Journal of Rare Cardiovascular Diseases
ISSN: 2299-3711 (Print) | e-ISSN: 2300-5505 (Online)
www.jrcd.eu
RESEARCH ARTICLE

Prevalence of Single, Double, and Triple Vessel Disease in Patients Undergoing Coronary Angiography: Experience from a Tertiary Care Center

Shining Rose*, Pavithra S, Moses, Latchitha L, Manigandan G, Immanuvel S, Rufus Daya Andrews D, Sandhya S, Shaik Haji Mabhu Chandhu, T. Jayakodi and S. T. Farzana,
Meenakshi College of Allied Health Sciences, Meenakshi Academy of Higher Education and Research (MAHER), Deemed to be University, Chennai 600078, Tamil Nadu, India

*Corresponding Author
Shining Rose

Article History
Received: 15.05.2025
Revised: 04.06.2025
Accepted: 13.07.2025
Published: 04.08.2025

Abstract: ***Background***: Coronary artery disease (CAD) remains a major cause of morbidity and mortality worldwide. Coronary angiography is the gold standard diagnostic tool to assess arterial narrowing, severity, and the extent of vessel involvement. ***Objective***: To evaluate the severity and pattern of CAD using coronary angiogram, with emphasis on the prevalence of single-vessel disease (SVD), double-vessel disease (DVD), and triple-vessel disease (TVD) across different age groups and genders. ***Methods***: A retrospective study was conducted among 200 patients who underwent coronary angiography at Meenakshi Medical College and Research Institute, Tamil Nadu. Patients with prior coronary interventions or non-atherosclerotic cardiac diseases were excluded. Data regarding involvement of the Left Anterior Descending (LAD), Left Circumflex (LCX), and Right Coronary Artery (RCA) were analyzed along with demographic variables. ***Results***: Among 200 patients, 56% had TVD, 28% had DVD, and 16% had SVD. Males showed higher prevalence of CAD compared to females, with TVD being more common in men (73%). LAD was the most frequently involved artery (88.8%), followed by RCA (72.5%) and LCX (42.5%). Patients aged 41–50 years (56%) and 61–70 years (53%) showed the highest prevalence of severe CAD. ***Conclusion***: Triple-vessel disease emerged as the most prevalent and severe form of CAD, particularly among middle-aged and older male patients. Early detection, lifestyle modification, and timely interventions are essential to prevent progression to severe vessel involvement. Coronary angiography remains indispensable for diagnosis and guiding therapy.

Keywords: Coronary artery disease, Coronary angiography, Single-vessel disease, Double-vessel disease, Triple-vessel disease, Atherosclerosis.

INTRODUCTION

Coronary artery disease (CAD) is one of the leading causes of morbidity and mortality globally. It occurs due to narrowing or complete blockage of coronary arteries, most commonly from atherosclerosis, leading to reduced myocardial perfusion and complications such as myocardial infarction(1).

BRANCHES OF CORONARY ARTERIES:

Right coronary artery: RCA begins in the right aortic sinus and usually divides into the right posterior descending artery, the acute marginal artery, sinoatrial nodal and atrioventricular nodal artery

Left main coronary artery: The left aortic sinus is where the LMCA begins. Eighty percent of the flow is carried to the heart muscle by it. The artery is brief and bifurcates into two branches.

Right Coronary Artery: One of the two main coronary arteries that supply oxygen-rich blood to the heart muscle is the right coronary artery (RCA). The RCA supplies blood to different cardiac structures by passes along the right atrioventricular (AV) groove after emerging from the right aortic sinus of the ascending aorta. The right marginal artery, posterior interventricular artery (PDA), atrioventricular (AV) nodal artery, andsinoatrial (SA) nodal artery are some of its branches (Fig 1). Whether the RCA supplies the PDA or not determines whether the heart has a right dominant, left dominant or co-dominant coronary circulation(2, 3).

Origin and Course: The right aortic sinus, directly above the right aortic valve cusp, is where the RCA begins. It descends toward the center of the heart via the right AV groove. As it courses, it gives rise to several branches that supply various parts of the heart. The RCA's path is crucial for its function in delivering blood to the right atrium, right ventricle, and parts of the left ventricle.

