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Research Article

Baseline Clinical and Angiographic Profile of Patients Undergoing Left Main Coronary Artery Percutaneous Intervention in an Indian Tertiary Centre

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ABSTRACT

Background Left-main coronary artery disease (LM-CAD) accounts for 4–9 % of diagnostic angiograms and carries the highest risk among coronary lesions.[1] High-quality baseline data from low- and middle-income settings remain sparse.

Methods We prospectively enrolled 35 consecutive adults (August 2022 – July 2023) undergoing unprotected LM percutaneous coronary intervention (PCI) at Jagjivan Ram Railway Hospital, Mumbai. Detailed demographic, laboratory, echocardiographic and quantitative angiographic variables were captured.

Results Mean age was 66.2 ± 6.3 years; 63 % were male. Hypertension (71 %), diabetes (63 %) and dyslipidaemia (43 %) predominated, with 43 % reporting current smoking. Distal bifurcation involvement occurred in 68 % of cases; 43 % had double-vessel and 20 % triple-vessel disease in addition to LM stenosis. Median SYNTAX score was 29 (IQR 24–33); IVUS/OCT guidance was used in 100 % of procedures. Left-ventricular ejection fraction (LVEF) was preserved (>45 %) in 40 %, moderate (35–45 %) in 31 %, and severely reduced (<35 %) in 20 %.

Conclusion Patients undergoing LM-PCI in this single-centre Indian cohort were older, burdened with multiple cardiometabolic risk factors and presented predominantly with complex distal bifurcation disease. These data provide a contemporary regional baseline against which procedural strategies and outcomes can be benchmarked.

Keywords: Left-Main PCI; Clinical Profile; India; SYNTAX Score; Intravascular Imaging.

INTRODUCTION

Cardiovascular mortality in low- and middle-income countries (LMICs) exceeds that of high-income regions four-fold, with South-Asia contributing disproportionately.[2] In India, premature deaths attributable to coronary heart disease (CHD) rose by 59 % between 1990 and 2010.[3] Converging epidemics of diabetes, hypertension, central obesity and tobacco exposure accelerate atherogenesis and precipitate coronary events at a younger age compared with Western populations.[4]

Left-main coronary artery disease (LM-CAD) is particularly formidable because the vessel supplies 75 % – 100 % of left-ventricular myocardium depending on coronary dominance.[5] Historical series reported three-year mortality approaching 50 % with medical therapy alone.[6] Coronary-artery bypass grafting (CABG) became the reference revascularisation modality, but drug-eluting stent (DES) evolution combined with intravascular ultrasound (IVUS) and optical-coherence tomography (OCT) optimisation have reinvigorated percutaneous approaches.[7] Contemporary randomised trials—SYNTAX,[8] PRECOMBAT,[9] EXCEL,[10] and NOBLE[11]—demonstrate non-inferiority of PCI to CABG for selected anatomy (SYNTAX score ≤ 32) when undertaken by experienced operators supported by physiologic and imaging guidance.

Guideline adoption, however, mandates granular knowledge of local case-mix and resource availability. Published Indian data on LM-PCI remain limited, often retrospective or

confined to short-term outcomes.[12] Baseline clinical and angiographic descriptors underpin meaningful interpretation of both procedural choices and long-term results.

We therefore performed a prospective observational study capturing the complete baseline profile—demographics, comorbidities, laboratory indices, left-ventricular function, lesion anatomy and complexity—of all patients undergoing unprotected LM-PCI at a high-volume public tertiary centre in Mumbai. These data establish a reference cohort for subsequent outcome analyses in the same population.

MATERIALS AND METHODS

Study Design and Setting

This was a prospective, single-centre, observational cohort study conducted in the Department of Cardiology, Jagjivan Ram Railway Hospital (a 550-bed public tertiary-care institution in Mumbai, India). Patient enrolment spanned 1 August 2022 to 31 July 2023; every participant was followed for 12 months, giving a total study duration of 24 months (August 2022 – July 2024). The protocol complied with the Declaration of Helsinki and was approved by the hospital Institutional Ethics Committee (IEC No. JRRH/IEC/22-21). All patients gave written informed consent.

Study Population

Consecutive adult patients (≥18 years) undergoing *de novo* percutaneous coronary intervention (PCI) for unprotected left-main coronary artery (LMCA) stenosis ≥ 50 % were screened.

