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FREQUENCY OF MULTIVESSEL CORONARY ARTERY DISEASE IN PATIENT WITH INFERIOR WALL MYOCARDIAL INFARCTION AT FIRST PRESENTATION

Original Research

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ABSTRACT

Background: Inferior wall myocardial infarction (IWMI) is traditionally considered to have a better prognosis than other myocardial infarction types. However, emerging evidence suggests that a significant proportion of these patients may have underlying multivessel coronary artery disease (MVD), which can adversely affect outcomes and necessitate more aggressive management.

Objective: To determine the frequency of multivessel coronary artery disease in patients presenting with inferior wall myocardial infarction.

Methods: A cross-sectional study was conducted at the National Institute of Cardiovascular Diseases (NICVD), Karachi, over a period of six months. A total of 170 patients aged 18–65 years with confirmed IWMI within four hours of symptom onset and undergoing coronary angiography were enrolled through non-probability consecutive sampling. Patients with prior MI, PCI, CABG, renal or liver disease, and arrhythmias were excluded. Demographic, clinical, and angiographic data were collected. Data were analyzed using SPSS v24, with frequencies, means, and chi-square tests applied where appropriate.

Results: Among 170 patients, 71.8% were male and the mean age was 54.2 ± 8.6 years. Multivessel disease was found in 63.5% of patients, with triple-vessel disease seen in 35.3% and double-vessel disease in 28.2%. The right coronary artery (RCA) was the most frequently involved infarct-related artery (76.5%). Hypertension, diabetes, and smoking were common risk factors. Patients with multivessel disease had a higher frequency of these comorbidities.

Conclusion: A substantial proportion of patients presenting with IWMI had multivessel coronary artery disease. These findings highlight the importance of early angiographic assessment and comprehensive risk evaluation to optimize treatment strategies.

Keywords: Angiography, Coronary Artery Disease, Electrocardiography, Inferior Wall Myocardial Infarction, Multivessel Disease, Myocardial Infarction, Percutaneous Coronary Intervention.

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INTRODUCTION

Myocardial infarction (MI), a critical manifestation of acute coronary syndrome (ACS), encompasses a spectrum of conditions including unstable angina, ST-segment elevation myocardial infarction (STEMI), and non-ST-segment elevation myocardial infarction (NSTEMI) (1,2). Coronary artery disease (CAD) remains the leading cause of death worldwide, contributing to over five million deaths annually. While NSTEMI continues to be more prevalent globally, mortality rates related to MI range between 2% and 5%, though they can reach as high as 72 per 1,000 hospitalized patients in some regions (3-5). Inferior wall MI is observed in approximately 40–50% of all acute MI cases and is often associated with relatively better outcomes compared to other types of infarction, particularly anterior wall MI. However, a considerable proportion of these cases still result in serious complications, with mortality reported between 2% and 9% (6,7). Despite its generally favorable prognosis, inferior wall MI can be accompanied by high-risk features, including precordial ST-segment depression, complete atrioventricular block (AVB), and right ventricular infarction (RVI), which significantly elevate morbidity and mortality risks (8,9). The accurate and prompt identification of infarct-related arteries using electrocardiographic findings plays a vital role in assessing the myocardial territory at risk and informs decisions on early revascularization (10). Among the various predictors of adverse outcomes in MI, the anatomical location of infarction has emerged as a key factor influencing both the extent of myocardial damage and the recovery of left ventricular function (11-13). Inferior wall MI, although considered less severe than anterior wall involvement, may still pose significant risks if associated with multivessel coronary artery disease (MVD).

Studies investigating the prevalence of MVD in patients with inferior wall MI have yielded inconsistent results. A tertiary care hospital study in Faisalabad reported a prevalence of 68.33% (82/120) (14), whereas another study showed a substantially lower frequency of 11.45% (11/96) (15). A study found MVD in 56.94% (123/216) of inferior wall MI patients (16). This wide variation in reported frequencies indicates a lack of consensus and highlights the need for more region-specific research. Moreover, inferior MI often includes extensive myocardial involvement and complications such as hypotension, bradycardia, heart block, and cardiogenic shock, which can adversely impact long-term prognosis (17,18). Although inferior wall infarctions are often deemed less severe, their potential to involve multiple coronary vessels may challenge this perception and calls for further clinical attention. Despite extensive international literature, there remains a paucity of local data addressing the burden of multivessel disease in patients presenting with inferior wall MI. This knowledge gap restricts the ability of clinicians to optimize treatment strategies and predict outcomes accurately within the local population. Therefore, generating evidence tailored to regional demographics and clinical profiles is crucial for enhancing patient care and guiding future research directions in cardiovascular medicine. The objective of this study is to determine the frequency of multivessel coronary artery disease in patients presenting with inferior wall myocardial infarction, aiming to inform local disease burden, improve risk stratification, and guide appropriate management strategies.

