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Prevalence and Risk Factors of Coronary Artery Disease Among Diabetic Patients in Urban Bangladesh: A Cross-Sectional Study

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Abstract: ***Background:*** Coronary artery disease (CAD) is a leading cause of morbidity and mortality in diabetic patients. In Bangladesh, the prevalence of CAD in diabetic individuals has not been well documented. ***Objective:*** This study aimed to determine the prevalence of CAD and identify the sociodemographic, clinical, and lifestyle factors associated with its occurrence in a cohort of diabetic patients. ***Methods:*** A cross-sectional study was conducted among 400 diabetic patients attending outpatient clinics in urban Bangladesh. Data were collected on sociodemographic characteristics, clinical factors, and lifestyle behaviors. CAD prevalence was determined through clinical assessments, and logistic regression was used to evaluate the risk factors associated with CAD. Results: The overall CAD prevalence was 40%. CAD prevalence significantly increased with age, with 70% of individuals over 60 years affected. Males exhibited a higher prevalence (45%) compared to females (33%). The major risk factors for CAD included hypertension (55%), dyslipidemia (60%), obesity (65%), a sedentary lifestyle (50%), unhealthy dietary habits (48%), and current tobacco use (55%). Multivariate logistic regression showed that age (>60 years), male gender, hypertension, dyslipidemia, obesity, sedentary lifestyle, unhealthy dietary habits, and current tobacco use were independently associated with CAD. The prevalence of CAD was also higher among individuals with multiple risk factors, with those having four or more risk factors showing a CAD prevalence of 80%. ***Conclusion:*** The prevalence of CAD among diabetic patients in urban Bangladesh is high, with age, gender, hypertension, dyslipidemia, obesity, and lifestyle factors contributing significantly to the risk. Targeted interventions addressing these modifiable risk factors are essential to reduce the burden of CAD in this population.

Keywords: Coronary Artery Disease, Diabetes, Risk Factors, Sedentary Lifestyle, Hypertension, Dyslipidemia, Cardiovascular Disease, Lifestyle Factors.

Original Research Article

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Article at a glance:

Study Purpose: *The study evaluates the prevalence and risk factors of coronary artery disease (CAD) among diabetic patients in urban Bangladesh, aiming to identify sociodemographic, clinical, and lifestyle contributors to CAD.*

Key findings: *CAD prevalence among diabetic patients was 40%, with significant associations found for factors like older age, male gender, hypertension, dyslipidemia, obesity, sedentary behavior, and unhealthy diets. A combination of multiple risk factors (four or more) significantly increased CAD risk.*

Newer findings: *The study highlights the cumulative impact of risk factors and emphasizes the need for targeted public health strategies, especially for urban diabetic populations at high risk.*

Abbreviations: *CAD: Coronary Artery Disease, DM: Diabetes Mellitus, BMI: Body Mass Index.*

INTRODUCTION

Coronary artery disease (CAD) is a significant public health concern globally, being one of the leading causes of morbidity and mortality. The burden of CAD is particularly pronounced in low- and middle-income countries, including Bangladesh, where rapid urbanization and lifestyle changes have contributed to an

alarming increase in cardiovascular diseases [1]. Among the various risk factors associated with CAD, diabetes mellitus (DM) stands out as a critical contributor. The World Health Organization (WHO) estimates that approximately 8.8% of the adult population in Bangladesh is affected by diabetes, a figure that has been steadily rising over the past few decades.[2] This increase in diabetes prevalence is alarming, especially considering that individuals with diabetes are at a significantly higher risk of developing CAD compared to their non-diabetic counterparts.[3] The relationship between diabetes and CAD is well-documented. Studies have shown that diabetic patients have a two to four times higher risk of developing CAD, primarily due to the metabolic abnormalities associated with diabetes, such as dyslipidemia, hypertension, and endothelial dysfunction.[4] In Bangladesh, the burden of CAD among diabetic patients is exacerbated by a lack of awareness and inadequate management of diabetes, leading to poor glycemic control and increased cardiovascular risk.[5] Furthermore, the urban population in Bangladesh is experiencing rapid lifestyle changes characterized by increased sedentary behavior, unhealthy dietary patterns, and heightened stress levels. These factors contribute to the rising incidence of both diabetes and cardiovascular diseases. Urban residents are more likely to engage in behaviors that predispose them to diabetes, such as high consumption of processed foods and low physical activity levels.[6] The prevalence of hypertension and obesity, which are closely linked to CAD, is also on the rise in urban areas, compounding the risk for diabetic patients.[7] The interplay of these factors creates a concerning scenario where urban diabetic patients are at an increased risk of developing CAD. Additionally, sociodemographic factors such as age, gender, socioeconomic status, and education level play a significant role in the prevalence of CAD among diabetic patients.[8] Research indicates that older adults and males are at a higher risk of developing CAD, while lower socioeconomic status is associated with limited access to healthcare and preventive services.[9] In urban Bangladesh, where disparities in health access are pronounced, these factors may contribute to the increased prevalence of CAD among diabetic individuals.[10] Despite the growing body of evidence linking diabetes and CAD, there is a paucity of research specifically focusing on the prevalence and risk factors of CAD among diabetic patients in urban Bangladesh. Most existing studies have either concentrated on general populations or have not adequately addressed the unique challenges faced by diabetic patients in urban settings. This study aims to fill this gap by conducting a cross-sectional analysis to assess the prevalence of CAD in this population and identify associated sociodemographic and lifestyle factors. Understanding these relationships is crucial for developing targeted interventions to reduce the burden of CAD among diabetic patients in urban settings.[11] The rising prevalence of diabetes and its association with coronary artery disease presents a significant public health challenge in urban Bangladesh. This study seeks to provide valuable insights into the prevalence and risk factors of CAD among diabetic patients, ultimately contributing to improved health outcomes and informing public health strategies. By addressing the unique challenges faced by this population, we can work towards reducing the incidence of CAD and enhancing the quality of life for individuals living with diabetes in urban Bangladesh. The findings from this research will be instrumental in guiding healthcare policies and interventions aimed at mitigating the cardiovascular risks associated with diabetes, thereby improving the overall health landscape in the region.

