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Angiographic Profile and Cardiovascular Risk Factors among Patients of NSTEMI Undergoing Percutaneous Coronary Intervention

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Abstract

Background: With the rising prevalence and mortality associated with coronary artery disease (CAD), especially in developing regions, there is a need for studies that provide insight into disease patterns. Non-ST-elevation myocardial infarction (NSTEMI) represents a significant subset of acute coronary syndrome (ACS), yet data regarding its angiographic profile in our region remain limited. The aim of the study was to evaluate the angiographic profile and assess the influence of cardiovascular risk factors on angiographic findings in NSTEMI patients undergoing Percutaneous Coronary Intervention (PCI).

Methods: This prospective observational study included 100 patients diagnosed with NSTEMI who underwent PCI at our institution between December 2018 and November 2020. Patients were evaluated for cardiovascular risk factors, angiographic profile, and the influence of these risk factors on angiographic findings.

Results: The mean age of presentation was 58.1 ± 11.1 years (males: 57 ± 11.0 years; females: 60.8 ± 11.3 years). Dyslipidaemia was the most common risk factor (49%). Single vessel disease (SVD) was the most common angiographic pattern (38%), followed by triple vessel disease (TVD, 29%) and double vessel disease (DVD, 27%). The left anterior descending (LAD) artery was the most frequently involved vessel. Patients with diabetes mellitus and hypertension showed a higher prevalence of multi-vessel disease (63.3% and 65.7%, respectively) compared to non-diabetics and non-hypertensives.

Conclusion: This study provides insight into the prevalence of cardiovascular risk factors and angiographic patterns in NSTEMI patients. It highlights the significant influence of risk factors on the severity and distribution of coronary artery disease.

Introduction

Cardiovascular diseases (CVD) are a leading cause of mortality worldwide, with a disproportionate burden in low- and middle-income countries such as India. Despite this, data regarding the prevalence and angiographic characteristics of coronary artery disease (CAD) in developing regions remain limited.

Rapid urbanisation and socio-economic changes have increased exposure to major cardiovascular risk factors, including diabetes mellitus, hypertension, smoking, and dyslipidaemia. Additionally, inadequate preventive strategies have contributed to the growing burden of CAD.

In India, CAD has reached epidemic proportions. Data from the Registrar General of India show an increase in mortality due to CAD from 17% (2001 - 2003) to 23% (2010 - 2013). The CREATE registry reported that 39% of acute coronary syndrome cases were NSTEMI, with a mortality rate of 3.7%, higher than in developed countries.

Furthermore, the utilisation of revascularisation procedures remains low. PCI rates in NSTEMI or unstable angina are approximately 7% in India compared to 25 - 37% in developed countries. Similarly, coronary artery bypass grafting (CABG) rates are significantly lower.

Despite the presence of numerous cardiac catheterisation centers, there is a lack of comprehensive data on the angiographic profile and associated risk factors in NSTEMI patients. Therefore, this study was carried out to evaluate the angiographic profile and assess the influence of cardiovascular risk factors on angiographic findings in NSTEMI patients undergoing PCI.

Material and Methods

This was a prospective, observational study conducted at a tertiary care centre in Northern India over a period of two years, including 100 patients diagnosed with NSTEMI who underwent PCI. The study was approved by the institutional ethics committee (D. No. 248/FM). Enrolment was done after informed consent from patients. The study was in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Inclusion Criteria

- Patients presenting with symptoms of acute coronary

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syndrome

- ECG changes suggestive of NSTEMI
- Troponin I levels >99th percentile (as per the third universal definition of myocardial infarction)
- Patients providing informed consent

Exclusion Criteria

- ST-elevation myocardial infarction (STEMI)
- Chronic stable angina or unstable angina without MI
- Co-existing conditions such as sepsis or chronic kidney disease
- Patients not eligible for PCI

Definitions

- Significant CAD: ≥50% stenosis in major epicardial arteries
- Severity classification:
  - Mild: 20 - 49%
  - Moderate: 50 - 69%
  - Severe: 70 - 99%
  - Occluded: 100%
  - CTO: 100% occluded vessel that has existed for three or more months.

Risk Factors

- Hypertension: ≥140/90 mmHg or on treatment
- Diabetes Mellitus: FBS ≥126 mg/dL, PPBS ≥200 mg/dL, or HbA1c ≥6.5%
- Smoking: Current or within 1 year
- Dyslipidaemia: LDL ≥130 mg/dL, TG ≥150 mg/dL, or low HDL

Statistical Analysis

Data were analysed using SPSS version 25. Categorical variables were compared using the Chi-square test, and continuous variables using the Student's t-test. A p-value <0.05 was considered statistically significant.