METHODS

This cross-sectional study was conducted at the National Institute of Cardiovascular Diseases (NICVD), Karachi, over a period of at least six months following the approval of the research synopsis by the College of Physicians and Surgeons Pakistan (CPSP). The primary objective was to determine the frequency of multivessel coronary artery disease among patients presenting with inferior wall myocardial infarction (IWMI). A sample size of 170 was calculated using the WHO sample size calculator, based on a previously reported frequency of multivessel disease of 68.33% (14), a margin of error of 7%, and a 95% confidence level. Non-probability consecutive sampling was used to enroll participants. Patients aged between 18 and 65 years of either gender who presented with IWMI within four hours of symptom onset and were undergoing coronary angiography were included. Exclusion criteria comprised individuals with recurrent myocardial infarction, prior history of percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG), diagnosed cases of chronic renal failure or chronic liver disease, and those with documented arrhythmias.

The study was initiated after obtaining approval from the institutional review board (IRB) of NICVD under reference number IRB-42/2025. Informed consent was obtained from each participant after stabilization in the emergency department. Patients were counseled regarding the purpose, benefits, and risks of participation before consent was taken. All eligible patients admitted to the catheterization laboratory (cath lab) or coronary care unit (CCU) with clinical suspicion of IWMI were evaluated and enrolled. The diagnosis was

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confirmed using a 12-lead ECG, based on ST-segment elevation in leads II, III, and aVF with reciprocal depression in lateral leads, as defined in the operational definition. Upon enrollment, demographic and clinical characteristics including age, gender, place of residence, history of hypertension, diabetes mellitus, smoking status, family history of cardiovascular disease, and duration of symptoms were recorded. Physical examination included measurement of height and weight using standardized equipment to calculate body mass index (BMI). All participants underwent PCI, during which the coronary angiographic profile—including identification of the culprit artery and extent of coronary artery disease—was evaluated and documented. Angiographic assessments were performed by interventional cardiologists with over five years of experience. Data were recorded in a predesigned proforma.

Collected data were entered in Microsoft Excel 2016 and analyzed using IBM SPSS version 24. Quantitative variables such as age, height, weight, BMI, and symptom duration were assessed for distribution using the Shapiro-Wilk test and presented as mean ± standard deviation or median with interquartile range, as appropriate. Categorical variables including gender, place of residence, hypertension, diabetes, smoking status, family history of cardiovascular disease, culprit artery, type of coronary artery disease, and presence of multivessel disease were expressed as frequencies and percentages. Stratification was performed for potential effect modifiers including age, gender, BMI, duration of symptoms, diabetes, hypertension, smoking, and family history. Post-stratification, chi-square or Fisher's exact test was applied, with a p-value ≤0.05 considered statistically significant.

RESULTS

The study analyzed data from 170 patients presenting with inferior wall myocardial infarction. The mean age of participants was 54.2 ± 8.6 years, and the average body mass index (BMI) was 26.3 ± 3.5 kg/m². Among the participants, 71.8% were male and 28.2% were female. Most patients resided in urban areas (62.4%), while 37.6% were from rural settings. Regarding socioeconomic status, 53.5% of patients were from middle-income households, followed by 34.1% from lower-income and 12.4% from upper-income groups. Half of the participants (50.6%) had diabetes mellitus, and 57.6% had hypertension. A positive family history of cardiovascular disease was found in 45.3% of patients, while 38.2% reported a history of smoking. Angiographic evaluation showed that single-vessel disease (SVD) was observed in 36.5% of cases, while double-vessel disease (DVD) and triple-vessel disease (TVD) were found in 28.2% and 35.3% of patients, respectively. Regarding the infarct-related artery, the right coronary artery (RCA) was the most frequently involved vessel, accounting for 76.5% of cases. This was followed by the left circumflex artery (LCx) in 11.8%, the left anterior descending artery (LAD) in 8.2%, and other arteries in 3.5% of cases. Multivessel coronary artery disease (MVD) was present in 63.5% of the study population, while the remaining 36.5% had single-vessel involvement. This finding highlights a substantial burden of multivessel involvement among patients presenting with inferior wall MI in the local population.