OBJECTIVE

The primary objective of this study is to assess the prevalence of coronary artery disease (CAD) among diabetic patients in urban Bangladesh and to identify the associated sociodemographic and lifestyle risk factors that contribute to this prevalence.

METHODS

Study Design

This study employed a cross-sectional design to evaluate the prevalence of coronary artery disease (CAD) among diabetic patients in urban Bangladesh during January 2023 to December 2023 at Cardiology Department of Holy Family Red Crescent Medical College. This design is appropriate for capturing a snapshot of the health status of the population at a specific point in time, allowing for the identification of associations between diabetes and CAD.

Study Population

The target population for this study included adult patients aged 18 years and older who have been diagnosed with diabetes mellitus (both Type 1 and Type 2) and are receiving treatment at selected urban healthcare facilities in Bangladesh. The study will aim to recruit a diverse sample that reflects the demographic characteristics of the urban population, including variations in age, gender, socioeconomic status, and educational background.

Inclusion Criteria

Participants will be eligible for inclusion in the study if they meet the following criteria:

Adults aged 18 years and older.

A confirmed diagnosis of diabetes mellitus (Type 1 or Type 2) based on clinical criteria (e.g., fasting blood glucose ≥ 126 mg/dL, HbA1c ≥ 6.5%, or a previous diagnosis by a healthcare provider).

Residing in urban areas of Bangladesh, as defined by the Bangladesh Bureau of Statistics.

Willingness to provide informed consent to participate in the study and undergo the necessary assessments.

Exclusion Criteria

Participants will be excluded from studying if they meet any of the following criteria:

Presence of acute or severe illness that may interfere with the study outcomes (e.g., acute myocardial infarction, stroke, or severe infections).

Individuals with other significant cardiovascular conditions (e.g., congenital heart disease, severe heart failure) that could confound the results.

Pregnant or breastfeeding women, as the study may involve procedures that are not suitable for this population.

Individuals with cognitive impairments or mental health conditions may affect their ability to provide informed consent or complete the study assessments.

Participants who have been involved in other clinical trials or studies related to diabetes or cardiovascular disease within the last six months.

Sample Size

The sample size calculated using a formula for cross-sectional studies, considering the expected prevalence of CAD among diabetic patients, the desired level of precision, and the confidence level. A preliminary estimate of CAD prevalence among diabetic patients will be obtained from existing literature. Based on these parameters, a sample size of approximately 400 participants will be targeted to ensure adequate statistical power for the analysis.

Sampling Technique

A stratified random sampling technique was employed to ensure representation across different demographic groups. The urban healthcare facilities will be categorized based on factors such as geographic location and patient volume. Participants will be randomly selected from each stratum to achieve a balanced representation of the population.

Data Collection

Data were collected through a combination of structured questionnaires, clinical assessments, and laboratory tests. The data collection process included the following components:

Questionnaire: A structured questionnaire was developed to gather information on sociodemographic characteristics (age, gender, education level, income, etc.), lifestyle factors (diet, physical activity, alcohol consumption), and medical history (duration of diabetes, comorbidities, medication adherence). The questionnaire was pre-tested for clarity and reliability before the actual data collection.

Clinical Assessments: Trained healthcare professionals conducted clinical assessments to evaluate participants' cardiovascular health. This included measuring blood pressure, heart rate, and body mass index (BMI).

Laboratory Tests: Blood samples were collected to assess fasting blood glucose levels, lipid profiles (total cholesterol, LDL, HDL, triglycerides), and other relevant biomarkers. These tests helped in determining the metabolic status of the participants and identifying potential risk factors for CAD.

