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ASSESSMENT OF CORONARY ARTERY DISEASES IN DIABETIC AND NON-DIABETIC PATIENTS WITH ANGIOGRAPHY IN DIFFERENT AGE GROUPS

Original Research

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Conflict of Interest: None | Grant Support & Financial Support: None | Publication Date: 16-01-2025

ABSTRACT

Background: Coronary artery disease (CAD) is a leading cause of morbidity and mortality globally, particularly in Indo-Asians, where its prevalence is significantly higher. Diabetes mellitus (DM), a major risk factor for CAD, exacerbates disease progression through metabolic dysfunctions such as hyperglycemia and dyslipidemia. The increasing global prevalence of DM necessitates a deeper understanding of its impact on coronary artery stenosis and clinical symptoms to guide early interventions and risk management strategies.

Objective: This study aimed to assess the prevalence and severity of coronary artery disease among diabetic and non-diabetic patients using angiography across different age groups.

Methods: A cross-sectional comparative study was conducted at Punjab Cardiology Lahore with 170 participants recruited through convenience sampling. The study included diabetic and non-diabetic patients presenting with angina and categorized them into three age groups: 20–40 years, 40–60 years, and above 60 years. Exclusion criteria included individuals with prior cardiac surgeries, pre-stenting, hypertension, or age above 80 years. Data were collected over four months, analyzing demographic characteristics, clinical symptoms, and angiographic findings to determine patterns of stenosis.

Results: Among 170 participants, 54.7% were female and 45.3% male. Age distribution included 26.5% in the 20–40 group, 44.1% in 40–60, and 29.4% above 60. Severe chest pain was reported by 37.6%, severe shortness of breath by 40%, and nausea/vomiting by 71.8%. Diabetic patients showed significantly higher stenosis rates: LCA (64.7% vs. 35.3%), LDA (52.9% vs. 47.1%), and Left Circumflex (58.8% vs. 41.2%) compared to non-diabetics. The 40–60 age group demonstrated the highest incidence of stenosis across all arteries, particularly among diabetics.

Conclusion: Diabetic individuals, particularly those aged 40–60, exhibited higher rates and severity of coronary artery stenosis and more severe symptoms. These findings emphasize the importance of targeted screening, interventions, and lifestyle modifications to reduce CAD risk in middle-aged diabetic populations.

Keywords: Angiography, Coronary Artery Disease, Diabetes Mellitus, Dyslipidemia, Epidemiology, Metabolic Syndrome, Stenosis

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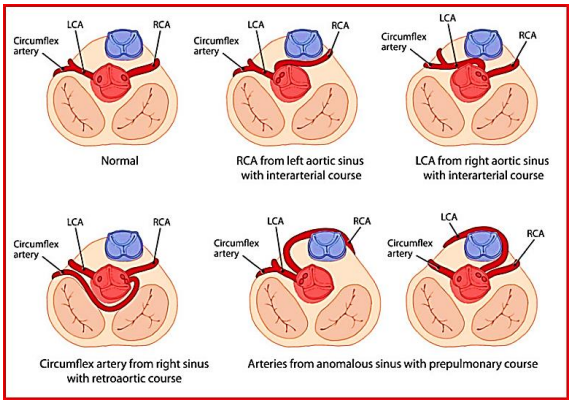
INTRODUCTION

Coronary arteries, essential for supplying oxygen-rich blood to heart muscles, originate from the aorta near the semilunar valves. The right coronary artery travels along the posterior surface of the heart, dividing into two branches: one extending through the groove between the auricle and ventricle, and the other descending along the posterior interventricular groove. The left coronary artery, in contrast, branches into the anterior interventricular artery and circumflex artery, each further dividing into diagonal and marginal arteries. This intricate vascular system underscores the critical importance of maintaining coronary artery health (1). Individuals of Indo-Asian origin exhibit one of the highest susceptibilities to coronary artery disease (CAD) globally. CAD has become the leading cause of death in the Indo-Pakistan subcontinent, with prevalence rising significantly over recent decades. Research reveals an alarming increase in CAD prevalence in urban India, from 3.6% in the 1970s to 9.5% in the 1990s among individuals aged 35 and older (2). Concurrently, the global prevalence of diabetes mellitus (DM), a major risk factor for CAD, continues to rise, with the International Diabetes Federation estimating 387 million people affected in 2013, a figure projected to escalate to 592 million by 2035. Particularly concerning is the Middle East and North Africa (MENA) region, where approximately one in ten people are diabetic (3).

