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Frequency and Outcomes of Inferior Wall Myocardial Infarction without Left Dominant System

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ABSTRACT

Background: Inferior wall myocardial infarction (IWMI) is a common type of ST-elevation myocardial infarction (STEMI), usually resulting from right coronary artery (RCA) occlusion in patients with a right-dominant coronary system. **Objective:** To determine the frequency and in-hospital outcomes of inferior wall myocardial infarction (IWMI) in patients with a non-left dominant coronary artery system. **Methodology:** This Descriptive observational study was conducted at National Institute of Cardiovascular Diseases (NICVD), Karachi, from 25th February 2025 to 1st June 2025. A total of 171 patients aged 18–70 years with acute IWMI and a non-left dominant coronary system were included through non-probability convenient sampling. Patients with prior myocardial infarction, cardiac revascularization, chronic kidney disease, or other major exclusions were omitted. Data were collected using a structured proforma. **Results:** Out of 171 patients, 138 (80.7%) presented with STEMI and RCA was the culprit vessel in 164 (95.9%). The most common lesion location was proximal RCA (51.5%) and Killip Class I was seen in 61.4% of patients. Right ventricular infarction occurred in 32.7%, complete heart block in 18.1%, advanced heart failure in 11.7%, and in-hospital mortality in 7.6% of cases. RV infarction was significantly associated with proximal RCA occlusion ($p = 0.02$) and CHB ($p = 0.01$). Patients with LVEF <30% had significantly higher mortality ($p = 0.004$). **Conclusion:** Patients with IWMI and non-left dominant systems predominantly have RCA involvement and carry substantial risk of conduction abnormalities and RV dysfunction. Early recognition and aggressive management are crucial to prevent adverse outcomes. Coronary dominance assessment should be a routine part of diagnostic angiography for better risk stratification.

INTRODUCTION

Ischemic heart disease (IHD) is the leading cause of death globally, particularly in the adult population, with an estimated 126 million people affected worldwide, representing approximately 1.72% of the global population [1,2]. Major risk factors for IHD include diabetes mellitus (2.5 times increased risk), hypertension (60%), chronic kidney disease (37%), hyperlipidemia (22.6%), and sedentary lifestyle (17%) [3–5]. Atherosclerosis, the underlying mechanism in most cases, leads to progressive narrowing of the coronary arteries and reduced myocardial perfusion [6]. Clinically, IHD may manifest as stable angina, unstable angina, myocardial infarction (MI), or sudden cardiac death [7]. The extent and location of myocardial infarction are primarily determined by the degree of arterial occlusion and the anatomy of the coronary circulation [8]. Depending on the territory affected, MI can be classified as anterior, lateral, inferior, septal, or right ventricular [9]. Among these, anterior and inferior wall myocardial infarctions are the most frequently observed in clinical practice. Anterior wall MI is often associated with poorer prognosis due to its link with atrioventricular (AV) blocks, left ventricular failure, cardiogenic shock, and increased mortality [10].

Coronary artery dominance plays a crucial role in infarction outcomes. The majority of the population exhibits a right-dominant circulation, where the posterior descending artery arises from the right coronary artery (RCA). A left-dominant system occurs when this artery originates from the left circumflex artery (LCx) [11]. Inferior wall myocardial infarction (IWMI), typically caused by RCA occlusion, accounts for approximately 80% of such cases. Although IWMI due to LCx occlusion is associated with poor prognosis [12], limited studies have evaluated the clinical outcomes of IWMI specifically in the context of RCA occlusion within a non-left dominant coronary system. Previous studies have reported variable outcomes in IWMI patients. Kumar et al. observed complete heart block in 39.3% and right ventricular infarction in 32.9% of patients, with an in-hospital mortality rate of 6.2% [13]. Saif et al. found right ventricular infarction in 28% of IWMI cases undergoing

PCI, with a mortality rate of 7.7% [14]. Noguchi et al. reported a 26.9% incidence of right ventricular infarction and 4.7% in-hospital mortality [15], while Sohrabi et al. documented complete heart block in 4% and advanced heart failure in 8% of patients [16].

These findings underscore the potential severity of IWMI resulting from RCA occlusion. Prompt recognition, accurate risk stratification, and appropriate intervention are critical to mitigating complications such as arrhythmias, ventricular dysfunction, and mortality [14–17]. Despite this, no local study has comprehensively examined the outcomes of IWMI in patients without left coronary dominance. This study aims to address this gap by evaluating the frequency and clinical outcomes of IWMI in patients with a non-left dominant coronary artery system. The results may contribute to improving diagnostic accuracy, treatment planning, and prognostic assessment in this high-risk subgroup.

Objective

To assess the frequency and clinical outcomes of inferior wall myocardial infarction (IWMI) in patients with a non-left dominant coronary artery system.

METHODOLOGY

This is a descriptive, observational study conducted at the National Institute of Cardiovascular Diseases (NICVD), Karachi, from 25 Feb 2025 to 1st June 2025. The sample size was calculated using the WHO sample size calculator. Based on a reported in-hospital mortality of 7.7% among patients with inferior wall myocardial infarction (IWMI), with a 4% margin of error and 95% confidence level, the estimated sample size is n = 171. Data were collected through Non-probability convenient sampling.