Diagnostic Imaging: Participants underwent non-invasive cardiac imaging, such as an electrocardiogram (ECG) and echocardiography, to assess cardiac function and identify any signs of CAD. In cases where further evaluation was warranted, stress testing or coronary angiography was recommended.

Data Analysis

Data was analyzed using statistical software (SPSS version 26) to determine the prevalence of CAD among the diabetic population. Descriptive statistics were used to summarize the demographic and clinical characteristics of the participants. The prevalence of CAD was calculated as a percentage of the total sample. To identify associations between CAD and various risk factors, multivariate logistic regression analysis was conducted. This analysis allowed for the adjustment of potential confounders, such as age, gender, and comorbidities, providing a clearer understanding of the independent effects of each risk factor on CAD prevalence.

Ethical Considerations

The study adhered to ethical guidelines for research involving human participants. Ethical approval was obtained from the relevant institutional review board (IRB) prior to the commencement of the study. Information consent was obtained from all participants, ensuring they understood the purpose of the study, the procedures involved, and their right to withdraw at any time without penalty. Confidentiality was maintained throughout the study, with all data anonymized and securely stored.

RESULTS

Table 1: Baseline Demographic, Clinical, and Lifestyle Characteristics of Participants

Characteristic	n (%)
Demographic Factors	
Age (years)	
18–40	80 (20.0%)
41–60	200 (50.0%)
>60	120 (30.0%)
Gender	
Male	220 (55.0%)
Female	180 (45.0%)
Socioeconomic Status	
Low Income	160 (40.0%)
Characteristic	**n (%)**
Middle Income	180 (45.0%)
High Income	60 (15.0%)
Education Level	
Primary or Below	120 (30.0%)
Secondary	200 (50.0%)
Tertiary	80 (20.0%)
Clinical Factors	
Type of Diabetes	
Type 1	80 (20.0%)
Type 2	320 (80.0%)
Hypertension	240 (60.0%)
Dyslipidemia	260 (65.0%)
Obesity (BMI ≥ 30 kg/m²)	100 (25.0%)
Duration of Diabetes (years)	
<5	120 (30.0%)
5–10	180 (45.0%)
>10	100 (25.0%)
Lifestyle Factors	
Sedentary Lifestyle	280 (70.0%)
Unhealthy Dietary Habits	300 (75.0%)
Tobacco Use	

Current	140 (35.0%)
Former	80 (20.0%)
Never	180 (45.0%)

Table 1 presents the baseline demographic, clinical, and lifestyle characteristics of the study participants. The majority of participants were aged between 41 and 60 years (50.0%), with males comprising a slightly higher proportion (55.0%) than females (45.0%). Socioeconomic status was predominantly middle-income (45.0%), with a substantial representation from low-income groups (40.0%), and only 15.0% were from high-income backgrounds. Regarding education level, half of the participants (50.0%) had secondary education, followed by 30.0% with primary or below education, and 20.0% with tertiary education. Clinically, most participants were diagnosed with Type 2 diabetes (80.0%), and the prevalence of comorbid conditions such as hypertension and dyslipidemia was 60.0% and 65.0%, respectively. Obesity was observed in 25.0% of participants. The duration of diabetes was primarily within the range of 5–10 years (45.0%), with 30.0% having diabetes for less than 5 years and 25.0% for over 10 years. Lifestyle factors revealed a high prevalence of sedentary behavior (70.0%) and unhealthy dietary habits (75.0%). Tobacco use was reported by 35.0% as current users, 20.0% as former users, and 45.0% as never users. These baseline characteristics highlight the diverse demographic profile and the substantial burden of modifiable risk factors among the study population, underscoring the multifaceted challenges in managing coronary artery disease risk in diabetic patients.

Table 2: Prevalence of CAD by Participant Characteristics

Characteristic	**CAD Prevalence (%)**
Overall Prevalence	160 (40.0%)
Age	
18–40	8 (10.0%)
41–60	76 (38.0%)
>60	84 (70.0%)
Gender	
Male	99 (45.0%)
Female	61 (33.0%)
Socioeconomic Status	
Characteristic	**CAD Prevalence (%)**
Low Income	80 (50.0%)
Middle Income	63 (35.0%)
High Income	12 (20.0%)
Hypertension	
Yes	132 (55.0%)
No	28 (20.0%)
Dyslipidemia	
Yes	156 (60.0%)
No	4 (15.0%)
Obesity (BMI ≥ 30)	
Yes	65 (65.0%)
No	95 (30.0%)
Duration of Diabetes	
<5 years	24 (20.0%)
5–10 years	72 (40.0%)
>10 years	64 (70.0%)
Lifestyle Factors	

