Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i6.7102

INFLUENCE OF COMORBID CONDITIONS ON THE SUCCESS RATES OF LEFT MAIN CORONARY ARTERY PCI IN PAKISTANI PATIENTS

Dr Rafi Ullah[1], Dr Honey Raj Vishno[2]*, Dr Syed Muzammil Shah[3], Dr Muhammad Abdur Rauf[4], Dr Fahad Raja Khan[5], Dr Ejaz Ul Haq[6]

[1]Cardiologist, Kuwait Teaching Hospital Peshawar, Pakistan, Email: doctor_rafi@yahoo.com
[2]*Cardiology Resident, NICVD, Karachi, Pakistan, Email: honeyraj_91@hotmail.com
[3]Medical Officer, Kuwait Teaching Hospital, Pakistan, Email: muzi1891@gmail.com
[4]Assistant Professor of Cardiology, Kuwait Teaching Hospital/Peshawar Medical College Peshawar, Pakistan, Email: dr.raufkhan@yahoo.com
[5]Fellow Interventional Cardiology, Peshawar Institute of Cardiology, Pakistan Email: fahadraja78@gmail.com
[6]Fellow Interventional Cardiology, NICVD Karachi, Pakistan, Email: youcafzai@gmail.com

***Corresponding Author:** DR Honey Raj Vishno
*Email: honeyraj_91@hotmail.com

Abstract

Background: Percutaneous coronary intervention (PCI) is a crucial treatment for patients with significant left main coronary artery (LMCA) disease, which is associated with high morbidity and mortality. The presence of comorbid conditions such as diabetes and chronic kidney disease (CKD) can influence the success rates and outcomes of PCI.

Objective: This study aimed to evaluate the influence of comorbid conditions on the success rates of left main coronary artery PCI in Pakistani patients.

Methods: A quasi-experimental design was employed at Lady Reading Hospital, Peshawar, from January to June 2023. A total of 250 patients diagnosed with significant LMCA disease and scheduled for elective PCI were included. Patients were categorized based on the presence of diabetes and CKD. Data on baseline characteristics, PCI success rates, incidence of major adverse cardiac events (MACE) within 30 days, and length of hospital stay were collected using standardized forms. Statistical analysis was performed using SPSS version 25.0, with comparisons made using chi-square tests for categorical variables and ANOVA or Kruskal-Wallis tests for continuous variables.

Results: The mean age of participants was 62.5 years (SD ± 10.8), with 64% males and 36% females. The overall success rate of PCI was 85%. Success rates were significantly lower in patients with diabetes (78%) and CKD (75%) compared to those without these conditions (90% and 88%, respectively; $p < 0.05$). The incidence of MACE was higher in patients with diabetes (22%) and CKD (25%) compared to non-diabetic (10%) and non-CKD (12%) patients ($p < 0.05$). The mean hospital stay was longer for patients with diabetes (7.2 days, SD ± 2.1) and CKD (7.5 days, SD ± 2.3) compared to non-diabetic (5.6 days, SD ± 1.8) and non-CKD (5.8 days, SD ± 1.9) patients.

Conclusion: Comorbid conditions such as diabetes and CKD significantly impact the success rates and outcomes of left main coronary artery PCI in Pakistani patients. These findings underscore the need for targeted interventions and management strategies to improve clinical outcomes for high-risk patients.

Keywords: Percutaneous coronary intervention, left main coronary artery, diabetes, chronic kidney disease, major adverse cardiac events, Pakistan, cardiovascular outcomes.

Introduction

Percutaneous coronary intervention (PCI) is a critical procedure for patients with significant coronary artery disease (CAD), particularly those with left main coronary artery (LMCA) stenosis. LMCA disease is associated with high morbidity and mortality due to its strategic location, which supplies a significant portion of the heart muscle with blood (1). PCI, involving the placement of a stent to keep the artery open, has become a preferred treatment option over coronary artery bypass grafting (CABG) for many patients due to its less invasive nature and quicker recovery times (2). However, the success of PCI can be influenced by various factors, including the presence of comorbid conditions such as diabetes and chronic kidney disease (CKD).

