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Original Research Article

Clinical and Angiographic Profiles of Diabetic and Non-Diabetic Patients in a Tertiary Care Centre

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Abstract:

Background: Diabetes mellitus (DM) significantly increases the risk of coronary artery disease (CAD) due to metabolic and vascular dysfunction.

Objective: This study aimed to compare the clinical, echocardiographic, lipid, and angiographic profiles of diabetic and non-diabetic CAD patients.

Methods: A cross-sectional study was conducted in a tertiary care center, including adult CAD patients. Participants were categorized into diabetics (Group A) and non-diabetics (Group B). Data on clinical presentation, lipid profiles, ECHO findings, and angiographic patterns were collected.

Results: The mean age of Group A was 55.63 years, and Group B was 55.33 years, with no significant difference ($p = 0.748$). Group B had a significantly higher proportion of males (80.0%) compared to Group A (71.2%) ($p = 0.036$). AWMI was the most common presentation in both groups, followed by IWMI with no significant differences in clinical presentations ($p = 0.257$). Lipid profiles revealed significantly higher triglycerides (median: 151 vs. 125 mg/dL) and LDL (median: 86 vs. 56 mg/dL) and lower HDL (median: 43 vs. 64.5 mg/dL) in group A ($p < 0.0001$) compared to group B. Angiographically, Group A had more double-vessel (27.4%) and triple-vessel disease (16.4%), while Group B had more single-vessel disease (72.5%) ($p = 0.001$). ECHO findings were similar between groups ($p = 0.810$).

Conclusion: Diabetic patients demonstrated more severe coronary artery disease, worse lipid profiles, and a higher prevalence of AWMI compared to non-diabetic patients. These findings emphasize the need for targeted prevention and management strategies.

Keywords: Diabetes, Lipid profiles, Coronary artery disease, Coronary CT angiography.

Introduction

Diabetes mellitus is a group of metabolic disorders characterized by a relative or absolute deficiency of insulin, leading to elevated blood glucose levels and long-term vascular complications[1]. The burden of diabetes is substantial and steadily increasing worldwide, with developing economies like India witnessing a significant surge, primarily driven by the rising prevalence of overweight/obesity and unhealthy lifestyles. In 2019, an estimated 77 million individuals in India had diabetes, a figure projected to exceed 134 million by 2045. Alarmingly, approximately 57% of these cases remain undiagnosed. Diabetes, which constitutes the majority of cases, often results in multiorgan complications categorized as microvascular and macrovascular. These complications contribute to heightened premature morbidity and mortality, reduced life expectancy, and significant financial and societal costs, placing a considerable economic burden on the Indian healthcare system[2].

Cardiovascular disease (CVD) continues to be a leading cause of morbidity and mortality globally, with coronary artery disease (CAD) as a major contributor. Individuals with diabetes mellitus face a significantly higher risk of developing CAD, largely due to the proatherogenic environment created by chronic hyperglycemia, insulin resistance, and dyslipidemia. These factors make diabetic patients more prone to a severe and diffuse form of CAD, frequently involving multiple

coronary vessels, leading to worse clinical outcomes compared to non-diabetic individuals[3,4].

In diabetic patients, the clinical and angiographic presentations of CAD are often more complex. They tend to present with atypical symptoms of acute coronary syndrome, making early diagnosis and intervention more challenging. Moreover, the extent and distribution of CAD are usually more extensive in diabetics, influencing treatment strategies and prognostication[5,6]. Understanding the key differences in clinical presentations, lipid profiles, echocardiographic findings, and coronary angiographic patterns between diabetic and non-diabetic individuals is crucial for optimizing patient management. Additionally, data on the prognostic significance of diabetes in patients across all clinical presentations of CAD remain limited, and studies exploring the influence of diabetes on the severity of CAD are notably scarce, especially in the Indian diabetic population. On this ground, this study aimed to compare these factors in diabetic (Group A) and non-diabetic (Group B) patients diagnosed with CAD at a tertiary care center.