Results

100 patients were recruited in the study. Out of 100 patients of NSTEMI, 77 were males and 23 were females. Mean age of females was 60.8 ± 11.3 years which was more than mean age of total patients (58.1 ± 11.1 years) and mean age of males which was 57 ± 11.0 years. Most common risk factor was dyslipidaemia (49) followed by smoking (37), hypertension (37) and diabetes (30) (Table I). SVD was most common (38) followed by TVD (29) and DVD (27). Most common vessel involved with maximum significant lesion was LAD (89) followed by RCA (68) and LCX (67) and left main (3). Total mild lesions were 91, moderate lesions were 22, severe lesions were 169 and total occlusions were 33. Chronic total occlusion (CTO) were 17, thrombotic lesions were 14 and calcified lesions were 7 (Table II).

Table I: Demographic characteristics of the patients

Demographic and risk factor profile	Number of patients
Mean age	58.1 ± 11.1 years
Males	77
Females	23
Diabetics	30
Hypertensives	37
Dyslipidaemia	49
Smokers	37
Previous Myocardial Infarction	9

Table II: Angiographic profile of NSTEMI patients

Coronary angiographic profile	Number of patients
SVD	38
DVD	27
TVD	29
LAD significant lesions	89
RCA significant lesions	68
LCX significant lesions	67

The relation between angiographic profile and major cardiovascular risk factors is shown in Table III. Severe coronary lesions were the most common finding across all risk factors, observed in 52.9% of diabetic patients, 53.0% of hypertensive patients, 43.3% of smokers, and 55.2% of patients with dyslipidaemia. Mild lesions were the next most frequent, whereas moderate lesions were relatively uncommon. Occluded lesions ranged from 7.5% in dyslipidaemia to 13.5% in diabetes mellitus.

With respect to the number of vessels involved, single vessel disease (SVD) was the most common pattern among smokers (60%) and patients with dyslipidaemia (46.8%). In contrast, diabetic and hypertensive patients showed a more even distribution of vessel involvement, with a relatively higher proportion of double vessel disease (DVD) and triple vessel disease (TVD).

Table III: Relation of angiographic profile with various risk factors

Angiographic Variable		Risk Factor			
		Diabetes mellitus	Hypertension	Smoker	Dyslipidaemia
Severity of Lesions	Mild	32 (30.8%)	42 (31.3%)	33 (34.0%)	49 (28.2%)
	Moderate	3 (2.9%)	10 (7.5%)	10 (10.3%)	16 (9.2%)
	Severe	55 (52.9%)	71 (53.0%)	42 (43.3%)	96 (55.2%)
	Occluded	14 (13.5%)	11 (8.2%)	12 (12.4%)	13 (7.5%)
	Total	104 (100%)	134 (100%)	97(100%)	174(100%)
No. of Vessels Involved	SVD	11 (36.7%)	12 (34.3%)	21 (60%)	22 (46.8%)
	DVD	9 (30.0%)	13 (37.1%)	10(28.6%)	12 (25.5%)
	TVD	10 (33.3%)	10 (28.6%)	4 (11.4%)	13 (27.7%)
	Total	30(100%)	35(100%)	35(100%)	57(100%)
No. of Significant Lesions	RCA	32 (43.8%)	27 (29.0%)	15(23.1%)	37 (29.6%)
	LAD	27 (37.0%)	37 (39.8%)	27(41.5%)	48 (38.4%)
	LCX	13 (17.8%)	28 (30.1%)	22 (33.9%)	40 (32%)
	LM	1 (1.4%)	1 (1.1%)	1 (1.5%)	0 (0%)
	Total	73(100%)	93(100%)	65(100%)	125(100%)
Characteristic Lesions	CTO	8 (50%)	5 (45.5%)	6 (46.2%)	9 (52.9%)
	Thrombus	6 (37.5%)	2 (18.2%)	6 (46.2%)	6 (35.3%)
	Calcified Lesion	2 (12.5%)	4 (36.4%)	1 (7.7%)	2 (11.8%)
	Total	16(100%)	11(100%)	13(100%)	17(100%)
Left main disease		03			
Mild lesions		91			
Moderate lesions		22			
Severe lesions		169			
Total occlusions		33			
Chronic total occlusions		17			
Thrombotic lesions		14			
Calcified lesions		7			

Analysis of significant coronary artery involvement showed that the left anterior descending artery (LAD) was the most frequently affected vessel in hypertensive (39.8%), smoking (41.5%), and dyslipidaemic patients (38.4%), whereas right coronary artery (RCA) involvement was most common among diabetic patients (43.8%). Involvement of the left circumflex artery (LCX) was moderate across groups, while left main (LM) artery involvement was rare.

