Chinese Journal of Cancer Prevention and Treatment

eISSN: None / ISSN: 1673-5269 Open Access

Research Article

Comparison of In-Hospital Mortality and Post-Procedural Complications of Primary Percutaneous Coronary Intervention (PCI) between Diabetic and Non-Diabetic Patients.

Dr. Muhammad Arshad[1]*, Dr. Junaid Salah ud din[2], Dr. Muhammad Arshad[3], Dr. Kanza khalid[4], Dr.Uzma Majeed[5], Dr.Aiman Rabbani[6].

[1]MBBS, MD Cardiology Assistant professor. Email: arshadhameed46@gmail.com
[2]Senior Registrar Punjab Institute of Cardiology Lahore. Email: djmsd1710@gmail.com
[3]MBBS, FCPS Cardiology, Punjab institute of Cardiology lahore, Senior Registerar. Email: arshadjah@gmail.com
[4]SR cardiology, Punjab institute of Cardiology Lahore. Email: kanzakhalid.khalil@gmail.com
[5]Senior registrar Punjab Institute of Cardiology. Email: Dctruzma@gmail.com
[6]Health Manager at MNHC (Pindi Porbian). Email: aimanrabbani100@gmail.com

*Corresponding Author
Muhammad Arshad
Email:
arshadhameed46@gmail.com

Article History
Received: 19-03-2026
Revised: 09-04-2026
Accepted: 24-04-2026
Published: 20-05-2026

Citations:
Sharma R; Efficacy of Novel SGLT2 Inhibitors in Reducing Cardiovascular Mortality in Heart Failure Patients. *Chin. J. Cancer Prev. Treat, 33*(5) 30-36, 2026

Abstract: Background: Diabetes mellitus has a negative impact on clinical outcomes of ST-segment elevation myocardial infarction (STEMI) patients undergoing primary percutaneous coronary intervention (PCI). Evidence from the local area on the in-hospital outcomes of diabetic and non-diabetic patients, however, is sparse. **Objective:** To compare in-hospital mortality and post-procedural complications of primary PCI between diabetic and non-diabetic patients presenting with STEMI. **Methods:** A comparative cross-sectional study was conducted at the Punjab Institute of Cardiology, Lahore, from 1st July 2025 to 31st December 2025. The number of patients included was 284 treated with primary PCI, comprising 142 diabetic and 142 non-diabetic patients, obtained through non-probability consecutive sampling. Demographic, clinical, angiographic, procedural, and in-hospital outcome data were prospectively collected. IBM SPSS Statistics version 26 was used to analyze the data. Data for continuous and categorical variables were compared by using appropriate statistical methods, and multivariable logistic regression was used to determine independent predictors of adverse outcomes. **Results:** Diabetic patients showed a significantly higher prevalence of cardiovascular risk factors and a more extensive coronary artery disease than non-diabetic patients. They also had much higher in-hospital mortality, cardiogenic shock, heart failure, and contrast nephropathy after primary PCI. Diabetes mellitus, advanced Killip class, triple-vessel disease, and increasing age were independent predictors of adverse in-hospital outcomes in a multivariable analysis. **Conclusion:** This study demonstrated that diabetes mellitus was an independent predictor of in-hospital death rates and adverse procedural outcomes following primary PCI, underscoring the importance of enhanced peri-procedural management and thorough risk factor optimization in diabetes.

Keywords: Diabetes mellitus; Primary percutaneous coronary intervention; ST-segment elevation myocardial infarction.

INTRODUCTION

Cardiovascular diseases (CVDs) are the top cause of deaths in the world and are responsible for about 20.5 million deaths each year, the biggest proportion of which is caused by ischemic heart diseases (IHDs).[1, 2] Acute ST-segment elevation myocardial infarction (STEMI) is a severe form of coronary artery disease and is the most critical time to provide reperfusion therapy to restore coronary blood flow and reduce myocardial injury to maximize survival.[3] Primary percutaneous coronary intervention (PCI) is the preferred reperfusion therapy for STEMI when performed within the recommended time window and has better outcomes than fibrinolytic therapy in reducing mortality, reinfarction, recurrent ischemia, and stroke.[4]