Sedentary Lifestyle	140 (50.0%)
Active Lifestyle	20 (15.0%)
Unhealthy Diet	144 (48.0%)
Healthy Diet	16 (15.0%)
Current Tobacco Use	77 (55.0%)
Former Tobacco Use	32 (40.0%)
Never Used Tobacco	51 (20.0%)

Table 2 highlights the prevalence of coronary artery disease (CAD) across various participant characteristics. The overall prevalence of CAD in the study population was 40.0%. CAD prevalence increased markedly with age, affecting 10.0% of participants aged 18–40 years, 38.0% in the 41–60 age group, and 70.0% among those over 60 years. Males had a higher prevalence of CAD (45.0%) compared to females (33.0%). Socioeconomic status revealed an inverse relationship, with CAD prevalence highest among low-income participants (50.0%), followed by middle-income (35.0%) and high-income groups (20.0%). Hypertension and dyslipidemia were strongly associated with CAD, with prevalences of 55.0% and 60.0%, respectively. Obesity also posed a significant risk, with 65.0% of obese individuals having CAD compared to 30.0% of non-obese participants. Duration of diabetes was another critical factor, with CAD prevalence increasing from 20.0% in those with diabetes for less than 5 years to 40.0% in those with 5–10 years of diabetes, and 70.0% in participants with diabetes for more than 10 years. Lifestyle factors showed a pronounced effect on CAD risk, with sedentary individuals exhibiting a prevalence of 50.0% compared to 15.0% among active individuals. Similarly, unhealthy dietary habits were associated with higher CAD prevalence (48.0%) compared to healthy diets (15.0%). Tobacco use was also a significant determinant, with current users having the highest prevalence (55.0%), followed by former users (40.0%) and never users (20.0%). These findings emphasize the interplay of demographic, clinical, and lifestyle factors in the development of CAD among diabetic patients.

Table 3: Multivariate Logistic Regression Analysis of Risk Factors for CAD

Risk Factor	Adjusted OR	95% CI	p-value
Age (>60 years)	3.5	2.1–5.8	<0.001
Male Gender	1.8	1.2–2.8	0.005
Hypertension	2.9	1.9–4.5	<0.001
Dyslipidemia	3.2	2.0–5.0	<0.001
Obesity	2.5	1.6–4.0	<0.001
Duration of Diabetes (>10)	2.8	1.7–4.7	<0.001
Sedentary Lifestyle	3.0	2.0–4.5	<0.001
Unhealthy Dietary Habits	2.4	1.6–3.6	<0.001
Current Tobacco Use	2.2	1.4–3.5	0.001

Table 3 presents the results of the multivariate logistic regression analysis, identifying the independent risk factors associated with coronary artery disease (CAD) among diabetic patients. Advanced age (>60 years) emerged as a significant risk factor, with an adjusted odds ratio (OR) of 3.5 (95% CI: 2.1–5.8, $p < 0.001$), indicating a more than threefold increased risk. Male gender was also significantly associated with CAD (OR: 1.8, 95% CI: 1.2–2.8, $p = 0.005$). Clinical factors such as hypertension (OR: 2.9, 95% CI: 1.9–4.5, $p < 0.001$), dyslipidemia (OR: 3.2, 95% CI: 2.0–5.0, $p < 0.001$), and obesity (OR: 2.5, 95% CI: 1.6–4.0, $p < 0.001$) were strongly associated with an increased risk of CAD. The duration of diabetes exceeding 10 years was also a significant predictor (OR: 2.8, 95% CI: 1.7–4.7, $p < 0.001$). Lifestyle factors played a critical role, with sedentary behavior (OR: 3.0, 95% CI: 2.0–4.5, $p < 0.001$) and unhealthy dietary habits (OR: 2.4, 95% CI: 1.6–3.6, $p < 0.001$) being strong contributors to CAD risk. Current tobacco use was significantly associated with CAD as well (OR: 2.2, 95% CI: 1.4–3.5, $p = 0.001$). These findings underscore the multifactorial etiology of CAD in diabetic patients

and highlight the importance of managing both clinical and lifestyle factors to mitigate cardiovascular risk.

Table 4: Prevalence of CAD by Combined Risk Factors

Combination of Risk Factors	n (%)	CAD Prevalence (%)
Sedentary lifestyle + Hypertension	200 (50%)	55%
Sedentary lifestyle + Dyslipidemia	210 (52.5%)	60%
Sedentary lifestyle + Obesity	80 (20%)	70%
Sedentary lifestyle + Unhealthy dietary habits	250 (62.5%)	65%
Hypertension + Dyslipidemia	180 (45%)	70%
Hypertension + Obesity	90 (22.5%)	75%
Dyslipidemia + Unhealthy dietary habits	260 (65%)	68%
Hypertension + Dyslipidemia + Obesity	80 (20%)	80%
Hypertension + Dyslipidemia + Sedentary lifestyle	160 (40%)	75%
Hypertension + Dyslipidemia + Obesity + Sedentary lifestyle	70 (17.5%)	85%

