

FREQUENCY OF LEFT MAIN STEM AND PROXIMAL LEFT ANTERIOR DESCENDING ARTERY DISEASE IN DIABETIC PATIENTS PRESENTED WITH ACUTE MYOCARDIAL INFARCTION

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ABSTRACT

Background: Coronary artery disease remains a leading cause of morbidity and mortality among diabetic patients, with a higher likelihood of involvement of critical coronary segments such as the left main stem and proximal left anterior descending artery. Early identification of such high-risk lesions in patients presenting with acute myocardial infarction is essential for timely management and improved outcomes. **Objective:** To determine the frequency of left main stem and proximal left anterior descending artery disease in diabetic patients presenting with acute myocardial infarction. **Study design:** Descriptive cross-sectional study. **Setting:** Conducted at a tertiary care hospital. **Duration of study:** 22-02-2025—22-05-2025. **Methods:** This study included 122 diabetic patients aged 18 years and above presenting with acute myocardial infarction. Patients with prior percutaneous coronary intervention, coronary artery bypass grafting, chronic kidney disease, and chronic liver disease were excluded. All patients underwent coronary angiography to assess the presence of left main stem and proximal left anterior descending artery stenosis. Data were analyzed using SPSS version 26. Descriptive statistics were calculated, and stratification was performed to assess associations, with a p-value ≤ 0.05 considered statistically significant. **Results:** The mean age of patients was 46.50 ± 13.92 years, with a mean body mass index of 27.14 ± 2.14 kg/m². Males constituted 64.8% of the study population. Left main stem disease was observed in 7 (5.7%) patients, while proximal left anterior descending artery disease was found in 23 (18.9%) patients. Hypertension was present in 61.5% of patients. Stratification analysis demonstrated a significant association between proximal left anterior descending artery disease and both hypertension and older age. **Conclusion:** The frequency of left main stem and proximal left anterior descending artery disease among diabetic patients presenting with acute myocardial infarction was 5.7% and 18.9%, respectively. Proximal left anterior descending artery disease showed a significant association with hypertension and increasing age, highlighting the importance of early cardiovascular risk assessment in this population.

Keywords: Left Main Stem Disease, Proximal Left Anterior Descending Artery, Diabetes Mellitus, Acute Myocardial Infarction, Coronary Angiography

INTRODUCTION

Myocardial infarction (MI) results from an acute obstruction of coronary blood flow due to plaque rupture and subsequent thrombus formation within a coronary artery. This interruption contributes to myocardial ischemia and necrosis if perfusion is not promptly restored (1, 2). Patients with acute MI manifestations include chest pain, dyspnea, diaphoresis, nausea, and hemodynamic instability or arrhythmias. Time management involves the reperfusion therapy via PCI or fibrinolysis, which are crucial for salvaging the myocardial tissue and improving outcomes (3). Advanced imaging and biomarker analysis help with accurate diagnosis and guide management. Diabetes mellitus is a known risk factor for coronary artery disease (CAD) and MI driven by the mechanisms involving the endothelial dysfunction and accelerated atherosclerosis. Diabetic patients sometimes present with extensive and diffuse atherosclerotic involvement with multi-vessel disease reported as common (4). Hyperglycemia during acute MI further worsens myocardial injury by encouraging oxidative stress and a pro-thrombotic state (5). Silent myocardial ischemia is more common in such a population, which contributes to delayed presentations and adverse clinical outcomes. Diabetic patients with MI face a greater occurrence of heart failure, recurrent ischemic events, and mortality, which requires the aggressive management of their cardiovascular and metabolic risk factors (4, 5).

In diabetic patients presenting with acute MI, left main stem disease (LMSD) and proximal left anterior descending (LAD) artery involvement signifies a high-risk scenario (6). Such lesions supply the large myocardial territories, and their occlusion can lead to significant hemodynamic compromise, such as cardiogenic shock, as well as severe left ventricular dysfunction (6). Diabetes is linked to diffuse and calcified coronary artery disease that often complicates the revascularization strategies. PCI in this subset carries a greater restenosis risk, while CABG is related to a higher perioperative risk in diabetes. Improving outcomes necessitates a multidisciplinary approach that balances the risks and benefits of revascularization strategies while managing underlying diabetic conditions to minimize additional cardiovascular events (7, 8).