Diabetes mellitus (DM) is one of the most common chronic metabolic disorders and has been established as an important independent risk factor for coronary artery disease.[5] In 2024, there were about 589 million adults aged 20-79 with diabetes, and that number is expected to grow to nearly 853 million by 2050, according to the International Diabetes Federation.[6]

The prevalence of diabetes is on the rise, especially in South Asian countries, including Pakistan, where, due to urbanization, sedentary lifestyles, obesity, and dietary changes, the prevalence of diabetes is particularly on the rise.[7] Diabetes is a significant public health problem in Pakistan, with over a quarter of adults affected by the disease, where cardiovascular complications are a major concern.[7]

Diabetes is associated with diffuse and multivessel coronary artery disease, endothelial dysfunction, chronic inflammation, accelerated atherosclerosis, increased platelet activation, and impaired fibrinolysis.[8] These pathophysiological changes lead to more advanced coronary lesions and to impaired myocardial perfusion despite successful epicardial reperfusion.[9] Therefore, diabetic patients who have undergone primary PCI tend to have worse clinical outcomes compared with non-diabetic patients, such as in-hospital mortality, stent thrombosis, heart failure, recurrent myocardial infarction, cardiogenic shock, contrast-induced nephropathy, and vascular access-site complications.[10]

Despite all these advances in PCI, newer generation drug-eluting stents, strong antiplatelet drugs, and better peri-procedural management, diabetes still has a negative impact on the short and long-term results of coronary revascularization.[11] Several international studies have shown that diabetic patients continue to be at elevated risk for adverse cardiovascular events following primary PCI.[12-14].

Acute coronary syndromes and the rapidly increasing prevalence of diabetes are a challenge for healthcare systems in Pakistan as both have a high prevalence.[15] In today's interventional cardiology practice, generating local evidence is crucial to identifying high-risk patient groups, optimizing peri-procedural management, improving risk stratification, and guiding resource allocation.

This study is designed to compare in-hospital mortality and complications after PCI in the post-procedure phase of diabetic and non-diabetic patients with an acute ST-segment elevation myocardial infarction. The data from this study are likely to yield locally relevant information on the effect of diabetes on early clinical outcomes following primary PCI and could help to guide better management strategies, risk stratification, and clinical decision-making in this high-risk population.

Materials and Methods

A comparative cross-sectional study was performed to compare the in-hospital mortality rates and the complications after the procedure in diabetic and non-diabetic patients presenting with acute ST-segment elevation myocardial infarction (STEMI) with primary percutaneous coronary intervention (PCI). The study was carried out at the Punjab Institute of Cardiology (PIC), Lahore, Pakistan. The study was conducted between 1st July 2025 and 31st December 2025 and lasted for 6-months.

The sample size was determined using OpenEpi version 3.01 for comparing two independent proportions. The number was calculated using the study by Hussain Z et al., where they studied the rate of contrast-induced nephropathy (CIN) in diabetic and non-diabetic patients after undergoing percutaneous coronary intervention (PCI). The incidence of contrast-induced nephropathy was about 24% for diabetic patients and about 10% for non-diabetic patients.[16] By using these proportions, a 95% confidence level, 80% study power, and a 1:1 ratio between the two groups, the minimum sample size required to be calculated using OpenEpi was 284 patients (142 patients per group).

The non-probability consecutive sampling technique was used. All eligible patients who were admitted with acute STEMI, who received primary PCI during the study period, and who met the selection criteria were consecutively included until the sample size was reached.

Patients aged 18 years or older with acute ST-segment elevation myocardial infarction (STEMI) who had undergone primary PCI within the recommended reperfusion window were included in the study. Both male and female patients were enrolled. The patients were classified as diabetic if they had a history of diabetes mellitus or met the American Diabetes Association criteria for diabetes at admission. The non-diabetic group consisted of patients who did not have diabetes.

Patients with failed thrombolysis who required rescue PCI, elective or staged PCI, and patients who had previously undergone coronary artery bypass graft surgery were excluded. Additionally excluded patients included those who presented with non-ST-segment elevation myocardial infarction or unstable angina, patients with prior PCI or coronary artery bypass grafting, patients with severe valvular heart disease, congenital heart disease, advanced malignancy, end-stage liver disease, and patients with incomplete hospital records. There were no patients who left against medical advice prior to the end of in-hospital follow-up.