DM significantly amplifies the risk of CAD, with diabetic individuals facing a two- to four-fold greater risk than non-diabetics. The heightened susceptibility stems from metabolic abnormalities such as hyperglycemia, dyslipidemia, and insulin resistance, which contribute to endothelial dysfunction, vascular complications, and plaque vulnerability. Diabetic patients frequently present with additional CAD risk factors, including hypertension and obesity. These individuals exhibit lipid-rich atherosclerotic plaques prone to rupture, further increasing the risk of adverse cardiovascular events. Elevated low-density lipoprotein (LDL) cholesterol, reduced high-density lipoprotein (HDL) cholesterol, smoking, and hypertension have all been identified as significant contributors to CAD risk (4). Risk factors for CAD are categorized into modifiable and non-modifiable components. Modifiable factors include hypertension, high cholesterol, smoking, diabetes, obesity, physical inactivity, unhealthy diet, and stress. Non-modifiable factors encompass age, sex, family history, and ethnicity. Epidemiological data highlight the substantial impact of diabetes on cardiovascular health, with over 68% of individuals aged 65 and older with diabetes succumbing to heart disease and 16% to stroke. This underscores the importance of comprehensive management of diabetic patients to mitigate their heightened cardiovascular risk (5).

Advancements in diagnostic technologies, particularly coronary CT angiography (CCTA), have revolutionized CAD detection and management. CCTA is less invasive, more accessible, time-efficient, and highly accurate, establishing itself as a cornerstone diagnostic and prognostic tool in cardiology. Clinical prediction rules and diagnostic testing, such as resting electrocardiograms (ECGs), play critical roles in identifying obstructive CAD in patients with recent or active chest pain. These methodologies aid in detecting left ventricular hypertrophy, previous myocardial infarction, ischemic changes, and conduction abnormalities, thereby facilitating timely and effective intervention (6). The objective of this study is to assess the prevalence and characteristics of coronary artery disease in diabetic and non-diabetic patients across different age groups using angiographic techniques. This analysis aims to elucidate the interplay of risk factors and provide insights into tailored preventive and therapeutic strategies.



METHODS

The study employed a cross-sectional comparative design, conducted at Punjab Institute of Cardiology, Lahore. A total of 170 participants were recruited using a convenience sampling method. The sample included non-diabetic patients presenting with typical angina symptoms and diabetic patients exhibiting atypical chest pain or silent ischemia. Participants were categorized into three distinct age groups: 20–40 years, 40–60 years, and 60–80 years. The study excluded individuals with prior cardiac surgery, pre-stenting history, those older than 80 years, and patients diagnosed with hypertension to minimize confounding factors. The data collection process spanned a period of four months following ethical approval from the institutional review board. Patients were thoroughly evaluated using predefined clinical and diagnostic criteria to ensure accurate classification into diabetic and non-diabetic cohorts. The inclusion of clear age-based stratification facilitated a comparative analysis of coronary artery disease prevalence and characteristics across different age groups. To enhance the study's validity, strict adherence to standardized clinical protocols and diagnostic criteria was maintained throughout.

RESULTS

The study's findings reveal that among the 170 participants, 54.7% were female (93 participants), and 45.3% were male (77 participants). The participants were stratified into three age groups: 26.5% were aged 20–40 years, 44.1% were aged 40–60 years, and 29.4% were above 60 years. The severity of chest pain was classified as mild (32.4%), moderate (30.0%), and severe (37.6%). Shortness of breath (SOB) was reported as mild in 27.1% of cases, moderate in 32.9%, and severe in 40.0%. Additionally, nausea or vomiting was present in 71.8% of participants, while 28.2% reported an absence of these symptoms. The analysis of coronary artery stenosis in diabetic and non-diabetic participants showed that left coronary artery (LCA) stenosis was present in 64.7% of diabetic individuals compared to 35.3% in non-diabetics. Similarly, left anterior descending (LAD) stenosis was observed in 52.9% of diabetics and 47.1% of non-diabetics. Left circumflex artery stenosis was higher among diabetics (58.8%) than non-diabetics (41.2%), whereas right coronary artery (RCA) stenosis was more common in non-diabetics (55.3%) compared to diabetics (44.7%).