Materials and Methods

This was a cross-sectional study conducted at MGM Government Hospital, Tiruchirappalli, between June 2023 and October 2024. The study included adult patients diagnosed with CAD, divided into two groups: diabetic patients (Group A) and non-diabetic patients (Group B). Clinical data, lipid profiles (triglycerides [TGL], high-density lipoprotein [HDL], low-density lipoprotein [LDL]), echocardiographic findings (ECHO), and coronary angiographic data (single-vessel, double-vessel, or triple-vessel disease) were collected for analysis.

Inclusion Criteria: The study included adults aged 18 years or older diagnosed with coronary artery disease (CAD). The participants were categorized based on their diabetes status. The diabetic group comprised individuals who were either previously diagnosed with diabetes or newly identified as diabetic based on the American Diabetes Association (ADA) criteria. The control group consisted of CAD patients who were non-diabetic, defined as those without a prior diabetes diagnosis and not meeting the ADA criteria for diabetes.

Exclusion Criteria: Patients with hyperglycemia due to secondary causes, such as steroid use or endocrine disorders, were excluded. Individuals with severe comorbidities, including cancer or advanced kidney or liver disease, which could interfere with the accurate diagnosis of CAD or diabetes, were also excluded. Furthermore, patients who had not undergone adequate diagnostic evaluations, such as coronary angiography or relevant diabetes testing, were not included in the study.

Data collection: Data were gathered using standardized forms, which included demographic and clinical information. Lipid profiles and serum creatine kinase-MB (CK-MB) levels were analyzed using enzymatic assays. ECHO was performed to evaluate left ventricular function and other relevant parameters. Coronary angiography was performed to determine the extent of CAD, classified as single-vessel disease (SVD), double-vessel disease (DVD), or triple-vessel disease (TVD).

Statistical analysis: Continuous variables were expressed as mean ± standard deviation and compared using the independent t-test. Categorical variables were summarized as frequencies and percentages and analyzed using the chi-square test. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 25.0 (IBM-SPSS Science Inc., Chicago, IL).

Results

The mean age of Group A was 55.63±9.09 years, and Group B was 55.33±10.67 years, with no significant difference ($p = 0.748$). Gender distribution differed significantly ($p = 0.036$), with more females in Group A (28.8%) than Group B (20.0%), while mean ECHO values were similar (Group A: 47.16, Group B: 46.96; $p = 0.810$). The clinical presentations showed AWMI as the most common in both groups, (50.4% in Group A, 41.0% in Group B), followed by IWMI (30.5% and 40.0%, respectively). Other presentations, including NSTEMI, CCS, ASWMI, IPWMI, and UA, were similarly distributed with minor variations. The differences in clinical presentations between the groups were not statistically significant ($p = 0.257$) (Table 1).

Triglyceride levels were significantly higher in Group A (25th: 120, median: 151, 75th: 197 mg/dL) compared to Group B (25th: 89, median: 125, 75th: 165 mg/dL; $p < 0.0001$). HDL levels were significantly lower in Group A (25th: 35, median: 43, 75th: 60 mg/dL) than in Group B (25th: 47.5, median: 64.5, 75th: 87.5 mg/dL; $p < 0.0001$). However, LDL levels were higher in Group A (25th: 63, median: 86, 75th: 113 mg/dL) compared to Group B (25th: 40, median: 56, 75th: 78 mg/dL; $p < 0.0001$). CK-MB levels were significantly higher in Group B (25th: 54.5, median: 84.5, 75th: 125 U/L) than in Group A (25th: 26, median: 49, 75th: 96 U/L; $p < 0.0001$) (Table 2).

In Group A, 27.4% had double-vessel disease (DVD), 56.2% had single-vessel disease (SVD), and 16.4% had triple-vessel disease (TVD), compared to 20.0%, 72.5%, and 7.5%, respectively, in Group B. These differences were statistically significant ($p = 0.001$) (Figure 1).