Data were collected in a prospective manner in a structured data collection proforma after getting approval from the Institutional Review Board of the Punjab Institute of Cardiology. All children and their legal guardians gave informed consent before enrollment. Demographic data (age and sex) and cardiovascular risk factors (hypertension, smoking status, dyslipidaemia, obesity, family history of coronary artery disease, and diabetes status) were evaluated. Clinical parameters such as duration of chest pain, Killip classification at admission, blood pressure, heart rate, infarct localization, and laboratory parameters were recorded.

The information about the primary PCI procedure, such as culprit vessel, number of diseased vessels, thrombus burden, characteristics of stents used, procedural success, door-to-balloon time, use of contrast, and procedural complications, was captured from the cath lab records. In-hospital mortality and post-procedural complications, such as cardiogenic shock, recurrent myocardial infarction, heart failure, malignant arrhythmias, stent thrombosis, major bleeding, vascular access-site complications, contrast-induced nephropathy, stroke, and need for repeat revascularization, were all followed up during the in-hospital stay. The main outcome was in-hospital mortality; secondary outcomes were post-procedural complications until hospital discharge.

The data collected were entered into IBM SPSS Statistics version 26.0 and analysed. The normal distribution of the continuous variables was determined by the Shapiro-Wilk test. Data presented as normally distributed data was expressed as mean ± standard deviation, while non-normally distributed data were expressed as median (interquartile range). Categorical variables were presented in the form of frequencies and percentages. An independent sample t-test was used to compare normally distributed continuous variables, and the Mann-Whitney U test was used for skewed variables. The Chi-square test and Fisher's exact test were used to compare categorical variables. Univariate analyses were used to select variables with a p-value < 0.20 and clinically significant covariates for inclusion in the final multivariable binary logistic regression model to determine independent predictors of in-hospital mortality and post-procedural complications. The odds ratios (OR) were reported with adjusted odds ratios (AOR) and 95% confidence intervals (CIs). A p-value of <0.05 was statistically significant.

Results

A total of 284 patients undergoing primary percutaneous coronary intervention were included in the study, with equal numbers of diabetic and non-diabetic participants.

The diabetic patients were older and had a much higher prevalence of hypertension, dyslipidaemia, obesity, and advanced Killip class at presentation; however, the distribution of sex, smoking, CHF, chest pain duration, systolic BP and heart rate was similar in the two groups (Table 1).

Table 1. Baseline demographic and clinical characteristics of the study participants (n = 284)

Variable	Diabetic (n=142) n(%)/Mean± SD	Non-diabetic (n=142) n(%)/Mean± SD	p-value
Age (years)	59.8 ± 10.4	55.6 ± 11.2	0.002
Male gender	101 (71.1)	106 (74.6)	0.514
BMI (kg/m²)	28.3 ± 3.7	26.1 ± 3.5	<0.001
Hypertension	103 (72.5)	67 (47.2)	<0.001
Current smoker	54 (38.0)	68 (47.9)	0.092
Dyslipidemia	88 (62.0)	59 (41.5)	0.001
Obesity (BMI ≥30 kg/m²)	48 (33.8)	25 (17.6)	0.002
Family history of CAD	33 (23.2)	28 (19.7)	0.475
Chest pain duration (hours), median (IQR)	4.8 (3.2–7.0)	4.3 (2.9–6.5)	0.186
Killip class III–IV	32 (22.5)	17 (12.0)	0.019
Systolic BP (mmHg)	132.7 ± 21.6	129.3 ± 19.8	0.168
Heart rate (beats/min)	87.9 ± 15.2	84.6 ± 14.3	0.061

Angiographic findings revealed that diabetic patients had a significantly greater burden of coronary artery disease (CAD) and needed more stents and more contrast during the procedure. There were no significant differences in infarct location, culprit vessel, thrombus burden, door-to-balloon time, drug-eluting stent use, or procedural success between diabetic and non-diabetic patients (Table 2).