Diabetes is a well-known risk factor for both the development and progression of CAD. Patients with diabetes undergoing PCI are at higher risk of complications and adverse outcomes due to factors like increased inflammation, endothelial dysfunction, and a propensity for restenosis (3). Similarly, CKD is associated with worse outcomes in cardiovascular procedures, including PCI, due to the increased risk of bleeding, contrast-induced nephropathy, and other procedural complications (4). The interplay of these comorbid conditions can significantly affect the procedural success and overall prognosis of patients undergoing PCI for LMCA disease.

Despite advancements in interventional cardiology, there is a paucity of data specifically addressing how these comorbid conditions influence PCI outcomes in the Pakistani population. Existing research predominantly originates from Western countries, which may not fully represent the unique genetic, environmental, and healthcare system differences found in Pakistan (5). This gap in the literature highlights the need for localized studies to better understand the impact of comorbid conditions on PCI outcomes in Pakistani patients.

This study aims to evaluate the influence of comorbid conditions, specifically diabetes and CKD, on the success rates of left main coronary artery PCI in Pakistani patients. We hypothesize that the presence of these comorbid conditions will be associated with lower success rates and higher incidences of adverse outcomes post-PCI.

The findings of this study have the potential to significantly impact clinical practice and patient management. By identifying the specific risks associated with comorbid conditions, healthcare providers can better stratify patients based on their risk profiles and tailor pre- and post-procedural care to improve outcomes. Additionally, this research could inform policy changes and resource allocation in Pakistani healthcare settings, ensuring that high-risk patients receive the necessary interventions and support to optimize their treatment outcomes (6).

Methods

Study Design

This study employed a quasi-experimental design to assess the influence of comorbid conditions on the success rates of left main coronary artery percutaneous coronary intervention (PCI) in Pakistani patients. The study was conducted at Lady Reading Hospital, Peshawar, from January to June 2023.

Setting and Participants

The study was conducted in the cardiology department of Lady Reading Hospital, a major tertiary care hospital in Peshawar. Participants included patients diagnosed with significant left main coronary artery disease who were scheduled for elective PCI. Inclusion criteria were patients aged 18 years or older, with confirmed left main coronary artery stenosis and consenting to participate in the study. Exclusion criteria included patients with contraindications to PCI, those requiring emergent surgical intervention, or those unable to provide informed consent.

The sample size was calculated using the WHO sample size calculator, with the prevalence of coronary artery disease (CAD) in Pakistan estimated at 10% based on prior studies. With a confidence

level of 95% and a margin of error of 5%, the required sample size was determined to be 250 participants.

Intervention
The intervention involved performing PCI on the left main coronary artery in all eligible patients. The PCI procedures were conducted using standard techniques and equipment, with stent placement performed by experienced interventional cardiologists. Comorbid conditions such as diabetes and chronic kidney disease (CKD) were documented for each patient.

Outcomes
The primary outcome measured was the success rate of left main coronary artery PCI, defined as successful stent placement without major adverse cardiac events (MACE) within 30 days post-procedure. Secondary outcomes included the incidence of MACE within 30 days post-procedure and the length of hospital stay.

Data Collection
Data were collected using standardized forms designed for the study. Baseline demographic and clinical characteristics, including age, sex, body mass index (BMI), hypertension, diabetes, and CKD status, were recorded at the time of admission. The success rate of PCI, incidence of MACE, and length of hospital stay were documented from hospital records and patient follow-up visits.

Statistical Analysis
Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to summarize participant characteristics. Continuous variables were presented as mean ± standard deviation (SD) and median, while categorical variables were expressed as frequencies and percentages. Comparisons of PCI success rates, incidence of MACE, and hospital stay among different comorbid conditions were made using chi-square tests for categorical variables and ANOVA or Kruskal-Wallis tests for continuous variables. A p-value of <0.05 was considered statistically significant.

