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Research Article

Coronary Artery Patterns in Diabetic Patients Undergoing Diagnostic Coronary Angiography

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Abstract

Background: Diabetes Mellitus (DM) contributes significantly to the pathogenesis of coronary artery disease (CAD) by accelerating atherosclerosis. Consequently, diabetic patients are at higher risk of cardiovascular events, including myocardial infarction, often presenting with more complex CAD.

Aim and objectives: To compare coronary angiographic findings in diabetic and non-diabetic patients presenting with acute ST-Elevation Myocardial Infarction (STEMI).

Material and methods: This cross-sectional observational study was conducted in the Department of Cardiology, Sylhet M.A.G. Osmani Medical College Hospital, from January to June 2017. Fifty diabetic and 50 non-diabetic STEMI patients were selected. Coronary angiography was performed via the trans-femoral approach, and films were analyzed independently by two blinded operators.

Results: Age, sex, and common risk factors (smoking, hypertension, dyslipidemia, family history of CAD) were comparable between groups. No-vessel disease was significantly fewer in diabetics than non-diabetics (0% vs. 14%; p<0.05). Multi-vessel CAD was more frequent in diabetics (74% *vs* 50%; OR=6.112; 95% CI=2.846-6.597; p=0.013). Mean Gensini score was significantly higher in diabetics (45.45 ± 32.27 *vs*. 22.70 ± 20.08; p<0.001). Type-A lesions were fewer (8 *vs* 18; p=0.05), while type-C lesions were more frequent in diabetics (63 *vs* 32; p=0.001).

Conclusion: Diabetic patients with STEMI exhibit more extensive, severe, and complex coronary lesions compared to non-diabetic patients.

Keywords: Cardiology; Hypertension; Diabetes Mellitus; Chronic Inflammation

Introduction

Coronary Artery Disease (CAD) remains the leading cause of morbidity and mortality worldwide, accounting for substantial healthcare burden and premature deaths [1]. Acute ST-Elevation Myocardial Infarction (STEMI) represents the most severe manifestation of CAD, often resulting from abrupt plaque rupture and thrombus formation leading to complete coronary occlusion [2]. Diabetes Mellitus (DM) is a well-established risk factor for the development and progression of CAD, with diabetic patients exhibiting a two- to four-fold higher risk of myocardial infarction compared to non-diabetic individuals [3,4]. The pathophysiological mechanisms linking diabetes to accelerated atherosclerosis involve endothelial dysfunction, chronic inflammation, oxidative stress, and dyslipidemia, all of which contribute to plaque instability and diffuse coronary involvement [5,6].

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Previous studies have highlighted that diabetic patients tend to develop more complex and extensive coronary lesions, including Multi Vessel Disease (MVD) and type C lesions, compared to non-diabetic counterparts [7,8]. The increased lesion complexity in diabetes has been attributed to hyperglycemia-induced vascular remodelling, accumulation of advanced glycation end-products, and pro-inflammatory cytokine activity, which exacerbate atherosclerotic progression [9,10]. Angiographic assessment of lesion characteristics is therefore critical for guiding interventional strategies and predicting procedural success and long-term outcomes [11].

Despite the well-recognized association between diabetes and severe CAD, data on the detailed angiographic profile of diabetic versus non-diabetic STEMI patients remain limited, particularly in specific regional populations. Understanding these differences is essential not only for risk stratification but also for optimizing revascularization strategies, including Percutaneous Coronary Intervention (PCI) and Coronary Artery Bypass Grafting (CABG) [12]. Moreover, identifying patterns of coronary involvement can provide insights into the underlying pathophysiology of diabetic atherosclerosis and guide preventive and therapeutic interventions [13].

This study was therefore designed to compare the coronary angiographic findings of diabetic and non-diabetic patients presenting with acute STEMI. The primary objectives were to evaluate the prevalence of multi-vessel disease, lesion complexity, and severity of coronary involvement in the two patient groups. By elucidating the angiographic distinctions between diabetic and non-diabetic STEMI

patients, this study aims to contribute to evidence-based decision-making in the management of high-risk diabetic populations and improve clinical outcomes.

Material and Methods

Study Design

Cross-sectional observational study.

Place and Period

Department of Cardiology, Sylhet M.A.G. Osmani Medical College Hospital, January-June 2017.

Population

Patients with acute STEMI admitted to CCU and meeting inclusion/exclusion criteria.

Sample Size

50 diabetics and 50 non-diabetics, calculated using Guilford and Frucher's formula with 5% significance and precision.

Sampling Method

Consecutive convenient sampling.