Regarding characteristic lesion types, chronic total occlusion (CTO) was the most common finding across all risk factors, ranging from 45.5% in hypertension to 52.9% in dyslipidaemia. Thrombus formation was the second most frequent lesion type, while calcified lesions were comparatively less common, though relatively higher among hypertensive patients (36.4%).

Fig. 1 shows the distribution of number of vessels involved in diabetic and non-diabetic patients with NSTEMI undergoing PCI. Among diabetics, 33.3% (10/30) exhibited TVD, compared to 27.1% (19/70) of non-diabetics. DVD was present in 27% (n = 27) of all patients. In the diabetic subgroup, 30% (9/30) had DVD, while 25.7% (18/70) of non-diabetics showed two-vessel involvement. SVD was the most common finding at 38% (n = 38). It was seen in 36.7% (11/30) of diabetics and 38.6% (27/70) of non-diabetics. When analyzing Multi-Vessel Disease (MVD), defined as the presence of either DVD or TVD, a higher prevalence was noted in the diabetic group. 63.3% of

diabetic patients had MVD, compared to 52.8% of non-diabetic patients.

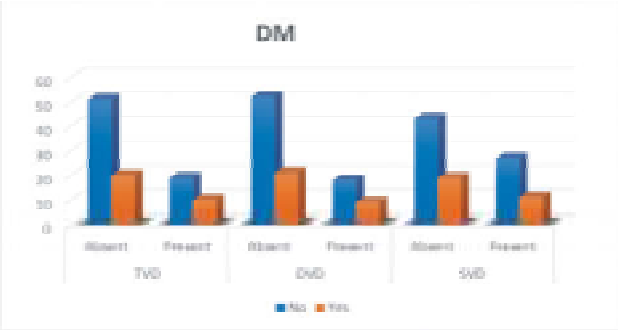


Fig. 1: *Distribution of number of vessels involved in diabetic and non-diabetic patients with NSTEMI undergoing PCI.*

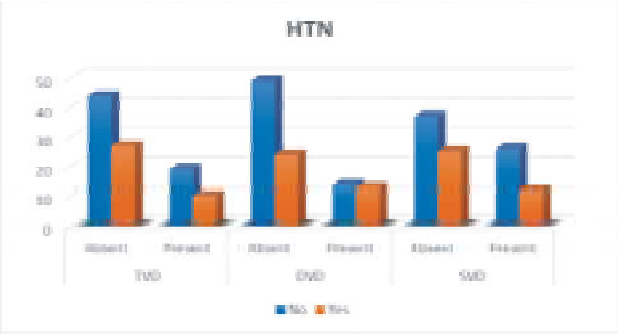


Fig. 2: *Relationship between hypertension and number of vessels involved in NSTEMI patients undergoing PCI.*

Similarly, hypertensive patients had a higher proportion of multi-vessel disease compared to non-hypertensive patients as shown in Fig. 2. TVD was present in 10 hypertensive patients (27.0%) compared to 19 non-hypertensive patients (30.1%) ($p > 0.05$). DVD was identified in 13 hypertensive patients (35.1%) and 14 non-hypertensive patients (22.2%). ($p > 0.05$). SVD was observed in 12 hypertensive patients (32.4%) and 26 non-hypertensive patients (41.2%) ($p > 0.05$). Hence 62.1% of hypertensive patients presented with MVD, whereas 52.3% of non-hypertensive patients exhibited involvement of two or more vessels.

In smokers, SVD was more common among smokers (60%) followed by DVD (28.6%) and TVD (11.4%) showing similarity with other studies. LAD had maximum number of total significant lesion in both group. Total occlusion was more (12.4%) as compared to non smokers (9.6%).

In dyslipidaemia subgroup, severe lesions were more common (55.2%) than in non dyslipidaemic (51.8%). SVD was most common in both dyslipidaemic and non dyslipidaemic (46.8%,34.0%) followed by TVD (27.7%,34.0%) and DVD (25.5%,31.9%). Maximum number of significant lesions were in LAD in both dyslipidaemic and non dyslipidaemic patients.

