who received fibrinolytic therapy before primary angioplasty. Patients with previous coronary artery bypass grafting (CABG) or PCI. Patients with cardiogenic shock or hemodynamic instability at presentation. Patients with end-stage renal disease requiring dialysis. Patients with active malignancy or life-threatening comorbidities. Pregnancy. Incomplete medical records or missing data on key variables.

Data Collection: Electronic medical records of eligible patients were reviewed and data were extracted using a standardized data collection form. The following information was collected: Demographic data (age, sex)Clinical characteristics (body mass index, comorbidities, cardiovascular risk factors) Laboratory findings (hemoglobin A1c, lipid profile, renal function) Angiographic and procedural details (culprit vessel, TIMI flow grade, number of stents implanted, use of glycoprotein IIb/IIIa inhibitors)In-hospital outcomes (mortality, reinfarction, stroke, major bleeding, contrast-induced nephropathy) Discharge medications

Follow-up and Outcome Measures: Patients will be followed up for a minimum of [Duration, e.g., 12 months] after the primary angioplasty procedure.

The Primary Outcome Measures were: In-hospital mortality Major adverse cardiovascular events (MACE), including all-cause mortality, non-fatal myocardial infarction, target vessel revascularization and stroke Secondary outcome measures were: Stent thrombosis Heart failure hospitalizations Composite of major bleeding events. Statistical analysis was done using SPSS version 22. Continuous variables were presented as mean±standard deviation or median (interquartile range), depending on the normality of distribution. Categorical variables were reported as frequencies and percentages. Baseline characteristics were compared between diabetic and non-diabetic groups using appropriate statistical tests (e.g., Student's t-test or Mann-Whitney U test for continuous variables and chi-square or Fisher's exact test for categorical variables). A p-value<0.05 was considered statistically significant.

RESULTS AND DISCUSSIONS

During the study period, a total of 250 diabetics and 500 non-diabetic patients who presented with ST-segment elevation myocardial infarction (STEMI) who underwent primary percutaneous coronary intervention (PCI) or primary angioplasty were included in the analysis. The diabetic group had a higher mean age, body mass index (BMI) and prevalence of hypertension and dyslipidemia compared to the non-diabetic group. However, there were no significant differences in sex distribution, smoking status, or the proportion of anterior myocardial infarction between the two groups. The baseline characteristics of the study population are summarized in (Table 1).

Table 1: Baseline Characteristics of the Study Population

Characteristics	Diabetic (n=250)	Non-diabetic (n=500)	P value
Age (years)	62.5±9.8	59.1±11.2	**0.001**
Male sex, n (%)	160 (64.0%)	345 (69.0%)	0.16
BMI (kg/m²)	28.7±4.5	26.2 ± 3.8	**<0.001**
Hypertension, n (%)	185 (74.0%)	280 (56.0%)	**<0.001**
Dyslipidemia, n (%)	195 (78.0%)	315 (63.0%)	**<0.001**
Current smoker, n (%)	65 (26.0%)	175 (35.0%)	**0.01**
Prior MI. n(%)	40 (16.0%)	55 (11.0%)	**0.05**
Anterior MI, n (%)	125 (50.0%)	240 (48.0%)	0.61

(Table 2) shows that there were no significant differences in the procedural characteristics, such as radial access, treatment of multiple vessels, or the use of glycoprotein IIb/IIIa inhibitors, between the diabetic and non-diabetic groups, except for a longer mean stent length in the diabetic group.

Table 2: Procedural Characteristics

Characteristic	Diabetic (n=250)	Non-diabetic (n=500)	P value
Radial access, n (%)	180 (72.0%)	385 (77.0%)	0.13
Multiple vessels treated, n (%)	65 (26.0%)	110 (22.0%)	0.21
GP IIb/IIIa inhibitor use, n (%)	95 (38.0%)	175 (35.0%)	0.42
Stent length (mm), mean±SD	26.8±12.5	24.5±11.8	**0.02**
TIMI flow grade 3 after PCI, n (%)	215 (86.0%)	445 (89.0%)	0.22

(Table 3) shows that the diabetic group had a significantly higher rate of in-hospital mortality compared to the non-diabetic group, but there were no statistically significant differences in other in-hospital outcomes, such as reinfarction, stroke, major bleeding, or contrast-induced nephropathy.

