

Comparative Study of Coronary Artery Disease between Diabetic and Non-diabetic Patients in the Elderly Patients Group

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ABSTRACT

Background: Diabetes mellitus increases the risk and severity of coronary artery disease (CAD), particularly in older adults. This study compared the clinical characteristics, cardiac function and angiographic severity of CAD between elderly diabetic and non-diabetic patients. **Methods & Materials:** This cross-sectional analytical study was conducted at the National Institute of Cardiovascular Diseases (NICVD) from January 2021 to December 2024. A total of 250 patients aged ≥ 40 years with IHD were enrolled, including 125 diabetic and 125 non-diabetic patients. Clinical, biochemical, electrocardiographic, echocardiographic and coronary angiographic data were compared using SPSS version 25.0. **Results:** Diabetic patients were older than non-diabetic patients (64.3 ± 8.0 vs. 61.2 ± 8.5 years; $p=0.004$) and had higher rates of hypertension (76.8% vs. 55.2%; $p<0.001$) and elevated BMI (36.8% vs. 24.8%; $p=0.04$). Systolic blood pressure ≥ 140 mmHg was also more frequent among diabetics (56.0% vs. 41.6%; $p=0.03$). Mean left ventricular ejection fraction was lower ($48.5 \pm 10.2\%$ vs. $52.3 \pm 9.8\%$; $p=0.003$), while regional wall motion abnormalities were more common (71.2% vs. 57.6%; $p=0.03$). Diabetic patients had higher odds of significant CAD (OR 2.28) and triple-vessel disease (OR 2.88), but lower odds of single-vessel disease (OR 0.39). **Conclusion:** Elderly diabetic patients with IHD have greater cardiometabolic risk, poorer left ventricular function and more extensive multivessel CAD than non-diabetic patients. Early assessment and appropriate invasive evaluation should be considered in this high-risk group.

Keywords: Diabetes mellitus, Ischemic heart disease, Coronary artery disease, Coronary angiography, Acute coronary syndrome.

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INTRODUCTION

Ischemic heart disease (IHD) remains the leading cause of morbidity and mortality worldwide and represents a major public health challenge, particularly among older adults. Its incidence increases markedly with advancing age owing to the cumulative effects of atherosclerosis and the growing burden of cardiovascular risk factors. Diabetes mellitus is one of the strongest contributors to the development and progression of ischemic heart disease, accelerating endothelial dysfunction, coronary atherosclerosis and adverse cardiovascular outcomes. As the prevalence of both ageing and diabetes continues to rise globally, an increasing number of elderly patients present with ischemic heart disease, making the interaction between diabetes and coronary artery disease an important clinical concern [1,2].

Angina and acute coronary syndrome (ACS) do not manifest uniformly across diabetic and non-diabetic patients. A recent systematic review and meta-analysis pooling more than 29,000 patients found that diabetic patients were markedly less likely to report classic chest pain during ACS and more often presented with dyspnoea, anxiety, or neck discomfort [3]. This blunted symptomatology is attributed largely to diabetic autonomic neuropathy,

which dulls afferent pain signalling from the ischaemic myocardium [4]. Consequently, silent or minimally symptomatic ischaemic events are disproportionately common among diabetics and studies from South Asia and Africa have documented silent myocardial ischaemia in a substantial minority of diabetic patients screened even in the absence of overt cardiac complaints [4-6]. Because atypical presentation delays recognition and treatment, elderly diabetic patients are particularly vulnerable to missed or late diagnosis of coronary events [5].

Beyond symptomatology, diabetes exerts a profound influence on the underlying anatomy of coronary disease and on myocardial performance. The synergistic combination of hypertension and diabetes has been shown to independently worsen the severity of coronary atherosclerosis, with hypertensive diabetics demonstrating a more extensive lesion burden than either risk factor alone [7]. Comparative angiographic series consistently report a higher prevalence of multivessel and triple-vessel disease, more diffuse lesions and greater stenosis severity among diabetic patients than non-diabetics with CAD [8]. Elevated glycated haemoglobin has similarly been correlated with the number of diseased vessels and the severity of

stenosis in patients presenting with acute myocardial infarction, regardless of a formal diabetes diagnosis [9,10]. These anatomical differences carry direct clinical consequences: diabetic patients undergoing intervention for non-ST-elevation ACS have higher rates of multivessel involvement and correspondingly different revascularization requirements compared with non-diabetics [11].