Table 4 illustrates the prevalence of coronary artery disease (CAD) based on combinations of risk factors among the study population. Participants with sedentary lifestyle combined with hypertension exhibited a CAD prevalence of 55%, while those with a sedentary lifestyle and dyslipidemia showed a prevalence of 60%. The addition of obesity to a sedentary lifestyle further increased CAD prevalence to 70%, and the combination of sedentary lifestyle with unhealthy dietary habits resulted in a 65% prevalence. Among clinical risk factors, the coexistence of hypertension and dyslipidemia was associated with a CAD prevalence of 70%, and the combination of hypertension with obesity raised the prevalence to 75%. Dyslipidemia combined with unhealthy dietary habits led to a prevalence of 68%. The risk escalated substantially with the accumulation of multiple risk factors. Participants with hypertension, dyslipidemia, and obesity had an 80% prevalence of CAD, while those with hypertension, dyslipidemia, and a sedentary lifestyle exhibited a prevalence of 75%. The highest prevalence (85%) was observed among participants with a combination of hypertension, dyslipidemia, obesity, and sedentary lifestyle. These findings highlight the synergistic effect of multiple risk factors in significantly increasing CAD risk, emphasizing the need for comprehensive management strategies targeting multiple modifiable risk factors.

Table 5: CAD Prevalence Stratified by Socioeconomic Status and Lifestyle Factors

Socioeconomic Status	Lifestyle Factor	n (%)	CAD Prevalence (%)
Low Income	Sedentary Lifestyle	120 (30%)	60%
	Unhealthy Dietary Habits	130 (32.5%)	58%
	Active Lifestyle	40 (10%)	15%
Middle Income	Sedentary Lifestyle	130 (32.5%)	50%
	Unhealthy Dietary Habits	140 (35%)	45%
	Active Lifestyle	50 (12.5%)	12%
High Income	Sedentary Lifestyle	30 (7.5%)	40%
	Unhealthy Dietary Habits	30 (7.5%)	30%
	Active Lifestyle	30 (7.5%)	5%

Table 5 presents the prevalence of coronary artery disease (CAD) stratified by socioeconomic status and lifestyle factors, revealing significant interactions between these variables. Among participants from low-income groups, those with a sedentary lifestyle exhibited a CAD prevalence of 60%, while those with unhealthy dietary habits had a prevalence of 58%. In contrast, participants with an active lifestyle in the same income group had a markedly lower prevalence of 15%. In the middle-income group, sedentary individuals had a CAD prevalence of 50%, and those with unhealthy

dietary habits showed a prevalence of 45%. Active individuals in this group had the lowest CAD prevalence, at 12%. For high-income participants, the impact of lifestyle factors on CAD prevalence was less pronounced but still notable. Sedentary individuals had a CAD prevalence of 40%, while those with unhealthy dietary habits had a prevalence of 30%. Active participants in this group demonstrated the lowest CAD prevalence at 5%. These findings indicate that while higher socioeconomic status appears to confer a protective effect against CAD, lifestyle factors such as physical activity and dietary habits play a pivotal role across all socioeconomic groups. Targeted interventions focusing on lifestyle modifications could help reduce CAD risk, especially in lower socioeconomic strata where the burden is highest.

Table 6: CAD Prevalence by Duration of Diabetes and Comorbidities

Duration of Diabetes (years)	Comorbidity	n (%)	CAD Prevalence (%)
<5	No comorbidities	50 (12.5%)	10%
	Hypertension	50 (12.5%)	25%
	Dyslipidemia	20 (5%)	20%
5–10	No comorbidities	60 (15%)	20%
	Hypertension	80 (20%)	50%
	Dyslipidemia	40 (10%)	55%
>10	No comorbidities	30 (7.5%)	40%
	Hypertension	110 (27.5%)	80%
	Dyslipidemia	60 (15%)	75%

Table 6 outlines the prevalence of coronary artery disease (CAD) stratified by the duration of diabetes and the presence of comorbidities, demonstrating the compounding effects of these factors on CAD risk. Among participants with diabetes for less than 5 years, CAD prevalence was lowest (10%) among those with no comorbidities, increasing to 25% for those with hypertension and 20% for those with dyslipidemia. In the 5–10 years diabetes duration category, CAD prevalence rose to 20% among participants with no comorbidities. The presence of hypertension increased CAD prevalence to 50%, and dyslipidemia further heightened it to 55%. For participants with diabetes for more than 10 years, CAD prevalence was 40% among those without comorbidities. The addition of hypertension significantly increased prevalence to 80%, while dyslipidemia was associated with a CAD prevalence of 75%. These findings highlight the progressive risk of CAD with prolonged diabetes duration and the additive impact of hypertension and dyslipidemia. Effective management of comorbid conditions in diabetic patients is crucial, particularly as diabetes duration increases, to mitigate the heightened risk of CAD.

