

## Association Of Diabetes Mellitus And Hypertension With Coronary Artery Disease In Bangladesh

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### Abstract

**Background:** Coronary artery disease (CAD) is a leading cause of morbidity and mortality worldwide, with diabetes mellitus (DM) and hypertension (HTN) being two of its most significant risk factors. This study aimed to evaluate the association between DM, HTN, and the severity of CAD among patients in Bangladesh.

**Methods:** This cross-sectional observational study was conducted in the Department of Cardiology, MMCH, from November 2023 to December 2024. A total of 56 patients undergoing coronary angiography were included. Data on age, sex, diagnosis of DM and/or HTN, and angiographic findings were collected. Statistical analysis was performed using SPSS version 25.

**Results:** The study population had a mean age of  $53.2 \pm 10.5$  years, with a male predominance (78.6%). HTN was present in 73.2% of patients, DM in 42.9%, and both in 16.1%. Among DM patients, 62.5% had triple-vessel disease (TVD), while 31.7% of HTN patients had normal coronary arteries. Patients with both DM and HTN most commonly exhibited double-vessel disease (55.6%). The severity of CAD was significantly higher among diabetic patients.

**Conclusion:** This study demonstrates a strong association between diabetes mellitus and severe coronary artery disease in the Bangladeshi population. Hypertension alone showed a less consistent correlation with CAD severity, while the coexistence of DM and HTN was linked to moderate disease. Early detection and comprehensive management of these comorbidities are crucial in reducing the burden of CAD.

**Keywords:** Coronary artery disease, diabetes mellitus, hypertension, angiography, Bangladesh.

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### I. Introduction

Coronary artery disease (CAD) remains one of the leading causes of morbidity and mortality worldwide, with a particularly growing burden in low- and middle-income countries like Bangladesh [1, 2]. CAD is a multifactorial condition influenced by a complex interplay of modifiable and non-modifiable risk factors, among which diabetes mellitus (DM) and hypertension (HTN) are considered two of the most significant contributors [3]. As both conditions are highly prevalent in the South Asian population, understanding their relationship with the severity and extent of CAD is crucial for early diagnosis, risk stratification, and optimal management [4].

Diabetes mellitus is a well-established independent risk factor for atherosclerosis and CAD. Chronic hyperglycemia leads to endothelial dysfunction, inflammation, and lipid abnormalities, all of which accelerate the development of coronary artery plaques [5]. Multiple studies have shown that diabetic patients are more likely to present with multi-vessel disease, silent ischemia, and adverse cardiovascular outcomes compared to

non-diabetic individuals [6, 7]. Similarly, hypertension exerts continuous stress on the arterial walls, resulting in vascular remodeling and increased susceptibility to atherosclerotic plaque formation [8]. The combination of DM and HTN is particularly detrimental, as it synergistically elevates the risk of CAD and worsens the prognosis [9].

In Bangladesh, the prevalence of both diabetes and hypertension has been steadily rising due to urbanization, sedentary lifestyles, and dietary changes [10]. Despite this, limited local data exist that explore the direct association between these risk factors and the severity of CAD, especially as confirmed by coronary angiography [11, 12]. Most existing studies either focus on broader cardiovascular risk profiles or do not categorize CAD severity in relation to individual comorbidities.

This study was therefore conducted to evaluate the association of diabetes mellitus and hypertension with the angiographic severity of CAD in patients admitted to the Department of Cardiology, Mymensingh Medical College Hospital. By categorizing patients based on the presence of DM, HTN, or both, and analyzing their coronary angiogram findings, we aimed to provide insight into the burden of CAD in these high-risk populations. The findings may help in refining screening strategies and optimizing clinical management tailored to comorbid risk profiles.

## II. Methodology & Materials

This cross-sectional study was conducted in the Department of Cardiology, Mymensingh Medical College Hospital, from November 2023 to December 2024. A total of 56 patients admitted with suspected coronary artery disease (CAD) who underwent coronary angiography were included. Patients aged 18 years and above with a confirmed diagnosis of diabetes mellitus (DM), hypertension (HTN), or both were enrolled. Patients with incomplete data, known congenital heart disease, valvular heart disease, or prior coronary revascularization were excluded from the study.

Data were collected using a structured datasheet, which included patient demographics, clinical history, and coronary angiogram findings. CAD severity was categorized as normal, single-vessel disease (SVD), double-vessel disease (DVD), or triple-vessel disease (TVD) based on angiographic results. Statistical analysis was performed using SPSS version 25. Descriptive statistics were used to summarize the data, and results were presented in frequencies and percentages for categorical variables and mean  $\pm$  standard deviation for continuous variables.

## III. Results

**Table 1: Patient Demographics (N = 56)**

Variable	Frequency (n)	Percentage (%)
Male	44	78.6
Female	12	21.4
Mean Age (years)	53.2 $\pm$ 10.5	

Table 1 summarizes the demographic features of the study participants (N = 56). The majority were male (78.6%), with a mean age of 53.2  $\pm$  10.5 years.