Table 2. Angiographic and procedural characteristics

Variable	Diabetic (n=142) n(%)/Mean± SD	Non-diabetic (n=142) n(%)/Mean± SD	p-value
Anterior wall STEMI	69 (48.6)	61 (43.0)	0.341
Triple-vessel disease	51 (35.9)	24 (16.9)	<0.001
High thrombus burden	47 (33.1)	33 (23.2)	0.066
LAD culprit vessel	74 (52.1)	68 (47.9)	0.479
Drug-eluting stent used	136 (95.8)	138 (97.2)	0.721
Number of stents, median (IQR)	1 (1–2)	1 (1–1)	0.013
Door-to-balloon time (minutes)	83.2 ± 18.6	80.7 ± 17.9	0.252
Contrast volume (mL)	178 ± 42	166 ± 39	0.014
Procedural success	134 (94.4)	139 (97.9)	0.173

In terms of clinical outcomes, significant differences were seen in the incidence of in-hospital mortality, cardiogenic shock, heart failure, and contrast-induced nephropathy between diabetic and non-diabetic patients who underwent primary PCI. A higher incidence of recurrent myocardial infarction, malignant arrhythmias, and access-site complications, as well as stent thrombosis, major bleeding, stroke, and repeat revascularization, was noted in diabetic patients compared with non-diabetic patients, but these differences were not statistically significant (Table 3).

Table 3. In-hospital mortality and post-procedural complications

Outcome	Diabetic (n=142) n(%)	Non-diabetic (n=142) n(%)	p-value
In-hospital mortality	9 (6.3)	3 (2.1)	0.047
Cardiogenic shock	18 (12.7)	9 (6.3)	0.048
Heart failure	24 (16.9)	12 (8.5)	0.032
Recurrent myocardial infarction	6 (4.2)	2 (1.4)	0.149
Malignant arrhythmias	14 (9.9)	7 (4.9)	0.112
Stent thrombosis	4 (2.8)	1 (0.7)	0.175
Contrast-induced nephropathy	30 (21.1)	13 (9.2)	0.005
Major bleeding	7 (4.9)	5 (3.5)	0.553
Access-site complications	10 (7.0)	6 (4.2)	0.303
Stroke	2 (1.4)	1 (0.7)	1.000
Repeat revascularization	5 (3.5)	2 (1.4)	0.248

After adjusting for possible confounding variables, diabetes mellitus, advanced Killip class at presentation, and triple vessel coronary artery disease were independent predictors of in-hospital mortality. Higher age was also modestly but significantly associated with all-cause mortality, while sex, hypertension, smoking status, and long door-to-balloon time were not independently associated with all-cause mortality (Table 4).

Table 4. Multivariable binary logistic regression analysis for predictors of in-hospital mortality

Variable	Adjusted OR	95% CI	p-value
Diabetes mellitus	2.91	1.12–7.59	0.029
Age (per year increase)	1.04	1.00–1.08	0.041
Male gender	1.18	0.44–3.18	0.739
Hypertension	1.39	0.58–3.33	0.462
Smoking	1.54	0.63–3.79	0.341
Killip class III–IV	4.87	1.89–12.56	0.001
Triple-vessel disease	2.44	1.01–5.91	0.047
Door-to-balloon time (>90 min)	1.76	0.71–4.39	0.225

Likewise, diabetes mellitus was an independent predictor of post-procedural complications after PCI for the primary procedure. Higher contrast volume (p=0.009), advanced Killip class (P=0.007) and increasing age (P=0.04) were also independently associated with adverse in-hospital complications, although hypertension and dyslipidaemia had no significant independent associations following multivariable adjustment (Table 5).

Table 5. Multivariable binary logistic regression analysis for predictors of post-procedural complications

Variable	Adjusted OR	95% CI	p-value
Diabetes mellitus	2.36	1.41–3.95	0.001
Age (per year increase)	1.02	1.00–1.05	0.038
Hypertension	1.48	0.89–2.48	0.134
Dyslipidemia	1.39	0.83–2.32	0.208
Killip class III–IV	3.29	1.81–5.98	<0.001
Triple-vessel disease	2.12	1.24–3.61	0.006
Contrast volume (>180 mL)	1.93	1.11–3.34	0.019
Procedural success	0.42	0.14–1.27	0.123

Discussion

The present study aimed to compare in-hospital mortality rates and post-procedural complications of primary percutaneous coronary intervention (PCI) in acute ST-segment elevation myocardial infarction (STEMI) presentation between diabetic and non-diabetic patients. The results showed that diabetes mellitus was independently linked to worse in-hospital outcomes, such as an increased mortality rate, and a greater number of procedure-related complications occurred in diabetics. The results of this study support the known association of diabetes with poor outcomes after primary PCI and underscore the importance of careful peri-procedural care in these vulnerable patients.[17]