In Bangladesh, the intersection of diabetes and cardiovascular disease is a growing public health concern. Hypertension coexists with type 2 diabetes in the majority of Bangladeshi patients attending diabetes clinics [12], dietary patterns among Bangladeshi CAD patients differ meaningfully from those of healthy controls [13] and comorbid conditions such as periodontal disease cluster with both diabetes and CAD in this population [14]. Nationally representative data further identify coronary artery disease as among the most frequent macrovascular complications of type 2 diabetes in both urban and rural Bangladeshi cohorts [15]. Despite this substantial burden, comparative evidence specifically describing how elderly diabetic and non-diabetic patients differ in clinical presentation, cardiac functional status and angiographic severity of CAD at the time of an angina attack remains scarce from

tertiary cardiac referral centers in this region. Understanding these differences carries direct clinical importance: if diabetic status predicts both atypical presentation and more severe angiographic disease, elderly diabetic patients may warrant a lower threshold for early invasive evaluation rather than reliance on symptom severity alone. This study was therefore designed to compare the baseline characteristics, clinical presentation, cardiac functional status and angiographic severity of coronary artery disease between elderly diabetic and non-diabetic patients presenting with ischemic heart disease at a national cardiac referral center.

METHODS & MATERIALS

This was a cross-sectional analytical study conducted in the Department of Cardiac Surgery, National Institute of Cardiovascular Diseases (NICVD), over a four-year period from January 2021 to December 2024. The study population comprised elderly patients aged 40 years or older presenting with ischemic heart disease who underwent clinical and angiographic evaluation. A total of 250 patients were enrolled and divided into two comparable groups of 125 patients each: a diabetic group and a non-diabetic group, based on a documented diagnosis of diabetes mellitus.

Selection Criteria

Inclusion criteria:

- Patients aged 40 years or older presenting with typical or atypical angina/ACS symptoms
- Patients with a confirmed diagnosis of type 2 diabetes mellitus (diabetic group) or with no history of diabetes (non-diabetic group)
- Patients who underwent clinical, biochemical, electrocardiographic, echocardiographic and coronary angiographic evaluation during admission

- Patients who provided informed written consent for participation

Exclusion criteria:

- Patients younger than 40 years
- Patients with type 1 diabetes mellitus or secondary/steroid-induced hyperglycaemia
- Patients with prior coronary artery bypass grafting or percutaneous coronary intervention
- Patients with valvular, congenital, or non-ischaemic structural heart disease
- Patients with incomplete records or who declined coronary angiography
- Critically ill or haemodynamically unstable patients unable to undergo angiographic evaluation

Data Collection Procedure

Data were collected prospectively from consecutive eligible patients admitted with ischemic heart disease to the Department of Cardiac Surgery, NICVD. After obtaining informed written consent, a structured, pretested data collection form was used to record demographic details, cardiovascular risk factors and comorbid conditions through direct patient interview and review of hospital records. Anthropometric measurements, including height, weight and body mass index, along with blood pressure, were recorded using standardized, calibrated instruments by trained study personnel to ensure accuracy, reliability and consistency. Diabetic status was confirmed from documented history, current antidiabetic therapy, or laboratory glycaemic parameters as per standard diagnostic criteria. All patients underwent a twelve-lead electrocardiogram on admission, interpreted by a cardiologist for ischaemic ST-T changes, Q waves, or T-wave inversion and venous blood samples were drawn for serum cardiac troponin I and routine biochemical analysis using the hospital's accredited laboratory protocols.

Transthoracic echocardiography was performed by a cardiologist for all patients to assess left ventricular ejection fraction, using Simpson's biplane method and to identify regional wall motion abnormalities. Coronary angiography was subsequently performed by an interventional cardiologist using the standard Judkins technique and angiographic findings, including the number of vessels involved and degree of stenosis, were independently documented and cross-verified against catheterization laboratory records. Patient confidentiality was strictly maintained throughout the study.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation and compared using the independent samples t-test, while categorical variables were expressed as frequencies and percentages and compared using the chi-square test. Odds ratios with 95% confidence intervals were calculated for angiographic outcomes. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table I shows the baseline characteristics of the elderly patients included in the study. Diabetic patients had a significantly higher mean age (64.3 ± 8.0 years) than non-diabetic patients (61.2 ± 8.5 years, $p=0.004$) and a greater proportion were aged 65 years or older (57.6% versus 44.8%, $p=0.04$). Hypertension was significantly more prevalent among diabetics (76.8% versus 55.2%, $p<0.001$), as was a body mass index of 27 kg/m^2 or higher (36.8% versus 24.8%, $p=0.04$). Sex distribution, current smoking, dyslipidaemia and family history of CAD were comparable between the two groups ($p>0.05$ for all).