Table 1: Comparison of age, sex, ECHO, and clinical presentation of diabetic and non-diabetic patients

	Group				P value
	Group A		Group B		
	Mean	Standard Deviation	Mean	Standard Deviation	
AGE	55.63	9.09	55.33	10.67	0.748
ECHO	47.16	8.43	46.96	8.64	0.810
	Count	Column N %	Count	Column N %	
SEX					
F	65	28.8%	40	20.0%	0.036
M	161	71.2%	160	80.0%	
PRESENTATION					
ASWMI	0	0.0%	1	0.5%	0.257
AWMI	114	50.4%	82	41.0%	
CCS	20	8.8%	17	8.5%	
IPWMI	1	0.4%	0	0.0%	
IWMI	69	30.5%	80	40.0%	
NSTEMI	21	9.3%	20	10.0%	
UA	1	0.4%	0	0.0%	

Table 2: Comparison of lipid profiles of diabetic and non-diabetic patients

LIPID PROFILE	Group A	Group B	P value
TGL			
25th Percentile	120.00	89.00	<0.0001
Median	151.00	125.00	
75th Percentile	197.00	165.00	
HDL			
25th Percentile	35.00	47.50	<0.0001
Median	43.00	64.50	
75th Percentile	60.00	87.50	
LDL			
25th Percentile	63.00	40.00	<0.0001
Median	86.00	56.00	
75th Percentile	113.00	78.00	
SR.CKMB			
25th Percentile	26.00	54.50	<0.0001
Median	49.00	84.50	
75th Percentile	96.00	125.00	

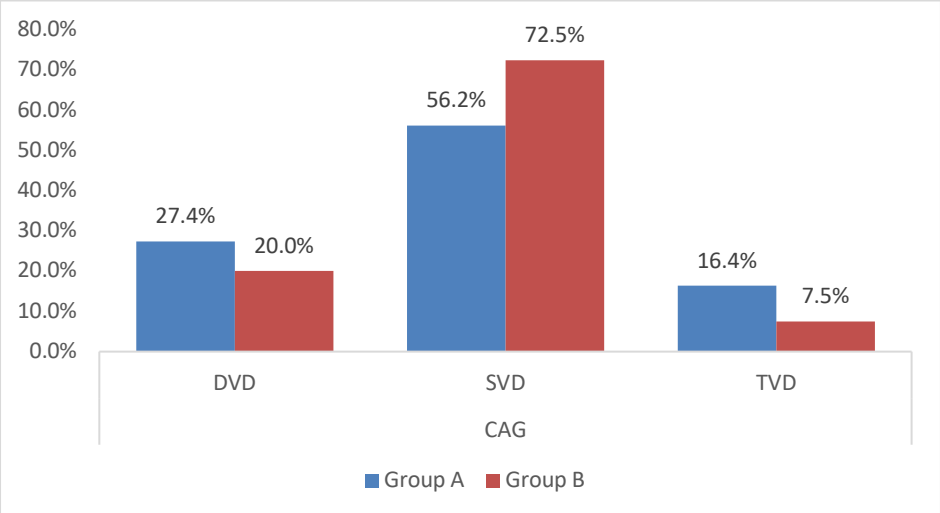

Figure 1: Coronary Angiography (CAG) Findings in diabetic and non-diabetic patient

In Group A, 13.3% underwent CABG, 17.7% received OMT, and 69.0% underwent PTCA. In Group B, these values were 9.5%, 21.0%, and 69.5%, respectively. There was no statistically significant difference in the management approaches between the groups (p = 0.383) (Figure 2).