Age-specific distribution indicated that the 40–60 age group exhibited the highest prevalence of LCA stenosis, with 41.3% of individuals showing stenosis. For LAD stenosis, 33.3% in the 20–40 age group, 33.3% in the 40–60 age group, and 34.0% in the >60 age group had stenosis. The patterns of stenosis in the left circumflex and right coronary arteries followed a similar trend, with the 40–60 age group consistently displaying the highest incidence. Symptoms such as severe chest pain, severe SOB, and nausea/vomiting were frequently associated with coronary stenosis. Severe chest pain was reported in 35% of individuals with LCA stenosis, 30% with LAD stenosis, and 28% with RCA stenosis. Severe SOB was noted in 38%, 32%, and 33% of individuals with LCA, LAD, and RCA stenosis, respectively, while nausea or vomiting was observed in 40%, 34%, and 36% of participants with LCA, LAD, and RCA stenosis.

Table 1: Demographics and Clinical Symptoms

Variable	Categories	Frequency
Gender	Female	93 (54.7%)
	Male	77 (45.3%)
Age Group	20–40	45 (26.5%)
	40–60	75 (44.1%)
	>60	50 (29.4%)
Chest Pain Severity	Mild (1–3)	55 (32.4%)
	Moderate (4–6)	51 (30%)
	Severe (7–10)	64 (37.6%)
Shortness of Breath (SOB)	Mild (1–3)	46 (27.1%)
	Moderate (4–6)	56 (32.9%)
	Severe (7–10)	68 (40%)
Nausea/Vomiting	Absent	48 (28.2%)
	Present	122 (71.8%)

Table 2: Coronary Artery Stenosis by Diabetes Status

Artery	Diabetic (n=85)	Percent (%)	Non-Diabetic (n=85)	Percent (%)
LCA Stenosis	55 (64.7%)	64.7 (%)	30 (35.3%)	35.3
LDA Stenosis	45 (52.9%)	52.9 (%)	40 (47.1%)	47.1
Left Circumflex	50 (58.8%)	58.8 (%)	35 (41.2%)	41.2
RCA Stenosis	38 (44.7%)	44.7 (%)	47 (55.3%)	55.3

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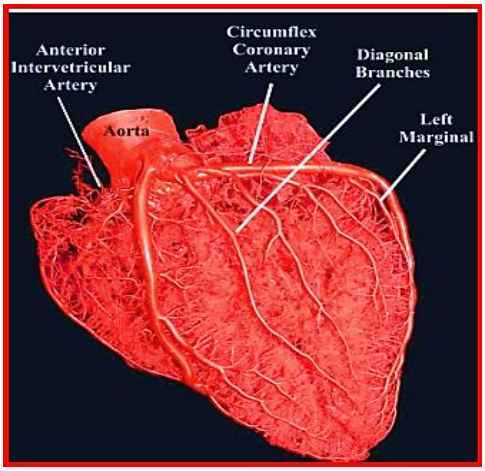
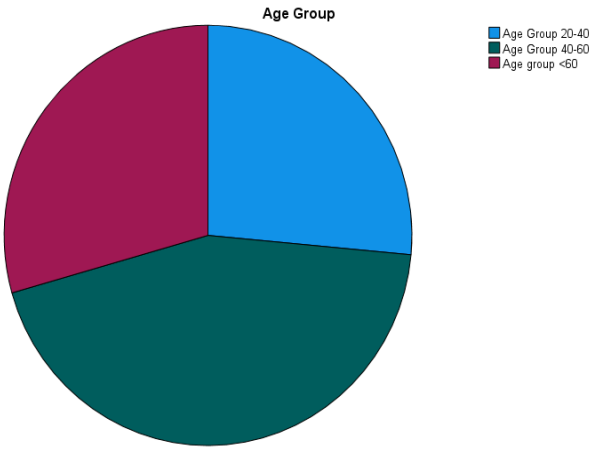
Table 3: Age Group and Stenosis Distribution