The frequency of LMSD and proximal LAD involvement in diabetic patients with AMI remains underexplored in Pakistan, with no considerable local data available. Though the international studies highlight the severe impact of diabetes on CAD, regional differences in the genetic predisposition, healthcare access, and lifestyle factors mean that global data cannot be directly applied to the local population. Conducting a local study will fill this critical knowledge gap, thus providing data specific to our population.

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METHODOLOGY

We conducted this cross-sectional study in the Department of Cardiology, LRH Peshawar, from 22-02-2025 to 22-05-2025, after taking ethical clearance from the hospital. This study included 122 patients. The sample size was calculated using OpenEpi, based on the previous frequency of left main stem disease in diabetic patients presenting with acute myocardial infarction (8), with a 95% confidence interval and a margin of error of 5%. A non-probability consecutive sampling method was used.

Patients aged 18 years and above of either gender with diabetes and AMI were included in this study. Diabetes was defined as patients with fasting blood sugar ≥ 126 mg/dl after overnight fasting and random blood sugar ≥ 200 mg/dl, as documented in the medical record, with a proven history of use of anti-hyperglycemic agents. Acute myocardial infarction was defined as Retrosternal chest pain for greater than 30 minutes, ST-segment elevation >2 mm in precordial leads and >1 mm in limb leads, and ST-segment depression in precordial leads or limb leads >1 mm with troponin T levels >0.1 mg/dl. Patients with prior percutaneous coronary intervention, coronary artery bypass grafting, chronic kidney and liver disease were excluded.

Informed consent was obtained from patients, ensuring confidentiality and that participation in this study posed no risk. Baseline demographics such as age, gender, BMI (Kg/m²), hypertension, residential status, educational level, profession, and socioeconomic status were collected. Blood was taken and sent to the hospital laboratory for baseline investigations to rule out kidney and liver diseases.

Coronary angiography was performed through a catheter inserted into the femoral or radial artery, allowing contrast dye to be injected into the coronary circulation. This enabled visualization of the coronary arteries, including the left main stem and proximal left anterior descending (LAD) artery, to assess the degree of stenosis. Left main stem disease (LMSD) was identified by observing any significant narrowing or occlusion in the left main coronary artery. Proximal LAD disease was diagnosed by visualizing stenosis in the initial segment of the LAD.

For this study, left main stem disease was defined as $\geq 50\%$ stenosis (a focal or diffuse reduction in the vessel lumen associated with a flow-limiting obstruction) in the left main coronary artery, diagnosed by coronary angiography. Proximal LAD was defined as $\geq 50\%$ stenosis (appearing as a focal or diffuse reduction in the vessel lumen, associated with a flow-limiting obstruction) in the proximal segment of the LAD, diagnosed through coronary angiography.

Data were analyzed using a statistical analysis program (SPSS Ver. 26). Frequencies and percentages were computed for categorical variables such as gender, hypertension, profession, residential status, socioeconomic status, educational level, left main stem disease, and proximal LAD. Mean \pm SD were calculated for quantitative variables

such as age and BMI. Left main stem disease and proximal LAD were stratified by age, gender, BMI (Kg/m²), diabetes, hypertension, residential status, profession, educational level, and socioeconomic status. Post-stratification chi-square test or Fisher's exact test was applied; and $p \leq 0.05$ was considered statistically significant.

RESULTS

This study included 122 diabetic patients. Their mean age was 46.50 ± 13.92 years, and their mean body mass index was 27.14 ± 2.14 kg/m². Hypertension was observed in 75 (61.5%) patients in the study. Regarding demographics, the majority of patients were male (79, 64.8%), while females were 43 (35.2%). Regarding the socioeconomic status, 52 patients (42.6%) were from the lower socioeconomic strata, and 46 patients (37.7%) were from the middle socioeconomic strata. Educational attainment varied, with 37 patients (30.3%) having primary education, and 34 (27.9%) having secondary education. The remaining demographic distribution is shown in Table 1.