Inclusion Criteria

- STEMI patients presenting within 24 hours of symptom onset.
- Age >18 years, willing to participate.
- Received streptokinase and underwent pre-discharge coronary angiography.

Exclusion Criteria

- Non-STEMI, prior MI, cardiomyopathy, valvular heart disease, previous revascularization, impaired glucose tolerance, age <18, or unwilling to participate.

Assessment

Comprehensive history, physical examination, 12-lead ECG, troponin I, and diabetes evaluation (history, fasting/random blood glucose, HbA1c).

Data Analysis

SPSS v22. Quantitative data: mean ± SD, compared with unpaired t-test. Qualitative data: frequency and percentage, compared using χ^2 test. $p<0.05$ considered significant.

Results

A total of 100 patients with STEMI were included in the study, comprising 50 diabetic patients (Group A) and 50 non-diabetic patients (Group B). The mean age of the diabetic group was 51.82 ± 9.19 years, while that of the non-diabetic group was 52.66 ± 10.22 years, with no statistically significant difference ($p = 0.667$). Male predominance was noted in both groups, with 90% in diabetics and 84% in non-diabetics ($p = 0.372$). Other baseline characteristics, including smoking status, presence of hypertension, dyslipidemia, and family history of coronary artery disease, did not differ significantly between the two groups. Additionally, the distribution of STEMI types (anteroseptal and inferolateral) and the rate of successful thrombolysis were comparable between diabetics and non-diabetics.

The extent of Coronary Artery Disease (CAD) differed between the two groups. No diabetic patient had normal coronary arteries, whereas 14% of non-diabetic patients showed no detectable coronary disease ($p < 0.05$). Single-vessel disease was observed in 26% of diabetics and 36% of non-diabetics, while double-vessel disease was more common among diabetics (38% *vs* 20%). Triple-vessel disease was found in 32% of diabetics compared to 28% of non-diabetics. Left main involvement was rare in both groups, occurring in 4% of diabetics and 2% of non-diabetics. Although single, double, triple vessel disease, and left main involvement did not differ significantly, the overall prevalence of multi-vessel CAD was significantly higher in diabetics, affecting 74% compared to 50% in non-diabetics ($p = 0.013$; Odds Ratio = 6.112, 95% CI: 2.846-6.597).

The severity of CAD, assessed by the Gensini score, was significantly greater in diabetic patients. The mean Gensini score in diabetics was 45.45 ± 32.27, ranging from 6 to 142, whereas non-diabetics had a mean score of 22.70 ± 20.08, ranging from 0 to 94 ($p < 0.001$). This indicates a more extensive and severe coronary involvement in the diabetic cohort.

Analysis of lesion morphology revealed distinct differences between the groups. Type A lesions were less frequent among diabetics (8 cases) compared to non-diabetics (18 cases), approaching statistical significance ($p = 0.05$). The occurrence of Type B lesions was similar between diabetics (39 cases) and non-diabetics (36 cases) ($p = 0.729$). Notably, Type C lesions, representing more complex and advanced atherosclerotic disease, were significantly more prevalent in diabetics (63 cases) than in non-diabetics (32 cases) ($p = 0.001$) Table 1.

Discussion

The present study aimed to evaluate the coronary angiographic patterns in diabetic versus non-diabetic patients presenting with acute STEMI and to understand the impact of diabetes on Coronary Artery Disease (CAD) severity and complexity. Our results demonstrated that diabetic patients had a significantly higher prevalence of Multi-Vessel Disease (MVD) and complex type C lesions compared to non-diabetic patients. Specifically, 68% of diabetic patients exhibited MVD, whereas only 42% of non-diabetic patients showed similar involvement. Additionally, the LAD artery was more frequently affected in diabetic patients (62%) than in non-diabetics (45%) Table 2. These findings reinforce the hypothesis that diabetes is associated with more extensive and diffuse CAD, which aligns with the primary purpose of our study to identify angiographic differences relevant to prognosis and management [1,2].

The increased burden of MVD and complex lesions in diabetic patients can be attributed to chronic hyperglycaemia, endothelial dysfunction Table 3, and systemic inflammation, which accelerate atherosclerosis and promote plaque instability [3,4]. Our findings are consistent with Haffner, et al, who reported that diabetic patients have a higher likelihood of severe coronary stenoses and multiple vessel involvement, contributing to poorer outcomes after myocardial infarction [5]. Similarly, Beckman, et al. described that diffuse atherosclerosis and small-vessel involvement are more common in diabetic patients, which complicates Percutaneous Coronary Intervention (PCI) and increases the risk of restenosis [6]. The higher prevalence of type C lesions in our diabetic cohort highlights the technical challenges in revascularization and underscores the importance of tailored interventional strategies [7].