Discussion

The present study provides insight into the clinical and angiographic profile of patients with NSTEMI undergoing percutaneous coronary intervention (PCI) at our institute. The mean age of presentation was relatively young (58.1 ± 11.1 years), supporting the observation that cardiovascular disease occurs approximately a decade earlier in the Indian population compared to Western populations. Additionally, female patients presented at a later age, consistent with previously reported trends.

Dyslipidaemia emerged as the most common risk factor (49%) in our study population, although its prevalence was lower compared to the NCDR-ARG registry (63%). This difference may reflect regional, genetic, or lifestyle variations in the study population.

Single vessel disease (SVD) was the most common angiographic pattern (38%) among NSTEMI patients. Interestingly, triple vessel disease (TVD, 29%) was slightly more prevalent than double vessel disease (DVD, 27%), which differs from findings in some other studies. The left anterior descending (LAD) artery showed the highest number of significant lesions (n = 89), followed by the right coronary artery (RCA, n = 68) and left circumflex artery (LCX, n = 67), while left main involvement was relatively rare (n = 3).

The study highlights the strong influence of major cardiovascular risk factors on the severity and distribution of coronary artery disease (CAD). Severe coronary lesions were predominant across all risk groups, particularly among patients with dyslipidaemia, hypertension, and diabetes mellitus, suggesting that these metabolic and hemodynamic factors contribute to advanced atherosclerosis. Smoking was also associated with a high proportion of severe lesions, underscoring its role in accelerating coronary artery damage.

In terms of vessel involvement, SVD was most frequently observed among smokers and patients with dyslipidaemia, whereas diabetic and hypertensive patients demonstrated a higher prevalence of multi-vessel disease (DVD and TVD). This pattern reflects the diffuse nature of atherosclerosis in diabetes and long-standing hypertension, both of which promote endothelial dysfunction and vascular remodeling.

Analysis of individual vessel involvement revealed that the LAD artery was the most commonly affected vessel across most risk groups, consistent with its known anatomical and haemodynaemic susceptibility to atherosclerosis. However, in diabetic patients, the RCA showed slightly higher involvement, suggesting variability in plaque distribution

in this subgroup.

Chronic total occlusion (CTO) was the most common lesion characteristic (17%), indicating chronicity of advanced coronary artery disease in a significant proportion of patients. Thrombotic lesions (14%) were particularly common among smokers, likely due to smoking-induced hypercoagulability and endothelial injury. Calcified lesions (7%) were relatively less frequent but more commonly observed in hypertensive patients, possibly reflecting chronic vascular stress and long-standing disease.

A notable finding was the higher prevalence of multi-vessel disease among diabetic patients (63.3% *versus* 52.8%) and triple vessel disease (33.3% *versus* 27.1%) compared to non-diabetics. This aligns with the established understanding of diabetic macrovascular complications, where hyperglycaemia, insulin resistance, and oxidative stress contribute to diffuse and complex coronary lesions.

Similarly, hypertensive patients demonstrated greater multi-vessel involvement compared to non-hypertensives. Hypertension contributes to atherosclerosis through chronic mechanical stress, endothelial dysfunction, and activation of the renin – angiotensin – aldosterone system, leading to arterial remodeling and widespread plaque formation.

In contrast, smokers and patients with dyslipidaemia more commonly presented with SVD, consistent with existing literature. Smoking acts as a potent trigger for acute thrombosis, often leading to NSTEMI due to rupture of a single vulnerable plaque. However, the relatively higher rate of total occlusion in smokers (12.4%) highlights its aggressive pro-thrombotic effect.

A consistent finding across all subgroups was the predominant involvement of the LAD artery, reinforcing its critical role in coronary circulation and clinical outcomes. Regardless of the underlying risk factor, the LAD remains the most frequently affected vessel in NSTEMI-related atherosclerosis.

Conclusion

The present study provides valuable insight into the prevalence of cardiovascular risk factors and the angiographic profile of NSTEMI patients in our population. It highlights the significant influence of risk factors such as diabetes, hypertension, dyslipidaemia, and smoking on the pattern and severity of coronary artery disease.

Diabetes and hypertension were associated with more diffuse and multi-vessel involvement, whereas smoking and dyslipidaemia were more commonly associated with single vessel disease and thrombotic lesions. The LAD artery was the most frequently involved vessel across all subgroups.

These findings contribute to a better understanding of disease patterns in NSTEMI and may help in risk stratification and management planning. However, larger studies involving diverse geographic and socioeconomic populations are required to validate these findings and further strengthen the evidence base.

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