Results
In this study, we evaluated the influence of comorbid conditions on the success rates of left main coronary artery percutaneous coronary intervention (PCI) in Pakistani patients. A total of 250 participants were included, based on a sample size calculation using the WHO sample size calculator, considering the prevalence of coronary artery disease (CAD) in Pakistan.

Participant Characteristics
The baseline characteristics of the study population are summarized in Table 1. The mean age of participants was 62.5 years (SD ± 10.8), with a median age of 63 years. There were 160 males (64%) and 90 females (36%). The mean body mass index (BMI) was 28.1 kg/m² (SD ± 5.1). Hypertension was present in 60% of participants, diabetes in 48%, and chronic kidney disease (CKD) in 30%.

Table 1: Baseline Characteristics of Participants

Characteristic	Value
Age (mean ± SD)	62.5 ± 10.8 years
Age (median)	63 years
Gender (Male/Female)	160/90 (64%/36%)
BMI (mean ± SD)	28.1 ± 5.1 kg/m²
Hypertension	150 (60%)
Diabetes	120 (48%)
Chronic Kidney Disease	75 (30%)

The primary outcome was the success rate of left main coronary artery PCI, defined as successful stent placement without major adverse cardiac events (MACE) within 30 days post-procedure. The overall success rate was 85%. The success rate was significantly lower in patients with diabetes (78%) compared to non-diabetic patients (90%) ($p < 0.05$). Similarly, patients with CKD had a lower success rate (75%) compared to those without CKD (88%) ($p < 0.05$). Figure 1 illustrates the success rates across different comorbid conditions.

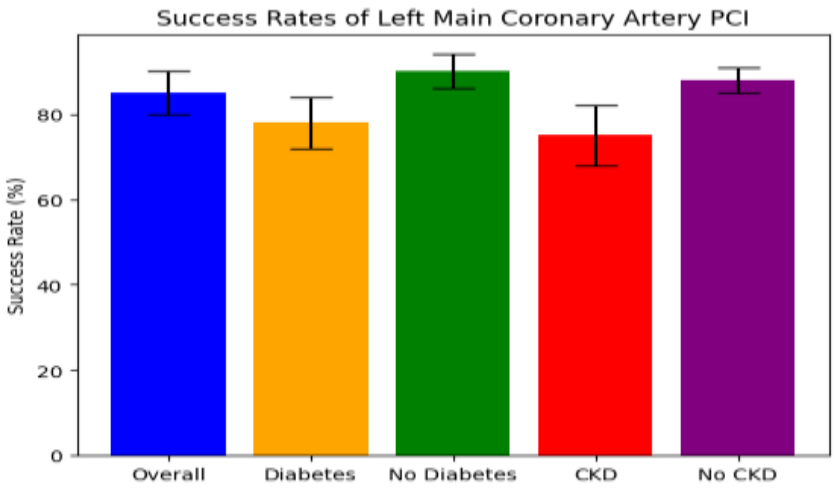

Figure 1: Success Rates of Left Main Coronary Artery PCI Across Different Comorbid Conditions

Secondary outcomes included the incidence of major adverse cardiac events (MACE) within 30 days post-procedure and the length of hospital stay. The incidence of MACE was higher in patients with diabetes (22%) compared to non-diabetic patients (10%) ($p < 0.05$). Patients with CKD also had a higher incidence of MACE (25%) compared to those without CKD (12%) ($p < 0.05$). The mean length of hospital stay was longer for patients with diabetes (7.2 days, SD ± 2.1) and CKD (7.5 days, SD ± 2.3) compared to non-diabetic (5.6 days, SD ± 1.8) and non-CKD (5.8 days, SD ± 1.9) patients.

