

## CHARACTERISTICS AND OUTCOME OF LEFT MAIN STEM PCI AMONG WOMEN

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**Abstract:** Left main stem disease is a severe condition affecting a major coronary artery, traditionally treated with coronary artery bypass grafting. Recent advancements in percutaneous coronary intervention have made it a viable option, particularly for women who face unique risks and outcomes compared to men. **Objective:** This study aims to evaluate the characteristics and outcomes of percutaneous coronary intervention for left main stem disease in female patients, focusing on procedural outcomes and changes in laboratory parameters before and after the intervention. **Methods:** A prospective observational study was conducted from January to July 2024 with 68 female patients, aged 18 and above, from Fauji Foundation Hospital Rawalpindi. Various percutaneous coronary intervention techniques were used, and data on ejection fractions, access methods, and procedural specifics were collected. Pre- and post-procedural laboratory outcomes including haemoglobin, creatinine, platelet counts, and alanine aminotransferase levels were analyzed. **Results:** The mean age of participants was 63.6 years. Diabetes, hypertension, and dyslipidemia were common comorbidities. Laboratory results showed stable haemoglobin levels, slight increases in creatinine, and consistent platelet counts and ALT levels post-procedure. Statistical analysis revealed no significant changes in these parameters, indicating minimal impact on anaemia, renal function, and platelet or liver function. **Conclusion:** percutaneous coronary intervention for the left main stem in females generally results in stable laboratory outcomes with minimal impact on anaemia, renal function, and platelet or liver function. The procedure is safe with a low mortality rate. Continuous monitoring is recommended to manage any potential complications effectively.

**Keywords:** Left Main Stem, PCI, Female Patients, Laboratory Outcomes, Procedural Safety.

### Introduction

The left main stem condition, which is defined as notable constriction of the left-side main coronary artery, is extremely serious since the blood vessel is responsible for feeding a significant percentage of the heart's muscle(1). For many years, the conventional treatment of LMS was coronary artery bypass grafting (CABG). On the other hand, developments in percutaneous coronary intervention (PCI), particularly in the advancement of stents that deliver drugs and imaging tools, have rendered PCI a feasible option for patients with unprotected LMS (ULMS) illnesses (2). Women represent a high-risk category among this population, with distinct features and outcomes as compared to males, demanding additional investigation of sex-specific variables impacting PCI effectiveness(3).

Within the last few years, studies have demonstrated that women having LMS PCI experience more concurrent medical conditions than males, such as diabetes, hypertension, and renal impairment(4). Women accounted for 23.1 per cent of the patients recruited in the previous study, which evaluated PCI and CABG for ULMS illness. These women appeared much older, with an average age of 67.1 years, and they had a higher probability of congestive heart failure and renal impairment than males. Women often had lesser anatomical difficulty as determined by the SYNTAX score, which evaluates coronary lesion severity(5).

LMS illness is generally caused because of atherosclerosis, which impairs the artery's capability to supply

the appropriate flow of blood to the cardiac muscle. Women's disease development differs from men's due to hormonal variations and thinner coronary arteries. More specifically, estrogen reduction during menopause raises the likelihood of coronary artery disease, aggravating results for older women receiving PCI(6).

Although PCI has proven a more efficient and secure treatment for LMS illness, women are more inclined to encounter problems than males. The researches demonstrate this difference(7). Women who underwent PCI were significantly more inclined to have significant unfavourable cardiac and cerebrovascular events (MACCE) in the initial thirty days after the procedure, attributable mostly to increased incidences of myocardial infarction (MI), stroke, or bleeding problems(8). Women had a 30-day aggregate of mortality, MI, or stroke at 8.9%, versus 6.2% in those undergoing CABG. Furthermore, women had inferior long-term results, with a higher percentage of ischemic episodes and recurrent revascularization as compared to males(9).

Despite the increased short-term risk, long-term results for women who have PCI for LMS illness have improved. A 5-year follow-up in the NOBLE study revealed major adverse cardiac and cerebrovascular events rates in 29% of women receiving PCI and 15% in those treated with CABG(10). Although women continue to experience greater complication rates, advances in vasculature imaging, stenting procedures, and adjuvant medications have contributed to better rates of overall survival for men as well as women(11).