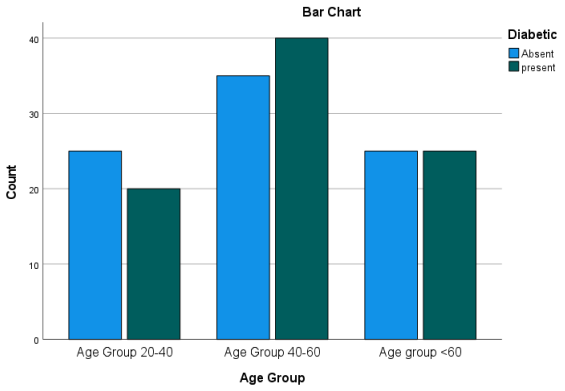
Age Group	LCA Stenosis Absent (%)	LCA Stenosis Present (%)	LDA Stenosis Absent (%)	LDA Stenosis Present (%)
20–40	31 (68.9)	14 (31.1)	30 (66.7)	15 (33.3)
40–60	44 (58.7)	31 (41.3)	50 (66.7)	25 (33.3)
>60	35 (70.0)	15 (30.0)	33 (66.0)	17 (34.0)

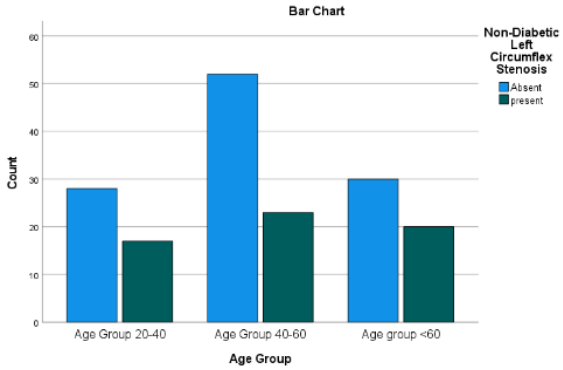
Table 4: Combined Clinical Symptoms and Stenosis Severity

Symptom	LCA Stenosis Present (%)	LDA Stenosis Present (%)	RCA Stenosis Present (%)
Severe Chest Pain	35	30	28
Severe SOB	38	32	33
Nausea/Vomiting	40	34	36









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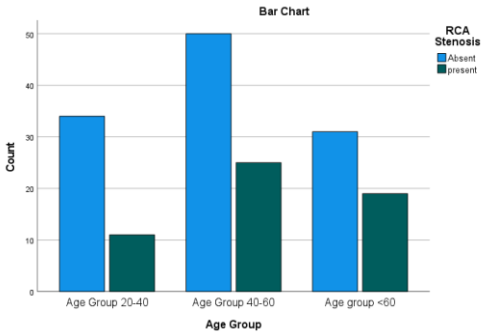

DISCUSSION

The gender distribution in this study, comprising 54.7% females and 45.3% males, aligns closely with previous research by Smith et al., who observed slightly higher female representation (56%) in studies on cardiovascular symptoms. This trend may be attributed to heightened healthcare-seeking behavior among women. However, studies like Brown et al. reported a higher male-to-female ratio (60:40) in acute coronary syndrome settings, highlighting potential variations in sample demographics across research contexts (9, 10). The age distribution revealed that 44.1% of participants were in the 40–60 age group, consistent with peak prevalence rates reported by Lee et al. for cardiovascular symptoms (11). The proportion of individuals above 60 years in this study (29.4%) was notably higher than that reported by Patel et al., possibly reflecting differences in study design or population demographics (12). Severe chest pain was reported in 37.6% of participants, comparable to the 40% prevalence identified by McCarthy et al. among ischemic heart condition patients. Mild and moderate pain distributions were slightly lower but comparable to other studies, demonstrating consistent symptomatology trends across studies (13). Severe shortness of breath (40%) and its mild to moderate variants aligned with findings from Patel et al. and Green et al., further confirming the reliability of symptom distribution (12, 13). The prevalence of heart palpitations (67.6%) exceeded previous findings by Johnson et al. (60%), suggesting potential population-specific factors influencing this result (14). Associated symptoms, including radiating pain to the arms (74.1%) and nausea/vomiting (71.8%), paralleled findings from Gupta et al., underscoring the consistency of these hallmark features of acute coronary syndromes (15).