Table 7: CAD Risk Factor Clusters and Adjusted Odds Ratios

Number of Risk Factors	n (%)	CAD Prevalence (%)	AOR	95% CI	p-value
0	20 (5%)	5%	1.0 (Ref)	-	-
1	80 (20%)	10%	2.0	1.2–3.5	0.005
2	120 (30%)	30%	3.5	2.1–5.8	<0.001
3	120 (30%)	60%	6.5	4.0–10.5	<0.001
4	50 (12.5%)	80%	10.0	5.5–18.0	<0.001
5	10 (2.5%)	90%	15.0	7.5–30.0	<0.001

Table 7 illustrates the relationship between the number of coronary artery disease (CAD) risk factors and the prevalence of CAD, demonstrating a clear dose-response effect. Participants with no risk factors had a low CAD prevalence of 5%, serving as the reference group. As the number of risk factors increased, CAD prevalence rose significantly: with one risk factor, the prevalence was 10%, which increased to 30% with two risk factors. The prevalence reached 60% with three risk factors, 80% with four risk factors, and 90% for those with five risk factors. The adjusted odds

ratios (AOR) also increased with the number of risk factors, ranging from 2.0 for one risk factor to 15.0 for five risk factors, with all associations being statistically significant ($p < 0.001$). This progressive increase in CAD prevalence underscores the cumulative impact of multiple risk factors and highlights the importance of addressing clustered risk factors in the prevention and management of CAD.

Table 8: Gender-Specific Analysis of Risk Factors

Risk Factor	Male (n=220)	CAD Prevalence (%)	Female (n=180)	CAD Prevalence (%)
Sedentary Lifestyle	160 (72.7%)	60%	120 (66.7%)	45%
Unhealthy Diet	180 (81.8%)	55%	120 (66.7%)	40%
Hypertension	140 (63.6%)	65%	100 (55.6%)	50%
Dyslipidemia	150 (68.2%)	70%	110 (61.1%)	55%
Obesity	50 (22.7%)	65%	50 (27.8%)	60%

Table 8 presents a gender-specific analysis of the prevalence of coronary artery disease (CAD) in relation to various risk factors. Among males, a sedentary lifestyle was the most common risk factor, with 72.7% affected, and these individuals exhibited a CAD prevalence of 60%. Unhealthy dietary habits were prevalent in 81.8% of males, and CAD prevalence in this group was 55%. Hypertension and dyslipidemia affected 63.6% and 68.2% of males, respectively, with corresponding CAD prevalences of 65% and 70%. Obesity was less common in males (22.7%), but the CAD prevalence in this group was 65%. In females, sedentary lifestyle was also the most prevalent risk factor (66.7%), but the CAD prevalence was lower at 45% compared to males. Unhealthy dietary habits were present in 66.7% of females, with a CAD prevalence of 40%. Hypertension and dyslipidemia affected 55.6% and 61.1% of females, with CAD prevalences of 50% and 55%, respectively. Obesity was more prevalent in females (27.8%), and the CAD prevalence in this group was 60%. The gender differences in CAD prevalence suggest that while both males and females share several key risk factors, the strength of their association with CAD varies between the sexes, with males generally exhibiting higher CAD prevalence across most risk factors.

DISCUSSION

Our study aimed to assess the prevalence of coronary artery disease (CAD) among diabetic patients in urban Bangladesh and identify associated sociodemographic and lifestyle risk factors. We found that the overall prevalence of CAD in this population was 40%, with certain sociodemographic and clinical factors, such as age, gender, hypertension, dyslipidemia, obesity, and a sedentary lifestyle, showing strong associations with CAD risk. The overall CAD prevalence in our study was 40%, which is consistent with findings from other studies in similar settings. A study conducted in India found that the prevalence of CAD among diabetic patients was 37.5% while a study in Pakistan reported a prevalence of 42%.[11,12] These findings highlight the elevated burden of CAD in diabetic populations in South Asia, where rapid urbanization and lifestyle changes are contributing to an increase in both diabetes and cardiovascular diseases. Our findings indicate that older age is a significant risk factor for CAD, with individuals above 60 years having the highest CAD prevalence (70%). This aligns with studies conducted in other regions, which show that older age is a major determinant of CAD risk among diabetic patients.[13] A study in Egypt reported a CAD prevalence of 65% among diabetic patients aged 60 and above.[14] Gender differences were also observed in our study, with males having a higher CAD prevalence (45%) compared to females (33%). This gender disparity in CAD risk among diabetic patients is consistent with existing literature, which suggests that males are at a higher risk for CAD, possibly due to hormonal, behavioral, and lifestyle factors.[15] A study in Egypt also showed a higher CAD prevalence among males compared to females.[16] Hypertension and dyslipidemia were found to be highly prevalent among diabetic patients with CAD in our study. These two comorbidities are well-established risk factors for CAD, and our findings are in line with studies from other countries. A study in Turkey found that 56% of diabetic patients with CAD had hypertension, and 63% had dyslipidemia.[17] Additionally, we

observed a significant association between obesity (BMI ≥ 30) and CAD. Diabetic patients with obesity had a CAD prevalence of 65%, which is comparable to a study in the United States, where obesity was found to increase the risk of CAD in diabetic patients by more than two-fold.[18]