The angiographic findings showed that left main stem disease was present in 7 patients (5.7%). Proximal left anterior descending artery disease was observed in 23 patients (18.9%) (Table 2). Tables 3 and 4 present the stratification of left main stem disease and proximal left anterior descending artery disease with demographics.

Table 1: Basic demographics

Demographics		n	%
Gender	Male	79	64.8%
	Female	43	35.2%
Socioeconomic status	Lower	52	42.6%
	Middle	46	37.7%
	Upper	24	19.7%
Residential status	Rural	55	45.1%
	Urban	67	54.9%
Educational level	Uneducated	29	23.8%
	Primary	37	30.3%
	Secondary	34	27.9%
	Higher	22	18.0%
Professional status	Employed	57	46.7%
	Unemployed	65	53.3%

Table 2: Frequency of left main stem disease and proximal left anterior descending artery disease

Variables		n	%
Left main stem disease	Yes	7	5.7%
	No	115	94.3%
Proximal LAD	Yes	23	18.9%
	No	99	81.1%

Table 3: Stratification of left main stem disease with demographics

Variables	Left main stem disease				P value	
	Yes		No			
	n	%	n	%		
Age groups (Years)	≤ 35	1	14.3%	35	30.4%	0.30
	36 to 50	1	14.3%	32	27.8%	
	> 50	5	71.4%	48	41.7%	
BMI distribution (kg/m ²)	18.5 to 24.9	0	0.0%	24	20.9%	0.17
	> 24.9	7	100.0%	91	79.1%	
Gender	Male	6	85.7%	73	63.5%	0.32
	Female	1	14.3%	42	36.5%	
Socioeconomic status	Lower	4	57.1%	48	41.7%	0.72
	Middle	2	28.6%	44	38.3%	

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Residential status	Upper	1	14.3%	23	20.0%	0.92
	Rural	1	14.3%	54	47.0%	
	Urban	6	85.7%	61	53.0%	
Educational level	Uneducated	2	28.6%	27	23.5%	0.30
	Primary	4	57.1%	33	28.7%	
	Secondary	1	14.3%	33	28.7%	
	Higher	0	0.0%	22	19.1%	
Professional status	Employed	4	57.1%	53	46.1%	0.56
	Unemployed	3	42.9%	62	53.9%	
Hypertension	Yes	6	85.7%	69	60.0%	0.17
	No	1	14.3%	46	40.0%	

Table 4: Stratification of proximal left anterior descending artery disease with demographics

Variables		Proximal LAD				P value
		Yes		No		
		n	%	n	%	
Age groups (Years)	<= 35	2	8.7%	34	34.3%	0.004
	36 to 50	4	17.4%	29	29.3%	
	> 50	17	73.9%	36	36.4%	
BMI distribution (kg/m2)	18.5 to 24.9	3	13.0%	21	21.2%	0.37
	> 24.9	20	87.0%	78	78.8%	
Gender	Male	18	78.3%	61	61.6%	0.13
	Female	5	21.7%	38	38.4%	
Socioeconomic status	Lower	7	30.4%	45	45.5%	0.26
	Middle	9	39.1%	37	37.4%	
	Upper	7	30.4%	17	17.2%	
Residential status	Rural	10	43.5%	45	45.5%	0.86
	Urban	13	56.5%	54	54.5%	
Educational level	Uneducated	3	13.0%	26	26.3%	0.28
	Primary	7	30.4%	30	30.3%	
	Secondary	6	26.1%	28	28.3%	
	Higher	7	30.4%	15	15.2%	
Professional status	Employed	11	47.8%	46	46.5%	0.90
	Unemployed	12	52.2%	53	53.5%	
Hypertension	Yes	22	95.7%	53	53.5%	0.001
	No	1	4.3%	46	46.5%	

DISCUSSION

Existing literature has consistently demonstrated that diabetes mellitus is associated with a higher burden of coronary artery disease. Parvez et al. in their study of ST-elevation myocardial infarction patients observed that diabetic patients exhibited significantly more extensive and severe coronary lesions with a higher prevalence of triple-vessel disease (40.0% versus 24.0%) and greater mean Gensini scores when compared to their non-diabetic cohorts (9). This aligns with the notion that chronic hyperglycaemia accelerates atherosclerosis and promotes a pro-inflammatory state conducive to plaque formation.