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**Methodology**

This was conducted as a prospective observation study from January 2024 to July 2024. Institutional approval was obtained from Fauji Foundation Hospital Rawalpindi’s ethical review board and the requirement for written informed consent was waived. A sample size of 68 female patients was calculated by using a reference article with 80% power of the test and 95% CI. (7) Only females aged above 18 years were enrolled. Data was collected from the cardiology department of the hospital.

The procedures performed focused primarily on percutaneous coronary intervention (PCI) of the left main stem (LMS) and left anterior descending artery (LAD) in a variety of clinical situations. Patients’ ejection fractions (EFs) before the procedure varied between 35% and 60%. Access methods included the right radial, ulnar, femoral, and brachial arteries, with 6F and 7F catheters usually employed. Provisional stenting, DK crush, Culotte, and internal crush were among the techniques used. The vessel

diameters ranged from 2.75 mm to 4.0 mm, while the stent sizes ranged from 2.25 mm to 4.5 mm, with many patients requiring several stents. In 60% of procedures, the LAD and LCX were involved, often alongside balloon angioplasty. A variety of guidewires and balloons were utilized, with the total number of balloons used in each procedure ranging from 1 to 5. Contrast volumes used ranged from 100 mL to 450 mL.

**Results**

The pre and post-procedural laboratory outcomes give significant results about the physiological changes that happened during left main stem PCI. Pre-procedure haemoglobin levels mean 11.5 g/dL (±1.91), showing moderate anaemia in patients. Following the procedure, the mean Hb level rises to 11.9 g/dL (±1.86), showing a decrease in anaemia or stability. However, this might be due to recovery of procedural loss of blood or improved levels of blood post-intervention.

**Table 1-Demographics of study**

Demographic Variable	Description/Value
Total Number of Patients	68
Gender	100% Female
Mean Age (±SD)	63.6 years (±11.8)
Diabetes	46.70%
Hypertension	60%
Smoking Status	17.8% (8 individuals reported)
Dyslipidemia	Noted in several patients
Takayasu Arteritis	1 patient
Mortality rate	6%

**Table 2 Clinical and Procedural Characteristics of Patients Undergoing Left Main Coronary Artery (LMS) Stenting**

Variable	Category	Percentage (%)
<b>Syntax Score</b>	Less than 19	20%
	20-29	28%
	30-39	30%
	40+	22%
<b>Old IHD</b>	PCI to LAD	12%
	NSTEMI	20%
	PPCI	2%
	Angina	12%
	IWMI	8%
	AWMI	10%
	CABG	10%
	DVCAD	6%
	TVCAD	12%
	Lateral wall MI	2%
<b>EF</b>	30-39%	4%
	40-49%	26%
	50-59%	24%
	60%	46%
<b>Presentation</b>	Routine	36%
	NSTEMI	30%
	Unstable angina	8%

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	AWMI	10%
	Urgent	2%
	Staged	2%
	STEMI	2%
<b>Procedure</b>	LMS to LAD	64%
	LMS to LAD and LCX	22%
	LMS to LCX	10%
	LMS	4%
<b>Technique</b>	Provisional	72%
	DK Crush	8%
	Internal Culotte	4%
	SKS	2%
	JBKT	2%
	Culotte	6%
<b>Access</b>	Right Radial	66%
	Right Femoral	18%
	Right Ulnar	14%
	Right Brachial	2%
<b>Other Stents</b>	0 Stents	14%
	1 Stent	40%
	2 Stents	30%
	3 Stents	24%
<b>Guidewires</b>	1 Guidewire	42%
	2 Guidewires	44%
	3 Guidewires	14%
<b>Contrast</b>	≤150 ml	24%
	151-250 ml	56%
	251-350 ml	20%
<b>Fluoro Time</b>	<10 mins	32%
	10-20 mins	38%
	20-30 mins	20%
	>30 mins	10%

Pre-procedure creatinine levels mean  $97.5 \pm 56.67 \mu\text{mol/L}$ , indicating normal to modestly compromised renal function for the majority of patients. Following the procedure, the mean creatinine level increased slightly to  $85.2 \pm 27.39 \mu\text{mol/L}$ . Although there was no substantial decrease in renal function, variation and standard deviation imply that a few individuals could have experienced varying renal function post-intervention, which is linked to the possibility of contrast-induced nephropathy.