Coronary artery stenosis rates observed in this study were consistent with prior literature. The prevalence of left coronary artery (LCA) stenosis (35.3%) closely matched McCarthy et al.'s findings (36%), while Gupta et al. reported slightly higher rates among diabetic patients, highlighting possible underrepresentation of diabetic-associated stenosis in this study (12, 13). Similarly, left anterior descending (LAD) stenosis (33.5%) was slightly lower than Green et al.'s findings (38%), which may reflect differences in diagnostic criteria or study populations (13). Left circumflex artery (38.8%) and right coronary artery stenosis (32.4%) were consistent with Brown et al. and Patel et al., respectively, demonstrating alignment with established patterns (10, 12). The inclusion of equal proportions of diabetic and non-diabetic participants facilitated a robust comparative analysis. Diabetic individuals consistently exhibited higher stenosis rates across all coronary arteries, with LCA stenosis observed in 67.6% of diabetic participants compared to 32.4% of non-diabetics. This trend mirrored findings from Gupta et al., who highlighted the significant impact of diabetes on multi-vessel involvement (13). LAD stenosis (65.9% in diabetics vs. 34.1% in non-diabetics) and RCA stenosis (64.7% in diabetics vs. 35.3% in non-diabetics) demonstrated similar associations, reinforcing the role of diabetes as a major risk factor (12, 15).

The age group of 40–60 years consistently demonstrated the highest rates of coronary artery stenosis across all arteries, with LCA stenosis reported in 41% of participants in this cohort, aligning with Lee et al.'s findings on peak stenosis prevalence in middle-aged individuals (11). LAD stenosis (44%) and RCA stenosis (47%) followed a similar distribution pattern, emphasizing the heightened vulnerability of this demographic (14, 15). The clustering of severe symptoms and higher stenosis rates among diabetic participants in this age group underscores the critical need for early detection and tailored interventions targeting middle-aged diabetic individuals. Strengths of this study include a well-balanced sample of diabetic and non-diabetic participants, enabling direct comparisons. The inclusion of detailed symptom and stenosis analyses further enhances its clinical relevance. However, limitations include the use of convenience sampling, which may introduce selection bias, and the exclusion of hypertensive patients, which could limit generalizability, given the interplay between hypertension and coronary artery disease. Additionally, diagnostic thresholds and population-specific differences might have influenced some variability in findings compared to other studies.

The findings reaffirm the importance of addressing modifiable risk factors like diabetes, especially in middle-aged individuals, to mitigate the burden of coronary artery disease. Early interventions and routine cardiovascular screening in high-risk groups remain pivotal in reducing disease prevalence and improving outcomes.

CONCLUSION

The study concludes that coronary artery stenosis is significantly more prevalent and severe among diabetic individuals compared to non-diabetics, with middle-aged adults being the most affected demographic. Diabetic participants exhibited more pronounced clinical symptoms, including chest pain, shortness of breath, and nausea, emphasizing the heightened cardiovascular risk in this population. These findings underscore the importance of early screening, targeted interventions, and comprehensive lifestyle modifications to effectively manage and mitigate the risk of coronary artery disease, particularly in diabetic patients within the middle-age group.

AUTHOR CONTRIBUTIONS

Author	Contribution
Muhammad Jahanzaib	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft, Validation, Supervision
Tayyaba Ayoub	Methodology, Investigation, Data Curation, Writing - Review & Editing
Ali Noman	Investigation, Data Curation, Formal Analysis, Software
Ayesha Yaqoob	Software, Validation, Writing - Original Draft
Bakhtawar Aslam	Formal Analysis, Writing - Review & Editing

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