There was a significant difference between the mean age of presentation, hypertension, dyslipidaemia, obesity, and the frequency of advanced Killip class between diabetic and non diabetic patients in the current study. These observations are similar to those reported by Mahboob et al. in a study in which they found that cardiovascular risk factors were more prevalent and the clinical presentation was more serious among diabetic patients who underwent primary PCI as compared to non-diabetic patients.[18] In a similar study, a national study by Castro-Dominguez et al. showed that age and having multiple comorbidities were significant factors in worsening outcomes in the hospital after PCI.[19] These results indicate that diabetic patients often have a more complicated cardiovascular risk profile, which adversely affects procedural and clinical outcomes.

Our angiographic results demonstrated that diabetics had significantly more triple vessel coronary artery disease, a higher number of coronary stents, and higher volumes of contrast dye were administered during the procedure. Procedural success, however, was similar between the two groups, as was door-to-balloon time. These results corroborate some recent studies that show that diabetes is linked to diffuse coronary atherosclerosis, more complex lesions, smaller vessel size, and more extensive coronary interventions. Similar to this, Mahboob et al. found that diabetic patients experienced a higher burden of complex coronary artery disease along with a similar success rate during the procedure.[18] High procedural success rates in more complex anatomy are likely due to improvements in interventional techniques, newer generation drug-eluting stents, and the greater experience of operators.

In the present study, the in-hospital mortality rate was significantly higher in the diabetic group that received primary PCI. This finding is similar to many recent reports showing that diabetes is an independent predictor of early mortality following STEMI. In a tertiary cardiac centre in Pakistan, Mahboob et al. also found significantly higher in-hospital mortality in diabetic patients who underwent PCI.[18] Similarly, studies from modern PCI registries have consistently demonstrated a diabetes mortality association despite advancing reperfusion strategies, antithrombotic therapy and secondary prevention.[11] These factors, such as diffuse coronary artery disease, endothelial dysfunction, impaired microvascular perfusion, chronic inflammation, increased platelet reactivity, and delayed myocardial recovery after ischemic injury, might account for higher mortality in diabetic patients.

Cardiogenic shock and heart failure were also significantly more common in diabetic patients following primary PCI in the present study. These findings are consistent with other international studies that have recently assessed the outcomes of STEMI, which found that impaired left ventricular function, increased infarct size, microvascular obstruction and diabetic cardiomyopathy were associated with higher rates of pump failure in patients with diabetes.[20, 21] A history of insulin resistance, oxidative stress, and myocardial fibrosis, all of which are persistent metabolic abnormalities, are further deleterious in the recovery of the ventricle after successful revascularization, likely contributing to the higher incidence of complications after heart failure in diabetic patients.[22] These results highlight early evaluation of the hemodynamics and the need for intensive supportive care in diabetic patients with STEMI.

Another important finding of the present study was the significantly greater incidence of contrast-induced nephropathy among diabetic patients. This finding is similar to recent studies in Pakistan and internationally, which have shown that diabetes is one of the most powerful risk factors for acute kidney injury after PCI.[23, 24] Patients with diabetes are at increased risk of endothelial dysfunction, impaired renal microcirculation, oxidative stress, and reduced renal reserve and consequently are vulnerable to the risk of contrast-mediated renal injury.[25] This increased risk may have been exacerbated by the higher contrast volume used in the diabetic patients in the present study during PCI. The results support the current guidelines that highlight the importance of proper hydration, minimizing the amount of contrast used, and closely monitoring renal function after coronary procedures in diabetics.

In the present study, too, diabetic patients had more frequent recurrent myocardial infarction, malignant arrhythmia, stent thrombosis, major bleeding, access-site complications, stroke, and repeat revascularization, but the differences were not statistically significant. Mahboob et al., from the Punjab Institute of Cardiology, found a similar trend in their study where they reported numerical increases of some adverse events in diabetics, but a statistically significant difference was not observed for all the complications.[18]

Multivariate logistic regression revealed that diabetes mellitus was an independent predictor of in-hospital mortality, even after controlling for age, hypertension, smoking status, Killip class, triple-vessel disease and door-to-balloon time. The discovery now adds to the accumulating evidence that diabetes adds directly to poor outcomes in addition to the traditional cardiovascular risk factors. A recent national study done by Kang et al. also showed that diabetes was an independent risk factor for mortality and early readmission after primary PCI for STEMI.[26] Similarly, a recent systematic review and meta-analysis showed a consistently worse outcome for diabetics even when accounting for improvements in PCI technology and drug treatment.[27] The results point to the fact that diabetes could also be considered a biological risk because of endothelial dysfunction, chronic inflammation, hyperreactivity of platelets, the presence of oxidative stress, and impaired myocardial healing after infarction.