Counts of platelets varied significantly. The overall mean platelet count was  $251.8 \times 10^9 \pm 104.63 \text{L}$  pre-procedure but rose slightly to  $253.6 \times 10^9 \pm 110.14 \text{L}$  post-procedure. This implies a consistent platelet response following the intervention, albeit some individuals developed thrombocytopenia or thrombocytosis, as seen by the broader standard deviation.

The pre-procedural mean for ALT values, which measure liver function, was  $35.06 \pm 20.12 \text{U/L}$ . Subsequently the procedure, ALT levels averaged  $33.88 \pm 19.17 \text{U/L}$ , showing steady hepatic function and no severe liver impairment during or subsequently.

The paired sample t-test results showed the differences in pre or post-procedure laboratory findings which are for haemoglobin, creatinine, platelets, and ALT levels.

The mean haemoglobin levels before and after the procedure were  $-0.15 \pm 2.29 \text{g/dL}$ , with a confidence interval of 95% range of  $-1.14$  to  $0.84$ . The t-value was  $-0.318$ , with a p-value of  $0.753$ , showing that there was no significant change in pre- and post-procedural haemoglobin levels. This shows that for the majority of patients, the procedure resulted in a significant shift in haemoglobin levels.

The average creatinine difference was  $23.27 \pm 86.34 \mu\text{mol/L}$ , having a 95% confidence range of  $-24.55$  to  $71.08$ . The t-value was  $1.044$ , whereas the p-value was  $0.314$ . These data demonstrate that, while creatinine levels increased after the procedure, it wasn't statistically significant. This suggests that the procedure wasn't responsible for major renal damage in most patients, while constant monitoring is still required.

The mean difference in platelet counts was  $-11.72 \times 10^9 / \pm 140.34 \text{L}$ , having a 95% confidence interval range of  $-81.51$  to  $58.07$ . The t-value was  $-0.354$  with a p-value of  $0.727$ , showing that pre and post-procedural platelet counts did not change significantly. This demonstrates that platelet counts mostly remain constant after the procedure and have no major risk of thrombocytopenia or thrombocytosis.

The ALT values showed a mean difference of  $-0.62 \pm 30.46 \text{U/L}$ , having a 95% confidence interval of  $-26.10$  to  $24.85$ . The t-value was  $-0.058$  and the significance level was

0.955 showing that there were no statistically significant differences in ALT levels before and after the procedure/ The correlation analysis between ejection fraction (EF) and Syntax score in 68 patients revealed a weak positive Pearson correlation coefficient of 0.160. However, this correlation

was not statistically significant, as indicated by a p-value of 0.282 ( $p > 0.05$ ). This suggests that there is no meaningful relationship between ejection fraction and the complexity of coronary artery disease, as measured by the Syntax score, in this patient population.