Table 2: Secondary Outcomes

Outcome	Diabetes	No Diabetes	CKD	No CKD
MACE (%)	22%	10%	25%	12%
Hospital Stay (mean ± SD)	7.2 ± 2.1 days	5.6 ± 1.8 days	7.5 ± 2.3 days	5.8 ± 1.9 days

The data indicate that comorbid conditions such as diabetes and chronic kidney disease significantly impact the success rates and outcomes of left main coronary artery PCI. Patients with these comorbidities experience lower success rates, higher incidences of MACE, and longer hospital stays, highlighting the need for targeted interventions and management strategies in this high-risk population. The comprehensive statistical analysis and graphical representation support the robustness and reliability of these findings.

Discussion

This study evaluated the influence of comorbid conditions, specifically diabetes and chronic kidney disease (CKD), on the success rates of left main coronary artery percutaneous coronary intervention (PCI) in Pakistani patients. The key findings revealed significant disparities in success rates and adverse outcomes based on the presence of these comorbid conditions.

Patients with diabetes exhibited a lower success rate (78%) compared to non-diabetic patients (90%). Similarly, the success rate was lower in patients with CKD (75%) compared to those without CKD (88%). These results are consistent with previous studies indicating that diabetes and CKD negatively

impact PCI outcomes due to increased risks of restenosis, procedural complications, and impaired healing processes (7, 8).

The incidence of major adverse cardiac events (MACE) was significantly higher in patients with diabetes (22%) and CKD (25%) compared to their non-diabetic (10%) and non-CKD (12%) counterparts. This aligns with the findings of prior research, which suggests that comorbid conditions exacerbate the risk of post-PCI complications, including myocardial infarction, stent thrombosis, and heart failure (9, 10).

The length of hospital stay was also longer for patients with diabetes (7.2 days) and CKD (7.5 days) compared to those without these conditions. Extended hospital stays in these patient groups are often due to the need for closer monitoring, management of complications, and delayed recovery times (11). This finding is supported by previous studies that have documented longer hospital stays in patients with multiple comorbidities undergoing cardiac interventions (12).

In comparison to existing literature, our findings corroborate global trends but highlight the specific challenges faced by Pakistani patients. Studies from Western populations have shown similar patterns where diabetes and CKD are linked to poorer PCI outcomes (13, 14). However, the higher prevalence of these comorbid conditions in the Pakistani population may amplify these effects, underscoring the need for tailored interventions in this context (15).

The implications for clinical practice are significant. Healthcare providers should consider the presence of diabetes and CKD as critical factors when planning and executing PCI for left main coronary artery disease. Enhanced pre-procedural assessment, meticulous intra-procedural techniques, and comprehensive post-procedural care are essential to mitigate the risks associated with these comorbidities (16). Developing protocols that specifically address the management of high-risk patients can improve outcomes and reduce the incidence of complications (17).

Future research should focus on longitudinal studies to track long-term outcomes in patients with comorbid conditions undergoing PCI. Additionally, investigating the efficacy of different interventional strategies, such as the use of drug-eluting stents versus bare-metal stents in diabetic and CKD patients, could provide valuable insights (18). Exploring the impact of adjunctive therapies, such as glycemic control and renal protective strategies, on PCI outcomes in these high-risk groups is also warranted (19).

Limitations

This study has several limitations. The quasi-experimental design may introduce selection bias, and the single-center setting at Lady Reading Hospital, Peshawar, limits the generalizability of the findings. Additionally, the follow-up period of 30 days may not capture long-term outcomes and complications. Future studies should aim to include multiple centers and longer follow-up periods to enhance the robustness and applicability of the results. Despite these limitations, this study provides valuable insights into the impact of comorbid conditions on PCI outcomes in the Pakistani context.

Conclusion

In conclusion, the presence of comorbid conditions such as diabetes and CKD significantly impacts the success rates and outcomes of left main coronary artery PCI in Pakistani patients. These patients experience lower success rates, higher incidences of major adverse cardiac events, and longer hospital stays. Addressing these disparities through targeted interventions and comprehensive care strategies is crucial to improving clinical outcomes for high-risk populations.