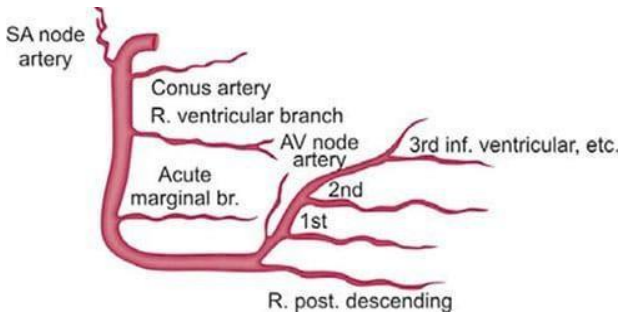

Figure1: Right Coronary Artery (RCA)

Branches of the Right Coronary Artery:

Conus Artery (Conal Branch): One of the RCA's original branches is the conus artery. It supplies the conus arteriosus (infundibulum), the region leading to the pulmonary trunk, as well as the right ventricular outflow tract. The healthy operation of the right ventricle's outflow depends on this artery.

Sinoatrial (SA) Nodal Artery: The SA nodal artery, which provides blood to the sinoatrial node the heart's natural pacemaker is produced by the RCA in about 60% of people.The SA nodal artery emerges from the left circumflex artery in the remaining 40%.The function of this artery is essential to preserving the heart's rhythm(4,5).

Coronary angiography remains the gold standard for evaluating CAD, allowing direct visualization of arterial narrowing, location of stenosis, and the number of vessels involved. Identifying the prevalence of SVD, DVD, and TVD in different demographic groups provides insight into the burden of CAD and guides early prevention strategies.

This study aimed to assess the severity of CAD using coronary angiography, with emphasis on vessel involvement across age groups and genders.

MATERIALS AND METHODS

Study design: Retrospective, cross-sectional study
Sample size: 200 patients

Setting: Department of Cardiology, Meenakshi Medical College and Research Institute (MMCHRI), Tamil Nadu
Inclusion criteria

- Age >18 years
- Patients with suspected CAD or myocardial infarction who underwent coronary angiography

Exclusion criteria

- Previous coronary revascularization (PCI, CABG)
- Congenital heart disease
- Non-atherosclerotic cardiac diseases (myocarditis, cardiomyopathy)
- Severe renal or hepatic failure
- Known hypersensitivity to contrast agents

Data collection
Records of 200 patients were reviewed. The involvement of the Right Coronary Artery (RCA), Left Anterior Descending artery (LAD), and Left Circumflex artery (LCX) was documented. Patient demographic details, age groups, and gender were analyzed in relation to severity of CAD.

Ethical clearance
Approval was obtained from the Institutional Ethics Committee of MMCHRI. Patient confidentiality was maintained throughout the study.

RESULTS

Table 1. Severity of CAD among study population (n=200)

CAD type	No. of patients	Percentage
Single-vessel disease (SVD)	40	16%
Double-vessel disease (DVD)	62	28%
Triple-vessel disease (TVD)	98	56%

Table 2. Gender-wise distribution of CAD

Gender	SVD (%)	DVD (%)	TVD (%)
Male	21%	40%	73%
Female	12%	11%	30%

Table 3. Average percentage of artery involvement

Coronary artery	% involvement
Left Main Coronary Artery (LMCA)	7.5%
Left Anterior Descending (LAD)	88.8%
Left Circumflex (LCX)	42.5%
Right Coronary Artery (RCA)	72.5%

Table 4. Age-wise prevalence of CAD

Age group (years)	No. of patients	% with significant CAD
31–40	50	24%
41–50	82	56%
61–70	68	53%

DISCUSSION

This study demonstrates that triple-vessel disease (TVD) was the most common and severe form of coronary artery disease (CAD), affecting more than half of the patients (56%). Previous angiographic studies have also reported high prevalence of multivessel disease, which is associated with greater atherosclerotic burden and worse clinical outcomes (6, 7). TVD often indicates extensive myocardial ischemia and usually necessitates revascularization strategies such as percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) (8).