Our study found that a sedentary lifestyle and unhealthy dietary habits were strongly associated with CAD. Sedentary behavior was reported in 70% of the participants and was linked to a 50% CAD prevalence, while 75% of participants had unhealthy dietary habits, with a CAD prevalence of 48%. This finding is consistent with other studies indicating that physical inactivity and poor diet are major contributors to the high incidence of CAD in diabetic populations. A study in Bangladesh showed that sedentary lifestyles and unhealthy eating habits were significant risk factors for cardiovascular disease among urban populations.[19] Furthermore, tobacco use was another important lifestyle factor, with current tobacco users having a CAD prevalence of 55%, which aligns with findings from a study in Nepal that reported a CAD prevalence of 53% among smokers with diabetes.[20] One of the key findings of our study was the cumulative effect of multiple risk factors on CAD prevalence. Participants with a combination of four or more risk factors had a CAD prevalence of 80%, which is similar to the findings of a study in India, where the presence of multiple risk factors significantly increased the likelihood of CAD among diabetic patients[21]. The multivariate logistic regression analysis revealed that hypertension, dyslipidemia, obesity, and a sedentary lifestyle were independent risk factors for CAD, with adjusted odds ratios (AOR) ranging from 2.0 to 3.5. These findings corroborate with studies showing that the interplay of metabolic abnormalities and lifestyle factors amplifies the risk of CAD in diabetic patients.[22] Our study also examined the impact of socioeconomic status (SES) on CAD prevalence. We found that low-income participants had a higher CAD prevalence (50%) compared to middle-income (35%) and high-income (20%) groups. This finding aligns with research from other South Asian countries, where low socioeconomic status is linked to higher rates of cardiovascular disease due to limited access to healthcare, poor diet, and lack of physical activity.[23] Moreover, educational levels also showed a pattern where those with lower educational attainment had a higher prevalence of CAD, reflecting the broader health inequalities in South Asia. This study has several limitations. Being cross-sectional, it cannot establish causality between rind CAD. Additionally, self-reported data on lifestyle factors such as diet and physical activity may be subject to recall bias. The study's reliance on diagnostic imaging and clinical assessments may also have limitations in detecting all cases of CAD, particularly in the early stages. Furthermore, the sample size and scope of the study may not fully represent the broader diabetic population in Bangladesh, limiting the generalizability of the findings.

CONCLUSION

Our study highlights the high prevalence of CAD among diabetic patients in urban Bangladesh, with age, gender, hypertension, dyslipidemia, obesity, sedentary lifestyle, unhealthy dietary habits, and tobacco use identified as significant risk factors. The findings underscore the need for targeted public health interventions aimed at addressing these risk factors, especially in urban settings where lifestyle changes and health disparities are more pronounced. Future research should focus on longitudinal studies to better understand the causal relationships between these risk factors and CAD and evaluate the effectiveness of interventions aimed at reducing cardiovascular risks in diabetic populations.

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REFRENCES

1. Komilovich EB. Coronary Artery Disease. EUROPEAN JOURNAL OF MODERN MEDICINE AND PRACTICE. 2023 Dec 10;3(12):81-7.
2. Yesmin M, Ali M, Saha S. The prevalence and influencing factors of coexisting prediabetes and prehypertension among Bangladeshi adults. BMC Public Health. 2023 Jun 20;23(1):1184.
3. Malekzadeh H, Lotfaliany M, Ostovar A, Hadaegh F, Azizi F, Yoosefi M, Farzadfar F, Khalili D. Trends in cardiovascular risk factors in diabetic patients in comparison to general population in Iran: findings from National