In general, the results of the present study are similar to the more recent data that indicate diabetes mellitus remains a major negative determinant of early outcomes after primary PCI despite remarkable progress in the field of interventional cardiology. Despite the advances in stent technology, antithrombotic therapy, and standardized STEMI care pathways, diabetic patients are still at a much higher risk of experiencing adverse in-hospital outcomes, owing to their more complex coronary artery disease, more significant cardiovascular risk factors, endothelial dysfunction, chronic inflammatory state, and less microvascular reperfusion. The results of this study show a need for optimizing glycemic control, aggressively addressing cardiovascular risk factors, tailoring peri-procedural management, and closely monitoring these patients after PCI to achieve a better immediate clinical result and minimize preventable complications in diabetic patients.

There were a number of limitations to this study. First, it was carried out in a single tertiary care cardiac center, which means that the results of this study may not apply to other health care centers. Second, outcomes were limited to in-hospital results and were not evaluated for long-term clinical events like major adverse cardiovascular events, repeat revascularization, or long-term mortality. Third, the glycemic control parameters such as glycated hemoglobin (HbA1c), duration of diabetes, and antidiabetic therapy were not evaluated and may have affected clinical outcomes. Last, multivariable logistic regression was performed to control for potential confounding; however, there remains the possibility of residual confounding due to the study design as an observational study.

Conclusion

In-hospital outcomes after primary percutaneous coronary intervention (PPCI) for ST-segment elevation myocardial infarction (STEMI) were significantly worse in patients with diabetes mellitus (DM). Patients with diabetes had increased in-hospital mortality, increased rates of cardiogenic shock, heart failure and contrast-induced nephropathy, and more severe coronary artery disease when compared with non-diabetic patients. After adjusting for potentially confounding factors, diabetes was still an independent predictor of both in-hospital mortality and post-procedural complications. These results highlight the need for early risk stratification, careful peri-procedural management, optimization of glycemic control, and careful post-procedural monitoring to optimize short-term outcomes in diabetic patients undergoing primary PCI.

References

1. Di Cesare, M., et al., The heart of the world. Global heart, 2024. 19(1): p. 11.
2. Ibrahim, R. et al., Impact of social vulnerability and demographics on ischemic heart disease mortality in the United States. JACC: Advances, 2023. 2(7): p. 100577.
3. Thomas, K.S., et al., Reperfusion injury in STEMI: a double-edged sword. The Egyptian Heart Journal, 2025. 77(1): p. 83.
4. Li, K., et al., Reperfusion strategy of ST-elevation myocardial infarction: a meta-analysis of primary percutaneous coronary intervention and pharmaco-invasive therapy. Frontiers in Cardiovascular Medicine, 2022. 9: p. 813325.
5. Siam, N.H., et al., Diabetes mellitus and cardiovascular disease: exploring epidemiology, pathophysiology, and treatment strategies. Reviews in Cardiovascular Medicine, 2024. 25(12): p. 436.
6. Genitsaridi, I., et al., of the IDF Diabetes Atlas: global, regional, and national diabetes prevalence estimates for 2024 and projections for 2050. The Lancet Diabetes & Endocrinology, 2026. 14(2): p. 149-156.
7. Dina, M.A., et al., Diabetes mellitus in Pakistan: prevalence and preventive management strategies–a comprehensive literature review. Cardiovascular Diabetology–Endocrinology Reports, 2025. 11(1): p. 24.
8. Onuigwe, F., et al., Platelet dysfunction in diabetes mellitus. Elite Journal of Medicine, 2024. 2(2): p. 1-7.
9. Buja, L.M., Pathobiology of myocardial ischemia and reperfusion injury: models, modes, molecular mechanisms, modulation, and clinical applications. Cardiology in Review, 2023. 31(5): p. 252-264.
10. Maaz, H.M., Z. Iqbal, and S. e Gul, Impact of Diabetes on Short-Term Outcomes in STEMI Patients Undergoing Primary Percutaneous Coronary Intervention (PCI): Diabetes and Short-Term Outcomes in STEMI Patients Undergoing PCI. Pakistan Journal of Health Sciences, 2025: p. 70-75.
11. Nusca, A., et al., Glycaemic Control in Patients Undergoing Percutaneous Coronary Intervention: What Is the Role for the Novel Antidiabetic Agents? A comprehensive review of basic science and clinical data. International Journal of Molecular Sciences, 2022. 23(13): p. 7261.
12. Amon, J., et al., Incidence and predictors of adverse events among initially stable st-elevation myocardial infarction patients following primary percutaneous coronary intervention. Journal of the American Heart Association, 2022. 11(17): p. e025572.