**Table 2: Prevalence of Diabetes Mellitus (DM) and Hypertension (HTN)**

Variable	Frequency (n)	Percentage (%)
Hypertension (HTN)	41	73.2
Diabetes Mellitus (DM)	24	42.9
Both DM & HTN	9	16.1

Table 2 shows that hypertension was the most common comorbidity (73.2%), followed by diabetes mellitus (42.9%). Both conditions coexisted in 16.1% of the patients.

**Table 3: CAD Severity Distribution among Patients with DM and HTN**

CAD Severity	DM Patients (n=24)	HTN Patients (n=41)	Both DM & HTN (n=9)
Normal	0 (0.0%)	13 (31.7%)	1 (11.1%)
Mild CAD (SVD)	5 (20.8%)	11 (26.8%)	2 (22.2%)
Moderate CAD (DVD)	4 (16.7%)	4 (9.8%)	5 (55.6%)
Severe CAD (TVD)	15 (62.5%)	13 (31.7%)	1 (11.1%)

Table 3 shows the distribution of CAD severity reveals important differences among patients with DM, HTN, and both conditions. Among diabetic patients, a significant majority (62.5%) had severe CAD (TVD), indicating a strong association between diabetes and advanced coronary involvement. In contrast, hypertensive patients showed a broader distribution, with the highest proportion (31.7%) having normal coronary arteries, suggesting relatively less severe disease. Interestingly, patients with both DM and HTN were more likely to

have moderate CAD (DVD) at 55.6%, possibly reflecting a synergistic impact of both conditions on vascular compromise.

#### **IV. Discussion**

This study aimed to explore the association between Diabetes Mellitus (DM), Hypertension (HTN), and the severity of Coronary Artery Disease (CAD) among patients in Bangladesh. Our findings suggest a significant relationship between these comorbid conditions and the extent of coronary involvement.

In our cohort of 56 patients undergoing coronary angiography, a high prevalence of hypertension (73.2%) and diabetes mellitus (42.9%) was observed, with 16.1% having both conditions. These findings align with national data indicating a growing burden of noncommunicable diseases in Bangladesh, particularly HTN and DM [13, 14]. The mean age of our study population was 53.2 years, and the male predominance (78.6%) is consistent with regional trends in CAD presentation [15].

The most striking observation from this study is the severity of CAD in diabetic patients. Among those with DM, 62.5% had triple-vessel disease (TVD), highlighting a strong link between diabetes and advanced coronary artery involvement. This supports previous literature, which describes diabetes as a powerful risk factor for atherosclerosis and macrovascular complications [16, 17]. The chronic inflammatory and metabolic derangements in DM accelerate endothelial dysfunction and plaque formation, contributing to severe CAD [18].

Interestingly, hypertensive patients had a more variable CAD presentation, with 31.7% showing normal angiographic findings and another 31.7% presenting with severe disease (TVD). This variability may reflect different stages of disease progression and effectiveness of blood pressure management. However, the significant proportion with normal coronary anatomy suggests that hypertension alone, particularly when controlled, may not always lead to critical coronary narrowing [19].

The group with both DM and HTN showed a notable pattern, with 55.6% presenting with double-vessel disease (DVD). This suggests a possible synergistic effect of both conditions in promoting moderate but extensive vascular compromise. Prior studies have reported that combined metabolic and hemodynamic stressors, as seen in patients with both DM and HTN, substantially accelerate the progression of CAD [20, 21].

Our findings are also supported by global and local data. In a population-based study in Bangladesh, both HTN and DM were independently associated with increased cardiovascular risk [22, 23]. Furthermore, poor glycemic control and long-standing hypertension are recognized contributors to cardiovascular morbidity, especially in South Asian populations where genetic predisposition and lifestyle factors compound risk [24, 25].

From a clinical perspective, our results highlight the need for aggressive screening and management of DM and HTN to prevent severe CAD. Lifestyle modifications, early pharmacologic intervention, and patient education should be emphasized, particularly in primary care settings [18, 26].

#### **Limitations of the study**

It is also important to consider limitations. The study was conducted in a single tertiary center with a relatively small sample size (N=56), which may limit generalizability. Additionally, we did not account for other potential confounding variables such as smoking, dyslipidemia, obesity, or family history. Future studies with larger, multicenter cohorts and multivariate analysis are warranted.

#### **V. Conclusion**

In conclusion, our study reinforces the strong association between diabetes, hypertension, and coronary artery disease in the Bangladeshi population. Diabetes, in particular, is associated with more severe coronary involvement, while coexisting diabetes and hypertension appear to increase the risk of moderate CAD. These findings underscore the importance of early detection and integrated management of these comorbidities to reduce the burden of CAD in Bangladesh.

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#### **Conflicts of interest**

There are no conflicts of interest.

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