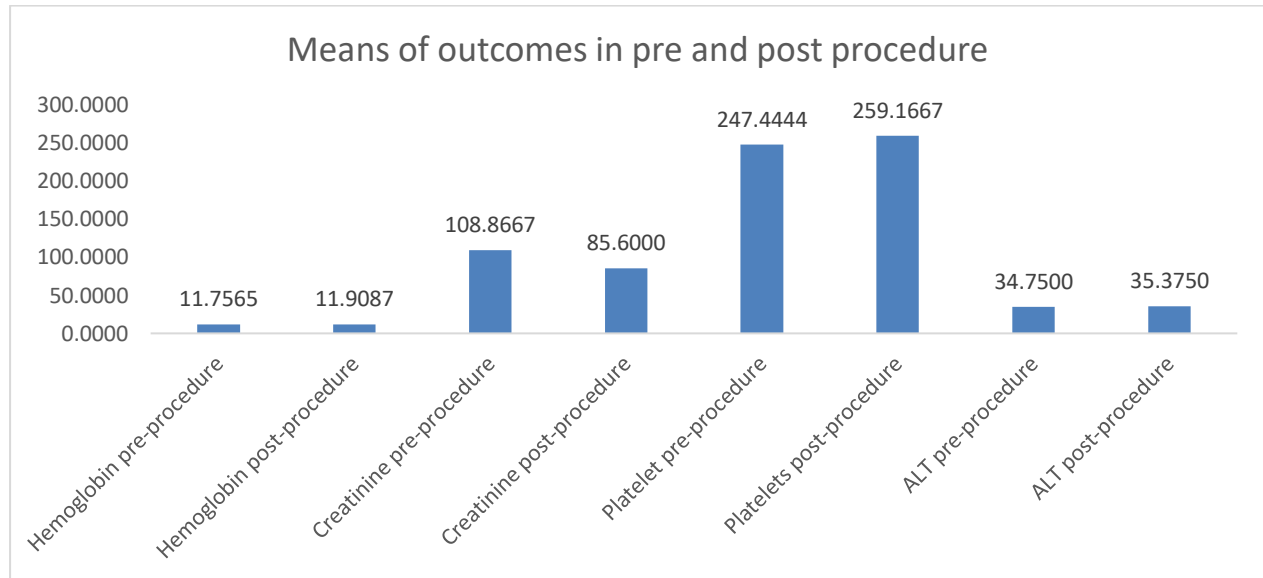


Fig 1- Mean differences in lab outcomes

**Discussion**

The investigation reported data on procedural outcomes, demographic features, and pre and post-procedure laboratory outcomes for female patients receiving PCI and concomitant therapies. The objective of this study was to assess the features and results of left main stem PCI in women, as well as compare the results to previous research. This study consisted mainly up of older females, with an average age of 63.3 years. This finding is in line with current research findings, which show that women undergoing PCI tend to be older than males (12). Comorbid diseases including diabetes, hypertension, and dyslipidemia were prevalent, having more than half of the population suffering from at least one of them. Additional research has found similar findings, with women undergoing PCI having a greater incidence of cardiovascular risk factors (13).

Procedural approaches vary, with the emphasis on provisional stenting and various access sites such as radial and femoral. The utilization of different procedures such as culotte, provisional stenting, and DK crush is consistent with current practice patterns, as outlined in recent studies (14). Radial access, which was preferred in our group, is consistent with current guidelines that encourage this method since it is associated with fewer bleeding problems (15).

Pre-procedure laboratory data revealed a wide range of Hb, Plt, Cr, and ALT levels, reflecting the patients' various health profiles. Following the process, the study saw a variety of variations in these parameters. Particularly, Hb levels rose in some patients, presumably reflecting the cessation of acute bleeding or anaemia improvement, whereas others fell, possibly because of procedural blood loss and other factors. Comparable changes in Hb levels

have been reported and recorded after PCI, indicating the necessity for vigilant monitoring and treatment of anaemia in such individuals (16).

Platelet counts varied after the procedure. Although certain individuals had lower counts, others showed higher counts, showing the complicated interaction between platelet function and responsiveness to treatments. This fluctuation corresponds with previous data indicating that platelet responses after PCI may appear unexpected and are frequently impacted by the administration of antiplatelet therapy (17).

Serum creatinine levels were reasonably steady after the procedure, indicating that no serious renal problems occurred in the majority of individuals. However fluctuations were seen, which is consistent with recent studies highlighting the importance of closely monitoring the renal function in PCI recipients, especially those with pre-existing renal problems (18).

In comparison to previous investigations that looked at consequences depending upon the SYNTAX score, our findings demonstrate a lower rate of mortality than expected, considering a high incidence of associated risks such as diabetes (46.7 per cent) and hypertension (60 per cent). (19) found a greater death rate in individuals with higher SYNTAX scores, especially individuals having complicated coronary artery disease. However, in our study, skilled care, including the possible use of radial access, resulted in positive results and reduced mortality.

The mortality rate in this study was quite low as well, with only a few in-hospital fatalities reported. This is in line with recent data indicating that death rates after PCI have improved because of advances in technique and post-procedural care (20). However, the heterogeneity in follow-

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up status across patients highlights the significance of long-term monitoring and patient participation in ensuring optimal results.

## Conclusion

In conclusion, this study on left main stem PCI in females showed that, while most laboratory results, including haemoglobin, creatinine, platelet counts, and ALT levels, were steady pre- and post-procedure, there were some differences. Haemoglobin levels did not change much, indicating that the anaemia is stable. Renal function was barely impaired, with no significant impairment seen. Platelet levels and liver function also remained stable. As a whole, PCI is safe, with minimal influence on these indicators and a lower death rate; nonetheless, continual monitoring is recommended.

## Declarations

### Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

### Ethics approval and consent to participate.

Approved by the department concerned. (IRBEC-FJFH-203/23)

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared an absence of conflict of interest.

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