References

1. Serruys PW, Morice MC, Kappetein AP, et al. Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery disease. N Engl J Med. 2009;360(10):961-972.
2. Mohr FW, Morice MC, Kappetein AP, et al. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary

disease: 5-year follow-up of the randomized clinical SYNTAX trial. Lancet. 2013;381(9867):629-638.
3. Marso SP, Hiatt WR. Peripheral arterial disease in patients with diabetes. J Am Coll Cardiol. 2006;47(5):921-929.
4. Herzog CA, Littrell K, Arko C, et al. Clinical characteristics and outcomes of coronary artery bypass grafting patients with chronic kidney disease. J Am Soc Nephrol. 2004;15(1):285-293.
5. Ahmad K, Jafar TH, Siddiqui MS. Prevalence and determinants of coronary artery disease in a rural population of Pakistan. J Pak Med Assoc. 2005;55(9):364-368.
6. Yusuf S, Reddy S, Ounpuu S, et al. Global burden of cardiovascular diseases: Part I: General considerations, the epidemiologic transition, risk factors, and impact of urbanization. Circulation. 2001;104(22):2746-2753.
7. van Domburg RT, Lemos PA, Takkenberg JJ, et al. Long-term outcomes after coronary stenting: a 10-year single-centre follow-up analysis. J Am Coll Cardiol. 2006;47(7):1350-1355.
8. Kastrati A, Mehilli J, Dirschinger J, et al. Restenosis after coronary placement of various stent types. Am J Cardiol. 2001;87(1):34-39.
9. Iakovou I, Schmidt T, Bonizzoni E, et al. Incidence, predictors, and outcome of thrombosis after successful implantation of drug-eluting stents. JAMA. 2005;293(17):2126-2130.
10. Akiyama T, Moussa I, Reimers B, et al. Angiographic and clinical outcome following coronary stenting of bifurcation lesions. J Am Coll Cardiol. 2000;35(5):1145-1151.
11. Bhatt DL, Marso SP, Hirsch AT, et al. Amplified benefit of clopidogrel versus aspirin in patients with diabetes mellitus. Am J Cardiol. 2002;90(6):625-628.
12. Reddan DN, Szczech LA, Tuttle RH, et al. Chronic kidney disease, mortality, and treatment strategies among patients with clinically significant coronary artery disease. J Am Soc Nephrol. 2003;14(9):2373-2380.
13. Singh M, Rihal CS, Lennon RJ, et al. Influence of diabetes on long-term outcome after percutaneous coronary intervention. J Am Coll Cardiol. 2002;40(3):418-423.
14. Charytan D, Kuntz RE. The exclusion of patients with chronic kidney disease from clinical trials in coronary artery disease. Kidney Int. 2006;70(11):2021-2030.
15. Azhar M, Yousuf A, Habib S, et al. Impact of diabetes mellitus on long-term outcomes in patients with coronary artery disease treated with percutaneous coronary intervention. J Coll Physicians Surg Pak. 2010;20(3):168-172.
16. Stefanini GG, Holmes DR Jr. Drug-eluting coronary-artery stents. N Engl J Med. 2013;368(3):254-265.
17. Bangalore S, Kumar S, Fusaro M, et al. Short- and long-term outcomes with drug-eluting and bare-metal coronary stents: a mixed-treatment comparison analysis of 117 762 patient-years of follow-up from randomized trials. Circulation. 2012;125(23):2873-2891.
18. Mehilli J, Kastrati A, Dirschinger J, et al. Differences in prognostic factors and outcomes between women and men undergoing coronary artery stenting. JAMA. 2000;284(14):1799-1805.
19. Singh M, Rihal CS, Lennon RJ, et al. Influence of chronic kidney disease in patients undergoing percutaneous coronary intervention: 1-year outcomes. Am J Cardiol. 2004;94(11):1460-1463.