Table 1: Demographic Characteristics of the Study Population (n = 170)

Variable	Value
Age (mean ± SD)	54.2 ± 8.6
Gender	
Male	122 (71.8%)
Female	48 (28.2%)
BMI (mean ± SD)	26.3 ± 3.5
Residence	
Rural	64 (37.6%)
Urban	106 (62.4%)
Socioeconomic Status	
Lower	58 (34.1%)
Middle	91 (53.5%)
Upper	21 (12.4%)
Diabetes	
Yes	86 (50.6%)
No	84 (49.4%)
Hypertension	

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Variable	Value
Yes	98 (57.6%)
No	72 (42.4%)
Family History of CVD	
Yes	77 (45.3%)
No	93 (54.7%)
Smoking	
Yes	65 (38.2%)
No	105 (61.8%)

Table 2: Number of Vessels Involved

Number of Vessels Involved	Frequency (n)	Percentage (%)
Single-Vessel Disease (SVD)	62	36.5
Double-Vessel Disease (DVD)	48	28.2
Triple-Vessel Disease (TVD)	60	35.3

Table 3: Infarct Related Artery

Infarct Related Artery	Frequency (n)	Percentage (%)
LAD	14	8.2
RCA	130	76.5
LCx	20	11.8
Other	6	3.5

Table 4: Prevalence of Multivessel Disease

Multivessel Disease	Frequency (n)	Percentage (%)
Yes	108	63.5
No	62	36.5

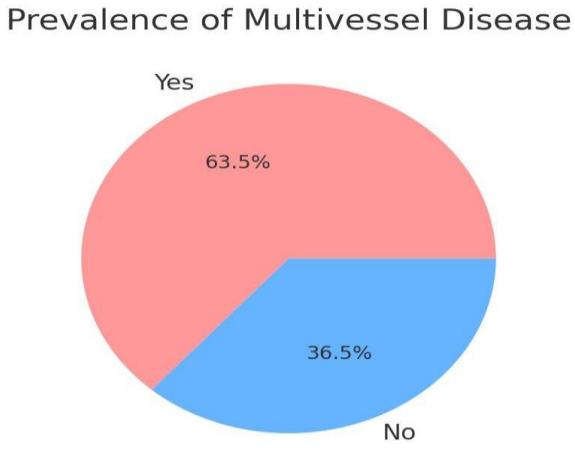

Figure 1 Prevalence of Multivessel Disease

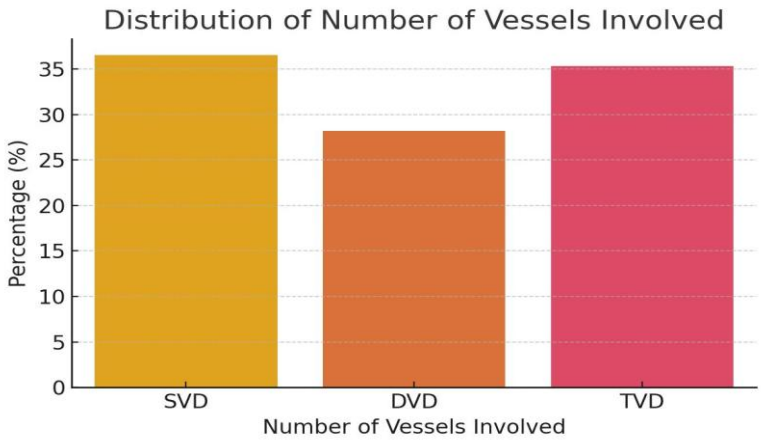

Figure 2 Distribution of Number of Vessels Involved

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DISCUSSION

The present study found that 63.5% of patients presenting with inferior wall myocardial infarction (IWMI) had multivessel coronary artery disease (MVD). This high prevalence aligns closely with regional findings such as those reported by a study which noted a 69.2% frequency of MVD among IWMI patients with precordial ST depression (16,17). The predominance of the right coronary artery (RCA) as the infarct-related vessel (76.5%) is consistent with anatomical expectations, given the typical perfusion territory of the RCA in IWMI. These results reinforce that despite the historical classification of IWMI as having a favorable prognosis, a significant proportion of these patients may harbor complex coronary disease requiring more aggressive therapeutic strategies. The observed frequency of triple-vessel disease (35.3%) further supports the notion that IWMI, particularly when associated with risk factors such as diabetes and hypertension, often reflects a more diffuse atherosclerotic burden. This aligns with the findings of a study which highlighted that ST-segment depression in precordial leads predicts both the presence of multivessel disease and the need for more extensive revascularization (18,19). The presence of MVD in over 60% of cases raises important clinical implications for early invasive strategies. It also calls into question the common assumption that inferior infarctions are uniformly less severe than anterior ones. The angiographic data suggest that IWMI patients, particularly those with anterior reciprocal ST depressions, may indeed have extensive disease, as previously reported a study, where anterior and lateral reciprocal changes strongly correlated with MVD in STEMI patients (20,21).