Table I
Baseline characteristics of the study population (n=250).

Variable	Diabetic (n=125), n (%)	Non-diabetic (n=125), n (%)	p-value
Mean age (years, mean ± SD)	64.3 ± 8.0	61.2 ± 8.5	0.004
Age ≥ 65 years	72 (57.6)	56 (44.8)	0.04
Male sex	86 (68.8)	91 (72.8)	0.48
Hypertension	96 (76.8)	69 (55.2)	<0.001
Current smoker	28 (22.4)	40 (32.0)	0.08
Dyslipidaemia	20 (16.0)	22 (17.6)	0.76
BMI ≥ 27 kg/m²	46 (36.8)	31 (24.8)	0.04
Positive family history of CAD	30 (24.0)	31 (24.8)	0.89

Table II presents the clinical presentation of the study population at admission. Typical exertional angina was the most common presenting symptom in both groups, observed in 70.4% of diabetics and 64.0% of non-diabetics, without a

statistically significant difference between groups ($p=0.29$). A systolic blood pressure of 140 mmHg or higher at presentation was significantly more frequent among diabetics (56.0% versus 41.6%, $p=0.03$). The frequencies of atypical chest pain

(15.2% versus 23.2%) and shortness of breath (32.0% versus 25.6%) did not differ significantly between the two groups. Clinical symptoms were not mutually exclusive.

Table II

Clinical presentation at admission ($n=250$).

Clinical characteristic	Diabetic (n=125), n (%)	Non-diabetic (n=125), n (%)	p-value
Typical angina	88 (70.4)	80 (64.0)	0.29
Atypical chest pain	19 (15.2)	29 (23.2)	0.11
Shortness of breath	40 (32.0)	32 (25.6)	0.28
Systolic BP $\geq$ 140 mmHg	70 (56.0)	52 (41.6)	0.03

Table III summarizes the electrocardiographic and biochemical findings at presentation. Ischaemic ECG changes were common in both groups,

observed in 82.4% of diabetics and 76.0% of non-diabetics, without reaching statistical significance ($p=0.24$). Elevated troponin I was numerically more frequent

among diabetics (65.6% versus 57.6%), although this difference did not reach statistical significance ($p=0.20$).

Table III

Electrocardiographic and troponin findings ($n=250$).

Parameter	Diabetic (n=125) n (%)	Non-diabetic (n=125) n (%)	p-value
Ischaemic ECG changes	103 (82.4)	95 (76.0)	0.24
Elevated troponin I	82 (65.6)	72 (57.6)	0.2

Table IV shows the distribution of final clinical diagnosis, which differed significantly between the diabetic and non-diabetic groups ($\chi^2=6.60$, $df=2$, $p=0.037$).

Chronic stable angina was more common among non-diabetic patients (40.0% versus 24.8%), whereas NSTEMI (41.6% versus 32.8%) and STEMI (33.6% versus 27.2%)

were more frequent among diabetic patients. Individual diagnostic categories were not tested separately.

Table IV

Final clinical diagnosis according to diabetic status ($n=250$).

Final diagnosis	Diabetic (n=125) n (%)	Non-diabetic (n=125) n (%)
Chronic stable angina	31 (24.8)	50 (40.0)
NSTEMI	52 (41.6)	41 (32.8)
STEMI	42 (33.6)	34 (27.2)

NSTEMI, non-ST-elevation myocardial infarction; STEMI, ST-elevation myocardial infarction.

Table V presents the echocardiographic findings of the study population. Regional wall motion abnormalities were significantly more prevalent among diabetic patients than non-diabetic patients

(71.2% versus 57.6%, $p=0.03$). Mean left ventricular ejection fraction (LVEF) was significantly lower in the diabetic group ($48.5 \pm 10.2\%$ versus $52.3 \pm 9.8\%$, $p=0.003$). Although an LVEF below 50%

was numerically more frequent among diabetic patients (43.2% versus 32.8%), the difference was not statistically significant ($p=0.09$).