The predominance of CAD among male patients in this study is consistent with global and regional data. Large multicenter studies have shown that men have a higher risk of CAD than women, largely due to the clustering of modifiable risk factors such as smoking, hypertension, and dyslipidemia (9,10). Hormonal protection from estrogen in premenopausal women has also been linked to lower CAD prevalence in females, although postmenopausal women exhibit a sharp increase in disease risk (11). In India, several angiographic studies have also reported male predominance, with proportions ranging from 70% to 85% among patients undergoing coronary angiography (12).

The age distribution of patients with severe CAD in our cohort highlights that the 41–50 years group had the highest prevalence (56%), followed by the 61–70 years group (53%). This suggests an alarming shift toward earlier onset CAD. Studies from South Asia have consistently documented premature CAD, with patients presenting at least a decade earlier compared to Western populations (13, 14). In Kerala, for example, 11.9% of patients under 40 years already had TVD, although single-vessel disease remained most common in that younger subset (15). This reinforces the urgent need for preventive strategies targeted at middle-aged adults.

With respect to vessel involvement, the Left Anterior Descending artery (LAD) was the most frequently affected (88.8%), followed by RCA (72.5%) and LCX (42.5%). The LAD has been consistently reported as the most common site of atherosclerotic stenosis, given its long anatomical course and its role in supplying a large portion of the left ventricle (6). Lesions in the LAD are clinically significant, as they are strongly associated with anterior wall myocardial infarction and carry higher mortality risk. Studies from both India and international cohorts confirm LAD as the dominant site of involvement in CAD (11).

Overall, these findings suggest that male gender, middle age, and LAD involvement are critical markers of severe CAD in this population. Compared with other Indian studies, our population showed a relatively higher prevalence of TVD, which may reflect late presentation, delayed referral, or poorly controlled comorbidities such as diabetes and hypertension. This underlines the importance of early screening, aggressive risk factor management, and public health interventions to reduce disease progression.

CONCLUSION

Coronary angiography revealed that triple-vessel disease was the most common and severe form of CAD, predominantly affecting males and middle-aged to elderly patients. Early identification, preventive measures, and timely interventions are crucial to reducing disease progression and improving outcomes.

REFERENCES

1. Murray CJL, Lopez AD. Alternative projections of mortality and disability by cause 1990–2020: Global Burden of Disease study. Lancet. 1997;349:1498–1504.
2. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics—2011 update: A report from the American Heart Association. Circulation. 2011;123:e18–e209.
3. Budoff MJ, Dowe D, Jollis JG, et al. Diagnostic performance of 64-multidetector row coronary CT angiography. J Am Coll Cardiol. 2008;52:1724–1732.
4. Miller JM, Rochitte CE, Dewey M, et al. Diagnostic performance of coronary angiography by 64-row CT. N Engl J Med. 2008;359:2324–2336.
5. Kreatsoulas C, Sloane D, Pogue J, Velianou JL, Anand SS. Referrals in acute coronary events for cardiac catheterization: The RACE CAR Trial. Can J Cardiol. 2010;26:e290–e296.
6. Budoff MJ, Dowe D, Jollis JG, et al. Diagnostic performance of 64-multidetector row coronary CT angiography for evaluation of coronary artery stenosis. J Am Coll Cardiol. 2008;52:1724–1732.
7. Miller JM, Rochitte CE, Dewey M, et al. Diagnostic performance of coronary angiography by 64-row CT. N Engl J Med. 2008;359:2324–2336.
8. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (INTERHEART study): case-control study. Lancet. 2004;364:937–952.
9. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics—2011 update. Circulation. 2011;123:e18–e209.
10. Gupta R. Trends in hypertension epidemiology in India. J Hum Hypertens. 2004;18:73–78.
11. Thom T, Hasse N, Rosamond W, et al. Heart disease and stroke statistics—2006 update. Circulation. 2006;113:e85–151.
12. Prabhakaran D, Chaturvedi V, Shah P. Differences in prevalence of metabolic syndrome in urban and rural India. Chronic Illn. 2007;3:8–19.
13. Clinical profiles and angiographic characteristics of CAD in women: insights from a tertiary care center in Eastern India. Cureus. 2023;15(1):e34122.

14. Risk factors and angiographic profile in young individuals with CAD: A South Indian study. Indian J Cardiovasc Dis Women. 2023;8:89–95.
15. Shah B, Mathur P. Surveillance of cardiovascular disease risk factors in India: The need and scope. Indian J Med Res. 2010;132:634–642.