A notable strength of this study is its robust sample size, drawn from a high-volume tertiary care cardiac center, enhancing the generalizability within similar clinical settings. The standardized angiographic assessment by experienced interventional cardiologists and comprehensive data collection further strengthens the validity of the findings. However, the study is not without limitations. The use of non-probability consecutive sampling may introduce selection bias, as only patients undergoing PCI within a limited time window after symptom onset were included. This may exclude late presenters, who often have different risk profiles and outcomes. Moreover, the cross-sectional nature of the study limits causal inference, particularly regarding long-term outcomes associated with MVD. Prospective cohort studies with follow-up data on mortality, re-infarction, and heart failure would add valuable insight into the prognostic implications of these findings. Additionally, the exclusion of patients with arrhythmias, renal failure, or prior interventions, while methodologically justified, limits the application of results to broader patient populations where such comorbidities are common. Future studies should aim to include these populations or assess subgroup variations to better inform clinical decision-making.

The findings also suggest the need for greater emphasis on electrocardiographic predictors of MVD at the point of initial presentation. Prior research has demonstrated the value of reciprocal ST-segment changes, particularly in anterior leads, as indicators of more extensive coronary involvement (22,23). Moreover, combining ECG interpretation with non-invasive imaging modalities such as dobutamine stress echocardiography or thallium-201 scintigraphy could enhance risk stratification (24). In conclusion, this study contributes important regional data indicating that multivessel disease is common among patients with IWMI. The high frequency of MVD emphasizes the need for comprehensive diagnostic evaluation and tailored management strategies. Integrating ECG features with early angiographic assessment could improve early identification of high-risk patients. Future research should expand to multicenter designs, incorporate long-term follow-up, and explore predictive models to optimize treatment in this population.

CONCLUSION

This study demonstrates a high prevalence of multivessel coronary artery disease among patients presenting with inferior wall myocardial infarction, challenging the traditional perception of IWMI as a less severe entity. The findings underscore the importance of early angiographic assessment and risk stratification to guide appropriate revascularization strategies. Incorporating ECG predictors and clinical profiling can enhance early detection and improve patient outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Saba Zafar	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Fawad Farooq	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing

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	Has given Final Approval of the version to be published
Ali Muhammad Mahar	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Ali Hyder	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Simran Ochani	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ahsan Ali Gaad*	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Tanzeel Rehman	Contributed to study concept and Data collection Has given Final Approval of the version to be published

REFERENCES

1. Benatti G, Gragnano F, Vignali L, Calabrò P, Gurgoglione FL, Niccoli G. Timing and modality of complete revascularization in patients presenting with ST-segment elevation myocardial infarction and multivessel coronary artery disease. Int J Cardiol. 2023;380:6-11.
2. Puymirat E, Cayla G, Simon T, Steg PG, Montalescot G, Durand-Zaleski I, et al. Three-Year Outcomes With Fractional Flow Reserve-Guided or Angiography-Guided Multivessel Percutaneous Coronary Intervention for Myocardial Infarction. Circ Cardiovasc Interv. 2024;17(6):e013913.
3. Freund A, Desch S, Thiele H. Revascularization in cardiogenic shock. Herz. 2020;45(6):537-41.
4. Erbay A, Penzel L, Abdelwahed YS, Heuberger A, Schatz AS, Seppelt C, et al. Prognostic impact of quantitative flow ratio (QFR)-consistent complete revascularization in patients with myocardial infarction and multivessel coronary artery disease. Am Heart J. 2024;276:22-30.
5. Omerovic E, Råmunddal T, Petursson P, Angerås O, Rawshani A, Jha S, et al. Percutaneous vs. surgical revascularization of non-ST-segment elevation myocardial infarction with multivessel disease: the SWEDEHEART registry. Eur Heart J. 2025;46(6):518-31.
6. Kakar H, Groenland FTW, Elscot JJ, Rinaldi R, Scoccia A, Kardys I, et al. Percutaneous Coronary Intervention Versus Coronary Artery Bypass Grafting in Non-ST-Elevation Coronary Syndromes and Multivessel Disease: A Systematic Review and Meta-Analysis. Am J Cardiol. 2023;195:70-6.
7. Taggart DP. PCI versus CABG in coronary artery disease. Vascul Pharmacol. 2024;155:107367.
8. Omer MA, Brilakis ES, Kennedy KF, Alkhouli M, Elgendy IY, Chan PS, et al. Multivessel Versus Culprit-Vessel Percutaneous Coronary Intervention in Patients With Non-ST-Segment Elevation Myocardial Infarction and Cardiogenic Shock. JACC Cardiovasc Interv. 2021;14(10):1067-78.
9. Rymer JA, Granger CB. Managing patients with ST-elevation myocardial infarction and multivessel disease: is the story complete? Eur Heart J. 2020;41(42):4111-3.
10. Mimoso J. Long-term recurrent events in ST-elevation myocardial infarction and multivessel disease: The impact of different revascularization strategies. Rev Port Cardiol. 2023;42(5):453-4.
11. Formica F, Gallingani A, Tuttolomondo D, Hernandez-Vaquero D, Singh G, Pattuzzi C, et al. Long-Term Outcomes Comparison Between Surgical and Percutaneous Coronary Revascularization in Patients With Multivessel Coronary Disease or Left Main Disease: A Systematic Review and Study Level Meta-Analysis of Randomized Trials. Curr Probl Cardiol. 2023;48(7):101699.
12. Diletti R, den Dekker WK, Bennett J, Schotborgh CE, van der Schaaf R, Sabaté M, et al. Immediate versus staged complete revascularisation in patients presenting with acute coronary syndrome and multivessel coronary disease (BIOVASC): a prospective, open-label, non-inferiority, randomised trial. Lancet. 2023;401(10383):1172-82.
13. Lee JM, Kim HK, Park KH, Choo EH, Kim CJ, Lee SH, et al. Fractional flow reserve versus angiography-guided strategy in acute myocardial infarction with multivessel disease: a randomized trial. Eur Heart J. 2023;44(6):473-84.