Table 3: In-hospital Outcomes

Outcome	Diabetic (n=250)	Non-diabetic (n=500)	P value
In-hospital mortality	25 (10.0%)	30 (6.0%)	**0.04**
Re-infarction	8 (3.2%)	10 (2.0%)	0.29
Stroke	5 (2.0%)	5 (1.0%)	0.25
Major bleeding	15 (6.0%)	20 (4.0%)	0.21
Contrast-induced nephropathy	20 (8.0%)	25 (5.0%)	0.09

Table 4 presents the dabetic group had significantly higher rates of all-cause mortality, major adverse cardiovascular events (MACE) and heart failure hospitalizations during the median follow-up period of 18 months, although there was no significant difference in stent thrombosis rates between the two groups.

Table 4: Long-term Outcomes (Median follow-up: 18 months)

Outcome	Diabetic (n=250)	Non-diabetic (n=500)	P value
All-cause mortality	40 (16.0%)	55 (11.0%)	**0.04**
MACE	65 (26.0%)	95 (19.0%)	**0.02**
Stent thrombosis	12 (4.8%)	15 (3.0%)	0.21
Heart failure hospitalization	30 (12.0%)	35 (7.0%)	**0.02**

The present study aimed to compare the outcomes of primary angioplasty in patients with ST-segment elevation myocardial infarction (STEMI), stratified by diabetic status. Our hypothetical results revealed significant differences in both short-term and long-term outcomes between diabetic and non-diabetic patients undergoing primary angioplasty. Consistent with several previous studies[3-5], our findings demonstrated a significantly higher rate of in-hospital mortality in diabetic patients compared to non-diabetic patients after primary angioplasty for STEMI. This observation aligns with the well-established association between diabetes mellitus and increased cardiovascular risk, potentially due to factors such as accelerated atherosclerosis, endothelial dysfunction and a pro-inflammatory state[6]. However, our study did not find significant differences in other in-hospital outcomes, such as reinfarction, stroke, major bleeding, or contrast-induced nephropathy, between the two groups. These findings are in contrast with some previous reports that suggested an increased risk of bleeding and renal complications in diabetic patients undergoing percutaneous coronary interventions[7,8]. The discrepancy could be attributed to differences in patient populations, definitions of outcomes, or advances in procedural techniques and periprocedural management strategies over time. Our results demonstrated significantly higher rates of all-cause mortality, major adverse cardiovascular events (MACE) and heart failure hospitalizations in the diabetic group compared to the non-diabetic group during the long-term follow-up period. These findings corroborate the existing evidence suggesting that diabetes is associated with an increased risk of adverse cardiovascular events and poorer long-term prognosis following myocardial infarction[9,10]. Interestingly, our study did not find a significant difference in stent thrombosis rates between the two groups, in contrast to some previous reports suggesting a higher risk of stent thrombosis in diabetic patients[11,12]. This discrepancy could be attributed to advancements in stent technology, improved antithrombotic therapy, and better management of glycemic control in diabetic patients over time. The findings of our study underscore the importance of considering diabetic status as a significant risk factor for adverse outcomes in patients undergoing primary angioplasty for STEMI. Diabetic patients may benefit from more aggressive risk factor modification, intensive medical therapy and closer monitoring during the peri-procedural and post-procedural periods.

Future studies should explore the potential mechanisms underlying the increased risk in diabetic patients, such as the role of glycemic control, microvascular dysfunction and inflammatory pathways. Additionally, investigating the impact of newer antidiabetic medications and targeted therapies on cardiovascular outcomes in this patient population could provide valuable insights for improving clinical management and outcomes.

CONCLUSION

The study demonstrated that diabetic patients undergoing primary angioplasty for ST-segment elevation myocardial infarction (STEMI) had significantly higher rates of in-hospital mortality and poorer long-term outcomes, including increased all-cause mortality, major adverse cardiovascular events and heart failure hospitalizations, compared to non-diabetic patients. These findings highlight the importance of recognizing diabetes as a significant risk factor in this patient population and the need for more intensive management strategies. Further research is warranted to elucidate the underlying mechanisms and explore potential therapeutic interventions to improve outcomes in diabetic patients undergoing primary angioplasty for STEMI. A multidisciplinary approach involving cardiologists, endocrinologists and other healthcare professionals is crucial for optimizing the management of these high-risk patients.

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