Inclusion Criteria

- symptomatic or objectively documented coronary artery disease attributable to LMCA ± downstream disease;
- Willingness and ability to adhere to scheduled follow-up.

Exclusion criteria

- previous LM stenting or coronary-artery bypass grafting (CABG);
- contraindication to dual-antiplatelet therapy;
- significant valvular heart disease requiring surgery;
- Refusal of consent.

During the enrolment window 39 eligible patients were identified; 4 were lost before the first follow-up, yielding a final analysis cohort of 35 patients.

Sample-size rationale

Using an expected LM-CAD prevalence of 10 % among angiographic studies, 85 % confidence level and 7 % absolute precision,[1] the calculated minimum sample was 30. Anticipating attrition and reflecting the institutional procedural volume (~2 LM-PCIs/month), we targeted ≥30 and ultimately studied 35 patients.

Baseline assessment

Demographics, cardiovascular risk factors, medication history and physical examination findings were recorded in a dedicated case-record form. Laboratory indices (full blood count, fasting lipid profile, renal function) were measured in the hospital ISO-certified laboratory. Two-dimensional transthoracic echocardiography (GE Vivid E95, 3.5 MHz transducer) provided left-ventricular ejection fraction (LVEF) by biplane Simpson method.

Angiography and PCI procedure

Diagnostic coronary angiography employed radial or femoral approach with 6 F or 7 F catheters. Lesion morphology, reference diameter and lesion length were quantified by two independent interventional cardiologists using quantitative coronary angiography; disagreements were resolved by consensus. Total anatomic complexity was graded with the SYNTAX score.

All interventions were performed with second-generation drug-eluting stents under systematic intravascular imaging guidance—IVUS (OptiCross™, Boston Scientific) in 80 % and OCT (Dragonfly™, Abbott) in 20 %. Lesion preparation included pre-dilatation and, when necessary, atherectomy or cutting balloons. Bifurcation strategy was selected according to Medina classification and imaging findings: *provisional* strategy as default, with DK-crush, culotte, TAP or mini-crush for complex carina or large side-branch disease. Final *proximal optimisation technique* (POT) and, when two stents were deployed, *kissing-balloon inflation* were mandatory. Procedural success was defined as residual stenosis < 10 % in the main branch and TIMI-3 flow in all treated vessels, without in-lab major complications.

Follow-up schedule

Patients were reviewed at 3, 6 and 12 months (earlier if symptomatic). Each visit included clinical evaluation, 12-lead ECG, and transthoracic echocardiography. Symptomatic patients underwent repeat coronary angiography immediately; otherwise, routine control angiography was planned between 9 and 12 months. Dual-antiplatelet therapy (aspirin 75 mg plus either clopidogrel 75 mg or

ticagrelor 90 mg twice daily) was prescribed for ≥12 months.

Outcome definitions

For the present manuscript, descriptive baseline data are reported. For completeness, the predefined clinical end-points assessed during follow-up were:

- **Major Adverse Cardiac Events (MACE):** composite of cardiac death, myocardial infarction (MI), ischemia-driven target-lesion revascularisation (TLR) or target-vessel revascularisation (TVR), and definite/probable stent thrombosis (Academic Research Consortium criteria).
- **In-stent restenosis (ISR):** ≥50 % luminal narrowing inside the stent or within 5 mm of its edges on quantitative angiography.

Statistical Analysis

Data were entered into a secure electronic database and analysed with SPSS Version 28 (IBM Corp.) Continuous variables are presented as mean ± standard deviation (SD) or median (inter-quartile range) according to distribution (Kolmogorov–Smirnov test). Categorical variables are expressed as counts and percentages. Between-group comparisons employed Student's *t*-test/ANOVA or Mann–Whitney *U* for continuous data and χ^2 or Fisher's exact test for categorical data. A two-tailed $P < 0.05$ defined statistical significance.

RESULTS

Baseline Demographics and Risk Factors

(Table 1) The cohort's mean age was 66.2 ± 6.3 y (range 56–84), with 54 % aged 61-70 y. Males comprised 63 %. Hypertension (71 %), diabetes (63 %), dyslipidaemia (43 %) and current smoking (43 %) dominated the risk profile.