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14. Böhm F, Mogensen B, Engstrøm T, Stankovic G, Srdanovic I, Lønborg J, et al. FFR-Guided Complete or Culprit-Only PCI in Patients with Myocardial Infarction. N Engl J Med. 2024;390(16):1481-92.
15. Dhaka M, Kumar T, Sharma A. Electrocardiogram predictors of multivessel disease in ST-elevation myocardial infarction patients undergoing primary percutaneous coronary intervention. Research in Cardiovascular Medicine. 2021;10:1-6.
16. Chowdhury A, Rahman A, Khalequzzaman, Islam MA. Early Detection of Multivessel Disease and Prevention of Short and Long Term Complications. 2020;8:2271-7.
17. Choi KH, Yang JH, Park TK, Lee JM, Song YB, Hahn JY, et al. Culprit-Only Versus Immediate Multivessel Percutaneous Coronary Intervention in Patients With Acute Myocardial Infarction Complicating Advanced Cardiogenic Shock Requiring Venoarterial-Extracorporeal Membrane Oxygenation. J Am Heart Assoc. 2023;12(10):e029792.
18. Lin S, Guan C, Wu F, Xie L, Zou T, Shi Y, et al. Coronary Artery Bypass Grafting and Percutaneous Coronary Intervention in Patients With Chronic Total Occlusion and Multivessel Disease. Circ Cardiovasc Interv. 2022;15(2):e011312.
19. Laudani C, Occhipinti G, Greco A, Spagnolo M, Giacoppo D, Capodanno D. Completeness, timing, and guidance of percutaneous coronary intervention for myocardial infarction and multivessel disease: a systematic review and network meta-analysis. EuroIntervention. 2025;21(4):e203-e16.
20. Faro DC, Laudani C, Agnello FG, Ammirabile N, Finocchiaro S, Legnazzi M, et al. Complete Percutaneous Coronary Revascularization in Acute Coronary Syndromes With Multivessel Coronary Disease: A Systematic Review. JACC Cardiovasc Interv. 2023;16(19):2347-64.
21. Kirov H, Caldonazo T, Riedel LL, Tasoudis P, Moschovas A, Diab M, et al. Comparing outcomes between coronary artery bypass grafting and percutaneous coronary intervention in octogenarians with left main or multivessel disease. Sci Rep. 2023;13(1):22323.
22. Choi KH, Lee SY, Park TK, Lee JM, Song YB, Hahn JY, et al. Cardiogenic shock complicating acute myocardial infarction and multivessel disease: revascularization strategy according to ischemic territory. Rev Esp Cardiol (Engl Ed). 2025;78(2):97-106.
23. Kubra G, Saghir T, Rasheed S, Rehan FH, Ali A, Abbas S. In-Hospital Outcomes of Female Patients With Inferior Wall Myocardial Infarction. Cureus. 2021 Feb 11;13(2):e13274.
24. Panda S, Sharma SK. Echocardiographic and Angiographic Profile of Patients with Lateral Wall MI ECG Presentation in Inferior Wall Mi (A Comparison Study). Scholars Journal of Applied Medical Sciences. 2020;8(11):2573-7

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