Table V

Echocardiographic findings ($n=250$).

Parameter	Diabetic (n=125) n (%)	Non-diabetic (n=125) n (%)	p-value
Regional wall motion abnormality	89 (71.2)	72 (57.6)	0.03
LVEF (mean $\pm$ SD), %	48.5 ± 10.2	52.3 ± 9.8	0.003
LVEF $< 50\%$	54 (43.2)	41 (32.8)	0.09

Table VI illustrates the coronary angiographic findings of the study population. Among the 230 patients (115 in

each group) who underwent coronary angiography, significant CAD (stenosis of 70% or more) was significantly more

common among diabetic than non-diabetic patients (80.0% versus 64.3%; OR 2.28, 95% CI 1.23–4.24; $p=0.009$).

Among the 166 patients with significant CAD (92 diabetic, 74 non-diabetic), the distribution of coronary vessel involvement differed significantly between the two groups ($\chi^2=10.98$, $df=2$, $p=0.004$). Single-vessel disease was significantly less frequent among diabetics (29.3% versus 51.4%; OR 0.39, 95% CI 0.21–0.74;

$p=0.004$), whereas triple-vessel disease was significantly more frequent (35.9% versus 16.2%; OR 2.88, 95% CI 1.36–6.10; $p=0.005$). Double-vessel disease did not differ significantly between groups (34.8% versus 32.4%; OR 1.11, 95% CI 0.58–2.12; $p=0.75$). Severe stenosis (90% or more) and more than two significant coronary

lesions were numerically more frequent among diabetic patients, but neither difference reached statistical significance (45.7% versus 37.8%, $p=0.31$; and 52.2% versus 43.2%, $p=0.25$, respectively).

Table VI
Coronary angiographic findings according to diabetic status.

Parameter	Diabetic	Non-diabetic	OR (95% CI)	p-value
Among patients undergoing coronary angiography (n=230)				
Significant CAD ($\geq 70\%$ stenosis)	92/115 (80.0%)	74/115 (64.3%)	2.28 (1.23–4.24)	0.009
Among patients with significant CAD (n=166)				
Single-vessel disease	27/92 (29.3%)	38/74 (51.4%)	0.39 (0.21–0.74)	0.004
Double-vessel disease	32/92 (34.8%)	24/74 (32.4%)	1.11 (0.58–2.12)	0.75
Triple-vessel disease	33/92 (35.9%)	12/74 (16.2%)	2.88 (1.36–6.10)	0.005
Severe stenosis ($\geq 90\%$)	42/92 (45.7%)	28/74 (37.8%)	1.38 (0.74–2.57)	0.31
>2 significant coronary lesions	48/92 (52.2%)	32/74 (43.2%)	1.43 (0.77–2.67)	0.25

DISCUSSION

This study compared the clinical presentation, cardiac function and angiographic severity of coronary artery disease (CAD) between elderly diabetic and non-diabetic patients. The findings reinforce established evidence while providing region-specific data from a tertiary cardiac center in Bangladesh. Diabetic patients were significantly older and had a higher prevalence of hypertension and elevated body mass index than non-diabetic patients. These findings are consistent with Díez-Villanueva et al., who highlighted the accumulation of cardiovascular risk factors, including diabetes and hypertension, with advancing age. The higher BMI among diabetic patients also reflects the well-established association between adiposity, insulin resistance and type 2 diabetes in older adults [2]. The high prevalence of hypertension among diabetic patients (76.8%) was comparable to the 67.2% reported by Alsaadon et al. in a Bangladeshi cohort with type 2 diabetes, further demonstrating the frequent coexistence of these conditions [12]. Typical exertional angina was the most common presenting symptom in both groups, with no significant difference between diabetic and non-diabetic patients. This finding differs from the meta-analysis by Tabowei et al., which showed that diabetic patients were less likely to report typical chest pain and more likely to present with dyspnoea and other atypical symptoms [3]. This discrepancy may partly reflect the present study population, which consisted of symptomatic patients undergoing coronary evaluation and therefore may have excluded individuals with silent or minimally symptomatic ischemia. Studies by Abdul Manan et al. and Rathie et al. have demonstrated a substantial prevalence of silent myocardial ischemia among diabetic patients [4,5], while Mfeukeu-Kuate et al. also reported a