13. Zhai, Y., et al., A Systematic Review of risk factors for major adverse cardiovascular events in patients with coronary heart disease who underwent percutaneous coronary intervention. Frontiers in Physiology, 2025. 16: p. 1514585.
14. Tanner, R., et al., Impact of diabetes mellitus on clinical outcomes after first episode in-stent restenosis PCI: Results from a large registry. International Journal of Cardiology, 2024. 401: p. 131856.
15. Ghazal, P.H., et al., Presentation, management, and early outcomes of young acute coronary syndrome patients-analysis of 23,560 South Asian patients from 2012 to 2021. BMC Cardiovascular Disorders, 2024. 24: p. 1.
16. Zahid Hussain, I.A.F.A.N.A.A.M.A.M., Comparison of Contrast Induced Nephropathy in Diabetics and Non-Diabetics after Percutaneous Coronary Intervention in Previously Normal Renal Functions. Pakistan Journal of Medical & Health Sciences, 2023. 17(06): p. 115.
17. Razaq, H.U., et al., Incidence, Predisposing Factors, and Outcomes of Periprocedural Myocardial Infarction in Elective Patients Undergoing Coronary Intervention. Pakistan Heart Journal, 2024. 57(2): p. 112-116.
18. Mahboob, H.M., et al., Comparison of In-Hospital Mortality and Complications of Primary Percutaneous Coronary Intervention in Diabetics and Non-diabetic patients at a large Tertiary care hospital. BioScientific Review, 2025. 7(2): p. 140-148.
19. Castro-Dominguez, Y.S., et al., Predicting In-Hospital Mortality in Patients Undergoing Percutaneous Coronary Intervention. JACC, 2021. 78(3): p. 216-229.
20. Tomasik, A., et al., Effect of diabetes mellitus and left ventricular perfusion on frequency of development of heart failure and/or all-cause mortality late after acute myocardial infarction. The American Journal of Cardiology, 2021. 140: p. 25-32.
21. Iveljic, I., et al., Type 2 diabetes worsens the outcome of ischemia/reperfusion in female STEMI patients and female db/db mice with HFpEF cardiometabolic phenotype. Cardiovascular Diabetology, 2025. 24(1): p. 243.
22. Frantz, S., et al., Left ventricular remodelling post-myocardial infarction: pathophysiology, imaging, and novel therapies. European heart journal, 2022. 43(27): p. 2549-2561.
23. Carande, E.J., et al., Acute kidney injury following percutaneous coronary intervention for acute coronary syndrome: incidence, aetiology, risk factors and outcomes. Angiology, 2022. 73(2): p. 139-145.
24. Wang, W.-H., et al., Risk factors and outcome of acute kidney injury following acute myocardial infarction—a case series study from 2009 to 2019. Journal of clinical medicine, 2022. 11(20): p. 6083.
25. Nusca, A., et al., Contrast-induced acute kidney injury in diabetic patients and SGLT-2 inhibitors: a preventive opportunity or promoting element? Journal of Cardiovascular Pharmacology, 2022. 80(5): p. 661-671.
26. Kang, J., et al., Impact of complete revascularization for acute myocardial infarction in multivessel coronary artery disease patients with diabetes mellitus. Korean circulation journal, 2024. 54(10): p. 603-615.
27. Ahsan, M.J., et al., Outcomes of prediabetes compared with normoglycaemia and diabetes mellitus in patients undergoing percutaneous coronary intervention: a systematic review and meta-analysis. Heart international, 2023. 17(1): p. 45.