Similarly, Zada et al. reported that among diabetic patients presenting with anterior wall myocardial infarction, multi-vessel disease was observed in 46.4% of cases, with hypertension and hyperlipidaemia being significantly associated with such cases (10). The present study's finding of proximal LAD disease in 18.9% of diabetic patients is consistent with the broader observation that people with diabetes frequently present with involvement of critical coronary segments. Soomro et al. further validated this by reporting that anterior wall infarction, which typically implicates the LAD territory, occurred in 39% of their diabetic patients, underscoring the vulnerability of this vascular bed in the setting of impaired glycaemic control (11).

Regarding left main stem disease, Hussain and associates reported left main coronary artery disease in 10.5% of their angiography cohort, with diabetics constituting 26.9% of those affected (12). Fayyaz et al. found left main stem involvement in 9.68% of patients with coronary

artery disease and 5.33% of patients with diabetes (8). The present study observed left main stem disease in 5.7% of the diabetic cohort, which aligns with the findings of Fayyaz et al (8). The slightly lower proportion in this study, compared to Hussain et al., may reflect differences in patient selection, timing of presentation, or regional variations in disease patterns. Bibi et al. compared diabetic and non-diabetic patients with non-ST-elevation myocardial infarction and found that patients with diabetes had significantly higher SYNTAX scores, indicating greater anatomic complexity that often encompasses left main and proximal vessel involvement (13).

The high prevalence of hypertension noted in this study aligns with the findings of Parvez et al., who observed hypertension in 61.3% of diabetic STEMI patients and Zada et al., who reported hypertension in 55.6% of their diabetic AAMI patients (9, 10). This consistent association highlights the effect of hypertension and diabetes in accelerating coronary atherogenesis. Shah et al. in their study of left main anterior wall myocardial infarction reported an even higher prevalence of hypertension at 91.7%, suggesting that left main involvement may be associated with a particularly high burden of this risk factor. The present study also observed a significant association of proximal LAD with hypertension and increasing age.

When considering the prognostic implications of these findings, the existing literature emphasizes that both left main stem and proximal LAD involvement are associated with significant adverse outcomes. The presence of proximal LAD disease in diabetic patients is particularly concerning, given the extensive myocardial territory at risk and the higher likelihood of left ventricular dysfunction. Zada et

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al. reported that anterior wall myocardial infarction in diabetics is frequently associated with multi-vessel involvement, which in turn is linked to larger infarct size and impaired left ventricular function (10). The observation that 18.9% patients in the present study had proximal LAD disease underscores the need for aggressive risk stratification and timely revascularisation strategies in this population.

CONCLUSION

From the present study, it is concluded that the frequency of left main stem and proximal LAD disease in diabetic patients presented with acute myocardial infarction was 5.7% and 18.9%, respectively. Proximal LAD was significantly associated with older age and hypertension. Diabetic patients with acute myocardial infarction represent a high-risk subgroup characterized by involvement of critical coronary segments, including the proximal LAD and, to a lesser extent, the left main stem.

DECLARATIONS

Data Availability Statement

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

Ethics approval and consent to participate

Approved by the department Concerned. (IRB-75/LRH/MTI)

Consent for publication

Approved

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Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

MUBASHIR AKBAR (Trainee Medical Officer)

Data Collection, Analysis, Manuscript drafting and Review of manuscript

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Conception of Study, Development of Research Methodology Design, Study Design, and final approval of manuscript

MASHAL FATIMA (Trainee Medical Officer)

Manuscript revisions, critical input.

SANA ULLAH (Postgraduate Resident)

Data entry, data analysis, and drafting an article.

MOUZA KASIR JAN

Critical input.

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