significant burden of unrecognized ischemia in diabetic populations [6]. Importantly, the final clinical diagnosis differed significantly between groups, with chronic stable angina more frequent among non-diabetics and NSTEMI and STEMI more common among diabetics. This may reflect the effects of diabetic autonomic neuropathy and the tendency for ischemia to remain clinically unrecognized until a more acute event occurs [4,5]. Diabetic patients also had significantly lower left ventricular ejection fraction (LVEF) and a higher prevalence of regional wall motion abnormalities. Diabetes may impair myocardial function through mechanisms beyond epicardial coronary obstruction, including microvascular dysfunction, metabolic abnormalities, oxidative stress and direct myocardial injury. In the present cohort, reduced systolic function occurred alongside more extensive angiographic disease, suggesting that ischemic and diabetes-related myocardial mechanisms may contribute jointly to ventricular dysfunction in elderly diabetic patients. The angiographic findings further support the established association between diabetes and extensive CAD. Diabetic patients had significantly higher odds of significant CAD and, among those with significant disease, were more likely to have triple-vessel disease and less likely to have single-vessel disease. These findings are consistent with Arshad et al., who reported a higher prevalence of multivessel disease among diabetic patients in a Pakistani cardiology cohort [8]. Although severe stenosis ($\geq 90\%$) and more than two significant lesions were numerically more frequent among diabetics, these differences were not statistically significant. This suggests that diabetes in this population may be associated more strongly with the extent of vessel involvement than with the severity of stenosis within an individual vessel.

The greater angiographic burden may partly reflect the coexistence of other cardiovascular risk factors. Masoudkabar et al. demonstrated a synergistic association between hypertension and diabetes in the progression of coronary atherosclerosis [7]. In addition, She et al. and Habib et al. reported associations between higher HbA1c levels and greater coronary stenosis severity, supporting a role for chronic hyperglycaemia in accelerating atherosclerosis [9,10]. Although glycaemic indices were not systematically assessed in the present study, these findings provide a plausible biological explanation for the greater multivessel involvement observed among diabetic patients. The observed differences have important clinical implications. Diabetic patients with non-ST-elevation acute coronary syndrome may require more complex revascularization because of their greater multivessel burden [11], while Zivkovic et al. emphasized the need for individualized revascularization strategies in patients with diabetes and extensive CAD [18]. Furthermore, the higher risk profile of elderly patients with acute coronary syndrome reported by Dakhil and Farhan [16], together with the atypical presentations described by Nguyen et al. [17], highlights the diagnostic challenges in elderly diabetic patients. The coexistence of age-related and diabetes-related atypical presentations may delay recognition of clinically significant ischemia. Overall, the present findings support the identification of elderly diabetic patients with IHD as a particularly high-risk group. The greater prevalence of cardiovascular risk factors, impaired ventricular function and extensive multivessel CAD observed in this study supports careful clinical assessment and a low threshold for appropriate coronary evaluation. These findings are also consistent with evidence of substantial macrovascular disease among Bangladeshi patients with diabetes

[15] and the broader cardiometabolic risk profile reported in Bangladeshi populations with CAD [13,14].

LIMITATIONS

This single-center, cross-sectional study may have limited generalizability and cannot establish causal or long-term relationships. Systematic assessment of HbA1c and diabetes duration was not performed and left ventricular function was evaluated using conventional two-dimensional echocardiography. Future multicenter prospective studies incorporating glycaemic indices, advanced echocardiographic techniques, longer follow-up and clinical outcomes are recommended to validate these findings and inform risk-stratified management of elderly patients with diabetes and ischemic heart disease.

CONCLUSION

Elderly diabetic patients are more susceptible to ischemic heart disease than the non-diabetic group. The diabetic group also exhibit marked ischemic changes on ECG and elevated HS troponin I. Echocardiography in the diabetic group also showed more marked wall motion abnormalities than in the non-diabetic group. We can conclude that elderly diabetic patients have more severe and extensive coronary artery disease than non-diabetic patients. Therefore, early cardiac evaluation should be considered in this high-risk group.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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