Laboratory and Echocardiography

(Table 2) Mean haemoglobin 12.3 g/dL; platelets 2.5 × 10^5/µL. Mean total cholesterol 152 mg/dL; LDL 86 mg/dL; triglycerides 133 mg/dL. LVEF categories depicted in Figure 1.

Angiographic Complexity

(Table 3 / Figure 2) Distal bifurcation involvement in 68 %; ostial/mid-shaft 32 %. Accompanying disease: single-vessel 31 %, double-vessel 43 %, triple-vessel 20 %. Median SYNTAX score 29 (IQR 24–33).

Table 1. Diabetes Mellitus and 12-Month Outcomes

Outcome	Diabetes (n = 22)	No-Diabetes (n = 13)	*P*-value
Angina	5 / 22 (22.7 %)	1 / 13 (7.7 %)	0.006
Reinfarction	2 / 22 (9.1 %)	0 / 13 (0 %)	0.101
Target-lesion revascularisation (TLR)	3 / 22 (13.6 %)	1 / 13 (7.7 %)	0.410
target-vessel revascularisation (TVR)	2 / 22 (9.1 %)	0 / 13 (0 %)	0.090
Death	1 / 22 (4.5 %)	0 / 13 (0 %)	0.031
MACE†	8 / 22 (36.4 %)	2 / 13 (15.4 %)	0.013

Table 2. Hypertension and 12-Month Outcomes

Outcome	Hypertension (n = 25)	Normotensive (n = 10)	*P*-value
Angina	6 / 25 (24 %)	0 / 10 (0 %)	< 0.001
Reinfarction	2 / 25 (8 %)	0 / 10 (0 %)	0.727
TLR	3 / 25 (12 %)	1 / 10 (10 %)	0.750
TVR	2 / 25 (8 %)	0 / 10 (0 %)	0.003
Death	2 / 25 (8 %)	0 / 10 (0 %)	0.071
MACE	8 / 25 (32 %)	2 / 10 (20 %)	0.240

Table 3. Dyslipidaemia and 12-Month Outcomes

Outcome	Dyslipidaemia (n = 15)	Normal Lipids (n = 20)	*P*-value
Angina	1 / 15 (6.7 %)	2 / 20 (10 %)	0.156
Reinfarction	2 / 15 (13.3 %)	1 / 20 (5 %)	0.040
TLR	2 / 15 (13.3 %)	2 / 20 (10 %)	0.467
TVR	2 / 15 (13.3 %)	0 / 20 (0 %)	< 0.001
Death	0 / 15 (0 %)	2 / 20 (10 %)	0.070
MACE	5 / 15 (33.3 %)	5 / 20 (25 %)	0.197

Table 4. Current Cigarette Smoking and 12-Month Outcomes

Outcome	Smoker (n = 15)	Non-smoker (n = 20)	*P*-value
Angina	1 / 15 (6.7 %)	2 / 20 (10 %)	0.180
Reinfarction	2 / 15 (13.3 %)	1 / 20 (5 %)	0.303
TLR	2 / 15 (13.3 %)	2 / 20 (10 %)	0.407
TVR	2 / 15 (13.3 %)	0 / 20 (0 %)	< 0.001
Death	0 / 15 (0 %)	2 / 20 (10 %)	0.070
MACE	5 / 15 (33.3 %)	4 / 20 (20 %)	0.070

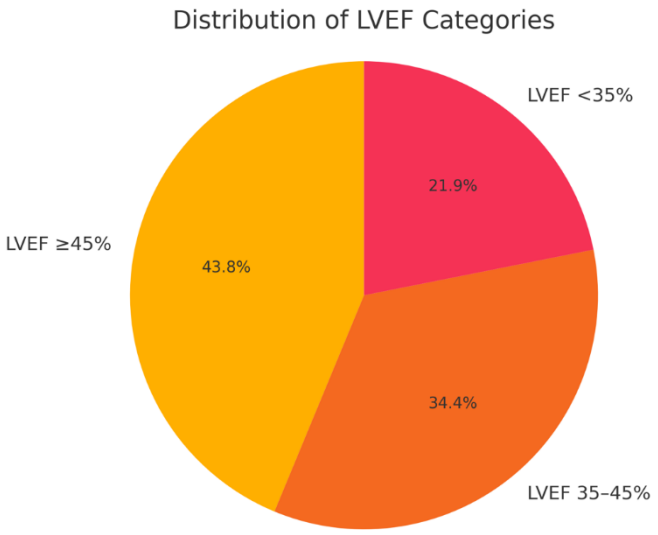

Figure 1. Distribution of Left-Ventricular Ejection-Fraction (LVEF) Categories among the 35-Patient Cohort (Pie Chart).