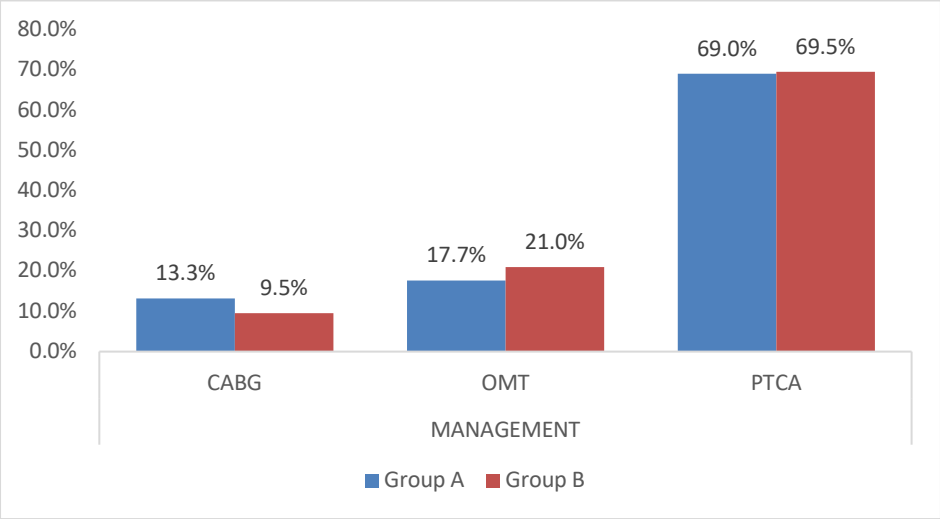

Figure 2: Management Modalities of diabetic and non-diabetic patients

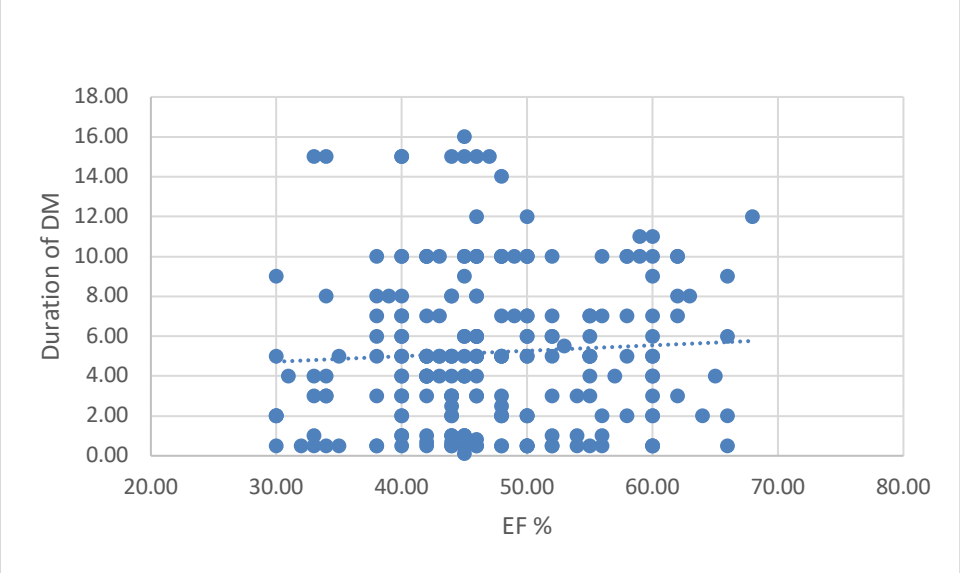

Figure 3 Correlation of duration of DM with EF%

No significant correlation (r = 0.060, p = 0.366) exists between diabetes duration and EF%.

Discussion

This study highlights significant differences in the clinical and angiographic profiles of diabetic (Group A) and non-diabetic (Group B) patients. CAD in diabetics is more severe and extensive than in non-diabetics, with prevalence increasing with age. Various Southeast Asian registries have reported that the onset of CAD occurs at a median age of 55 years, [7] which is consistent with the mean age of 55 years in our study. Although CAD typically occurs a decade earlier in diabetics, our study found similar ages between diabetic and non-diabetic patients, aligning with other studies[8,9]. However, Kundu et al performed a study in Kolkata and reported that the mean age of diabetic patients was 64.8 ± 8.4 years, while for non-diabetic patients, it was 55.8 ± 7.2 years (p = 0.0001). The youngest diabetic patient was 39 years old, and the oldest was 81 years[6].

We observed that diabetic women are more prone to CAD. Similarly, Sareddy et al. reported a male predominance (4.5:1) in non-diabetic CAD patients, which dropped to 2:1 in diabetics, further indicating a higher susceptibility of diabetic women to CAD[1]. In line with this, Kundu et al also reported that female patients were more prevalent in the

diabetic group[6]. This gender difference may be influenced by factors such as hormonal contraception, menstrual cycles, pregnancy, and perimenopausal glucose control variability.