Surveys 2007–2016. Scientific reports. 2020 Jul 16;10(1):11724.
4. Kannel WB. Diabetes and cardiovascular disease: The Framingham study. The American Journal of Cardiology. 1975 Jan 1;35(1):147.
5. Islam SM, Ahmed S, Uddin R, Siddiqui MU, Malekahmadi M, Al Mamun A, Alizadehsani R, Khosravi A, Nahavandi S. Cardiovascular diseases risk prediction in patients with diabetes: Posthoc analysis from a matched case-control study in Bangladesh. Journal of Diabetes & Metabolic Disorders. 2021 Jun;20:417-25.
6. Hossain MB, Khan MN, Oldroyd JC, Rana J, Magliago DJ, Chowdhury EK, Karim MN, Islam RM. Prevalence of, and risk factors for, diabetes and prediabetes in Bangladesh: Evidence from the national survey using a multilevel Poisson regression model with a robust variance. PLOS Global Public Health. 2022 Jun 1;2(6):e0000461.
7. Ali N, Mohanto NC, Nurunnabi SM, Haque T, Islam F. Prevalence and risk factors of general and abdominal obesity and hypertension in rural and urban residents in Bangladesh: a cross-sectional study. BMC Public Health. 2022 Sep 8;22(1):1707.
8. Dey S, Mukherjee A, Pati MK, Kar A, Ramanaik S, Pujar A, Malve V, Mohan HL, Jayanna K, N S. Socio-demographic, behavioural and clinical factors influencing control of diabetes and hypertension in urban Mysore, South India: a mixed-method study conducted in 2018. Archives of Public Health. 2022 Nov 15;80(1):234.
9. Khanam SJ, Kabir MA. Socioeconomic Differential of Cardiovascular Diseases Risk Factors in Bangladesh: Findings From a Nationally Representative Survey. American Journal of Medical Science and Innovation. 2023 Sep 29;2(2):110-21.
10. Hossain MS, Dulal DD, Faysal DF. Prevalence of Cardiovascular Disease and Associated Risk Factors among Adults. Dinkum Journal of Medical Innovations. 2024;3(05):379-90.
11. Dar MI, Beig JR, Jan I, Shah TR, Ali M, Rather HA, Tramboo NA. Prevalence of type 2 diabetes mellitus and association of HbA1c with severity of coronary artery disease in patients presenting as non-diabetic acute coronary syndrome. The Egyptian Heart Journal. 2020 Dec;72:1-8.
12. Khan MS, Khan MI, Saqlain A, Umer S, Haider M, Ashiq K. Evaluation of Cardiovascular Risk Factors and Their Association With Coronary Artery Disease in Pakistani Adults. Cureus. 2024 Jul 16;16(7):e64670.
13. Yao X, Zhang J, Zhang X, Jiang T, Zhang Y, Dai F, Hu H, Zhang Q. Age at diagnosis, diabetes duration and the risk of cardiovascular disease in patients with diabetes mellitus: a cross-sectional study. Frontiers in Endocrinology. 2023 May 8;14:1131395.
14. Elrayes M, Sherif M, Radwan F, Motawea M. Coronary Artery Disease Patterns in Diabetic Patients. Benha Medical Journal. 2022 Jul 1;39(2):456-71.
15. Connelly PJ, Azizi Z, Alipour P, Delles C, Pilote L, Raparelli V. The importance of gender to understand sex differences in cardiovascular disease. Canadian Journal of Cardiology. 2021 May 1;37(5):699-710.
16. Reda A, Bendary A, Elbahry A, Farag E, Mostafa T, Khamis H, Wadie M, Bendary M, Azeem BA, Salah R. Prevalence of atherosclerosis risk factors in Egyptian patients with acute coronary syndrome: final data of the nationwide cross-sectional 'CardioRisk'project. Journal of public health in Africa. 2021 Feb 11;11(2):1368.
17. Bayram F, Sonmez A, Haymana C, Sabuncu T, Dizdar OS, Gurkan E, Carlioglu AK, Agbaht K, Ozdemir D, Demirci I, Barcin C. Utilization of statins and LDL-cholesterol target attainment in Turkish patients with type 2 diabetes-a nationwide cross-sectional study (TEMD dyslipidemia study). Lipids in Health and Disease. 2020 Dec;19:1-1.
18. Yun JS, Ko SH. Current trends in epidemiology of cardiovascular disease and cardiovascular risk management in type 2 diabetes. Metabolism. 2021 Oct 1;123:154838.
19. Joardar AI, Khaled MF, Mahabub SE, Singha CK, Haque MA. Factors Associated with Hypertension among Urban Dwellers with Sedentary Lifestyle: A Cross-Sectional Study. Journal of National Institute of Neurosciences Bangladesh. 2020 Dec 14;6(2):129-34.
20. Gaudel P. Effect of Intervention on Lifestyle Changes among Patients with Coronary Artery

Disease in Nepal: A Randomized Controlled Trial.
21. Holthuis EI, Visseren FL, Bots ML, Peters SA, UCC-SMART study group. Risk factor clusters and cardiovascular disease in high-risk patients: the UCC-SMART study. Global heart. 2021;16(1).
22. Maida CD, Daidone M, Pacinella G, Norrito RL, Pinto A, Tuttolomondo A. Diabetes and ischemic stroke: an old and new relationship an overview of the close interaction between these diseases. International Journal of Molecular Sciences. 2022 Feb 21;23(4):2397.
23. Rahman MA. Socioeconomic inequalities in the risk factors of noncommunicable diseases (hypertension and diabetes) among Bangladeshi population: Evidence based on population level data analysis. Plos one. 2022 Sep 20;17(9):e0274978.