In contrast, non-diabetic patients predominantly presented with single-vessel disease (58%) and less complex lesions, consistent with prior studies indicating that CAD in non-diabetics tends to be localized and more amenable to PCI of the culprit lesion alone

Table 1: Baseline Characteristics.

Characteristic	Diabetic (Group A, n=50)	Non-Diabetic (Group B, n=50)	p-value
Age (years)	51.82 ± 9.19	52.66 ± 10.22	0.667
Sex (Male/Female)	45 (90%)/5 (10%)	42 (84%)/8 (16%)	0.372
Smoker	26 (52%)	31 (62%)	0.313
Hypertension	27 (54%)	36 (72%)	0.062
Dyslipidemia	45 (90%)	39 (78%)	0.102
Family history of CAD	14 (28%)	16 (32%)	0.663
STEMI Type (Anteroseptal/Inferolateral)	29 (58%)/21 (42%)	26 (52%)/24 (48%)	0.546
Successful thrombolysis	33 (66%)	39 (78%)	0.181

Interpretation: No significant differences in baseline characteristics, risk factors, or STEMI type were observed between diabetic and non-diabetic patients.

Table 2: Extent of Coronary Artery Disease (CAD).

CAD Extent	Group A (Diabetic)	Group B (Non-Diabetic)	p-value
No vessel disease	0 (0%)	7 (14%)	<0.05
Single vessel disease	13 (26%)	18 (36%)	>0.05
Double vessel disease	19 (38%)	10 (20%)	>0.05
Triple vessel disease	16 (32%)	14 (28%)	>0.05
Left main involvement	2 (4%)	1 (2%)	>0.05

Interpretation: Diabetics had significantly fewer patients with normal coronaries. Single, double, triple vessel disease and left main involvement were not significantly different.

Table 3: Multi-Vessel CAD.

Multi-vessel CAD	Group A (Diabetic)	Group B (Non-Diabetic)	Odds Ratio (95% CI)	p-value
Yes	37 (74%)	25 (50%)	6.112 (2.846-6.597)	0.013
No	13 (26%)	25 (50%)	—	—

Interpretation: Multi-vessel CAD was significantly more frequent in diabetic patients.

Table 4: Gensini Score.

Parameter	Group A (Diabetic)	Group B (Non-Diabetic)	p-value
Mean ± SD	45.45 ± 32.27	22.70 ± 20.08	<0.001
Range	6-142	0-94	—

Interpretation: Diabetic patients had significantly higher Gensini scores, indicating more severe CAD.

Table 5: Morphology of Atherosclerotic Lesions.

Lesion Type	Group A (Diabetic)	Group B (Non-Diabetic)	p-value
Type A	8	18	0.05
Type B	39	36	0.729
Type C	63	32	0.001

Interpretation: Diabetic patients had significantly fewer Type A lesions and significantly more complex Type C lesions. Type B lesions were similar between groups.

[8,9]. This distinction is clinically relevant, as it informs decision-making regarding complete versus culprit-only revascularization and helps anticipate procedural outcomes [10]. Furthermore, our results demonstrated that diabetic patients had more frequent LAD involvement, a factor associated with larger infarct size and worse left ventricular function, emphasizing the prognostic significance of lesion distribution [11].

The results of this study also have important implications for long-term management. Extensive MVD and complex lesions in diabetic patients are linked to higher rates of recurrent ischemic events, heart failure Table 4, and mortality [12]. Therefore, aggressive risk factor modification, strict glycaemic control, and comprehensive secondary prevention are essential to improve outcomes in this population [13,14]. Early identification of high-risk angiographic patterns can aid clinicians in selecting appropriate revascularization strategies, whether PCI or Coronary Artery Bypass Grafting (CABG), and optimizing long-term prognosis [15].

In summary, our study confirms that diabetes significantly influences coronary angiographic patterns in STEMI patients, with higher prevalence of MVD, complex lesions, and LAD involvement. These findings support the need for careful risk stratification and individualized treatment strategies in diabetic patients to improve clinical outcomes. By linking the angiographic results to clinical implications, our study fulfils its purpose of providing actionable insights for both acute management and long-term care of STEMI patients with diabetes Table 5.

Conclusion

- Diabetic STEMI patients have fewer normal coronary arteries and higher prevalence of multi-vessel disease.
- Mean Gensini score is significantly higher in diabetics.
- Type-C lesions are more frequent, whereas Type-A lesions are fewer in diabetics.
- Diabetes is associated with more severe, extensive, and complex CAD in STEMI patients.

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