Lipid profile differences were notable, with diabetics showing significantly higher triglyceride and LDL levels, and lower HDL levels, underlining the dyslipidemia associated with diabetes. Yao et al showed that hyperlipidemia (OR, 1.527 95% CI, 1.014-2.298, P = 0.043) might increase the risk of CAD[10]. Moreover, in a study by Sareddy et al, 82% of diabetic CAD patients were dyslipidemic. Although the prevalence of dyslipidemia is lower in non-diabetics, it remains significant (63%), suggesting an independent role in CAD development[1].

Diabetic patients presented more frequently with AWMI compared to non-diabetics, while IWMI was more common in non-diabetics. Although the differences in clinical presentations were not statistically significant, the predominance of AWMI in diabetics aligns with the higher burden of diffuse atherosclerosis typically observed in this population. Zada et al. found that multiple vessel disease is highly prevalent in diabetic patients presenting with AWMI[11].

Angiographic findings revealed more TVD and DVD in diabetics, while SVD was more frequent in non-diabetics, reflecting the more extensive coronary artery involvement in diabetes. Sareddy et al. observed that diabetic patients exhibit a higher prevalence of multiple vessel involvement (47.9% vs. 18.3%, $p < 0.01$). A prolonged duration of diabetes and poor glycemic control were found to be associated with a more severe and extensive form of CAD ($p < 0.05$)[1]. Kundu et al also reported that DVA and TVD were more frequent among diabetic patients[6]. Moreover, Pathak et al observed that 46.7% of diabetic patients had triple/multi-vessel disease, compared to 13.4% of non-diabetics[12].

Hegde et al observed that 44% of diabetic patients had triple/multi-vessel disease, compared to 16% of non-diabetics[13]. Girdhar et al stated that, in the diabetic group, 82.63% had significant stenosis, with higher rates of SVD (26.24%), DVD (40.98%), and TVD (32.78%). The non-diabetic group had 78.03% stenosis, with lower rates of SVD (32.85%), DVD (40%), and TVD (27.15%). Diabetic patients showed more severe coronary involvement than non-diabetics[14]. Baker et al noted that, in diabetic patients, 69.3% had positive CAG findings, with SVD at 26.1%, DVD at 15.9%, TVD at 27.3%, and average stenosis at 82.63%. In non-diabetic patients, 53.4% had positive CAG, with SVD in 25.9%, DVD in 12.9%, and TVD in 14.7%[15]. Similarly, Hasabi and Mudagall observed that multivessel disease was more common in diabetics than in non-diabetics (52.8% vs. 15.3%)[16]. Furthermore, Ahmed et al stated the higher frequency of multi-vessel disease in diabetics (50.9%) compared to non-diabetics (39.6%)[17]. These findings indicated that CAD in diabetics is more severe and unpredictable, highlighting the importance of aggressive lipid control and regular cardiovascular monitoring. With higher risk factors and poorer outcomes, early diagnosis and timely management are essential to reduce complications.

Future Directions: Future research should focus on longitudinal studies to evaluate the impact of intensive lipid-lowering therapies and glycemic control on clinical outcomes in diabetic patients. The role of emerging biomarkers, including epicardial adipose tissue thickness and novel lipid parameters, should be explored in understanding and managing coronary artery disease in diabetics.

Limitations: This study has some limitations. It was conducted in a single tertiary care center, which may limit the generalizability of the findings. The study was cross-sectional, preventing any causal inferences about the observed differences. Additionally, detailed data on medication use, duration of diabetes, and glycemic control were not included, which could have influenced the outcomes.

Conclusion

The present study highlights significant differences in the clinical and angiographic profiles of diabetic and non-diabetic CAD patients. Diabetic patients demonstrated more extensive coronary artery disease, worse lipid profiles, and a higher prevalence of AWMI compared to non-diabetics. These findings highlight the critical need for tailored management strategies in diabetics to address their unique cardiovascular risk profile. Future studies addressing the identified gaps may provide deeper insights and improve patient outcomes.

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