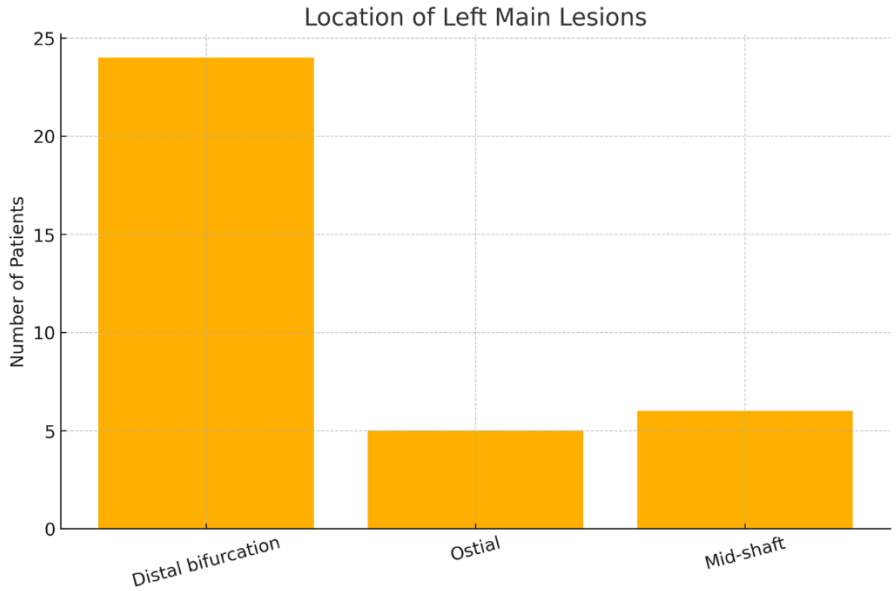

Figure 2. Anatomic Location of Left-Main Coronary Lesions (Bar Chart Showing Distal-Bifurcation, Ostial and Mid-Shaft Counts).

DISCUSSION

Our cohort illustrates the heavy cardiometabolic burden borne by Indian patients reaching the cath-lab for LM-PCI. Mean age was six years younger than Western series such as EXCEL (72 y)[10] yet risk-factor prevalence exceeded that of NOBLE (diabetes 23 %).[11] Similar observations have been recorded in the CREATE registry, reflecting earlier atherosclerotic onset in South-Asian phenotype.[13]

Distal bifurcation disease (68 %) mirrored SYNTAX LM subset data (70 %),[8] underscoring technical complexity. Routine intravascular imaging (100 %) aligns with expert-consensus recommendations for LM sizing, plaque modification and stent optimisation.[14] Intravascular guidance is independently associated with lower target-lesion failure and mortality.[15]

Median SYNTAX score 29 situates our population within the intermediate-complexity bracket where guidelines permit equipoise between PCI and CABG, provided surgical risk is low.[16] Nonetheless, socioeconomic constraints, limited bypass capacity and patient preference tilt real-world practice towards PCI, emphasising the need for indigenous outcome data.

Compared with prior Indian reports—e.g., Seth et al.[17] (2004-2011, n = 107), which lacked systematic imaging—our study offers an updated template reflecting second-generation DES, DK-crush refinement and IVUS/OCT penetration.

Limitations include single-centre design and modest sample size, but consecutive enrolment coupled with comprehensive data capture enhances internal validity.

Baseline insights here will contextualise the subsequent manuscripts analysing early (≤6 mo) and mid-term (12 mo) outcomes and risk predictors in the same cohort.

CONCLUSION

Indian patients selected for percutaneous treatment of unprotected LM-CAD are predominantly elderly males harbouring multiple modifiable risk factors and complex distal bifurcation lesions. Universal intravascular imaging and contemporary bifurcation techniques are feasible in the public-sector setting. These baseline data set the stage for evaluating procedural strategy, short-term safety and longer-term effectiveness of LM-PCI within resource-constrained environments.

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