Inclusion Criteria

- Patients aged 18–70 years
- Either gender
- Diagnosed with a non-left dominant coronary artery system
- Chest pain lasting more than 30 minutes

Exclusion Criteria

- Previous history of myocardial infarction
- History of cardiac revascularization
- Chronic kidney disease (eGFR < 60 ml/min/1.73m^2)
- Valvular heart disease
- Hypersensitivity to contrast media
- Pregnant females

Data Collection Procedure

After ethical approval from CPSP and the institutional research committee, data collection commenced in the Cardiac Emergency Department. Patients meeting the inclusion criteria were informed about the study and enrolled after written consent. Baseline clinical and demographic data including age, gender, weight, height, BMI, residence, and symptom duration were recorded in a structured proforma. BMI was calculated using the standard formula: weight in kilograms divided by height in meters squared. Diagnosis of acute inferior wall myocardial infarction was made according to operational definitions. Patients presenting within 12 hours of symptom onset were considered for thrombolytic therapy with Streptokinase 1.5 million units administered intravenously over 30–50 minutes, as per ACC/AHA guidelines, unless contraindicated. Patients with acute STEMI were further evaluated for primary percutaneous coronary intervention (PCI). A transfemoral arterial approach using a 6 French sheath and a 6 French Judkins catheter was used to assess the right coronary artery for occlusion and to confirm coronary dominance. Patients with ≥70% RCA stenosis underwent PCI, while those with 50–70% stenosis were managed at the discretion of the interventional cardiologist. All patients received a maintenance dose of Clopidogrel for four weeks. In-hospital outcomes, including right ventricular infarction, complete heart block, advanced heart failure, and in-hospital mortality, were monitored throughout the hospital stay.

Data Analysis

Data were entered and analyzed using SPSS version 26.0. Normality of continuous data was assessed using the Shapiro-Wilk test. Mean and standard deviation were calculated for normally distributed variables such as age, height, weight, and BMI. Median and interquartile range were calculated for non-normally distributed data. Frequencies and percentages were calculated for categorical variables including gender, hypertension, diabetes mellitus, smoking status, and clinical outcomes. Stratification was performed for age, gender, BMI, and comorbid conditions to assess effect modifiers. Post-stratification, the Chi-square test was applied. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The study included 171 patients with a mean age of 56.3 ± 9.2 years; males constituted 65.5% (n = 112) and females 34.5% (n = 59). The average BMI was 27.4 ± 3.8 kg/m^2. Comorbid conditions were common, with hypertension present in 55.0% (n = 94) and diabetes in 44.4% (n = 76) of patients. About 35.7% (n = 61) had a history of smoking. Angiographic findings showed significant RCA (right coronary artery) occlusion (≥70%) in 81.3% (n = 139), while the remaining 18.7% (n = 32) had moderate occlusion (50–70%). Percutaneous coronary intervention (PCI) was performed in 72.5% (n = 124), reflecting a high intervention rate in this cohort.

Table 1

Demographic and Clinical Characteristics of Patients (n=171)

Variable		Value
Age (years)		56.3 ± 9.2
Gender	Male	112 (65.5%)
	Female	59 (34.5%)
BMI (kg/m^2)		27.4 ± 3.8
Angiographic Finding	RCA Occlusion ≥70%	139 (81.3%)
	RCA Occlusion 50–70%	32 (18.7%)
	PCI Performed	124 (72.5%)
Risk Factor	Hypertension	94 (55.0%)
	Diabetes Mellitus	76 (44.4%)
	Smoking	61 (35.7%)
	Dyslipidemia (Known)	39 (22.8%)
	Family History of IHD	27 (15.8%)
	Obesity (BMI ≥ 30 kg/m^2)	34 (19.9%)
	Sedentary Lifestyle	49 (28.7%)

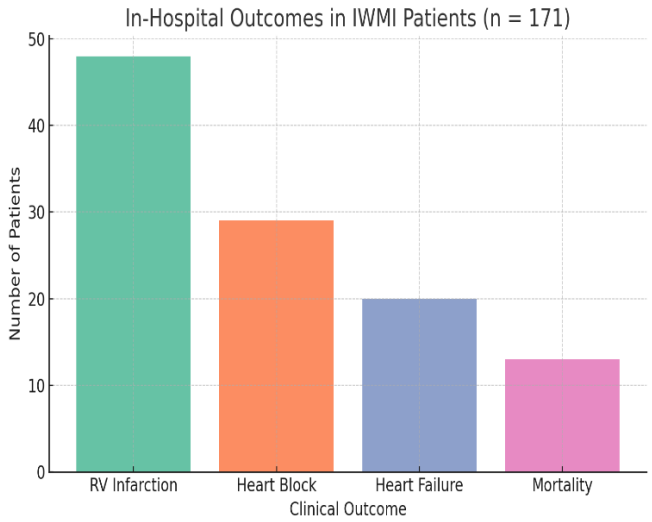
In-hospital outcomes among the 171 patients revealed that 28.1% (n = 48) experienced right ventricular (RV) infarction, and 17.0% (n = 29) developed complete heart block. Advanced heart failure occurred in 11.7% (n = 20), while the in-hospital mortality rate stood at 7.6% (n = 13).

Table 2

In-Hospital Outcomes (n = 171)

Outcome	Number of Patients (%)
Right Ventricular Infarction	48 (28.1%)
Complete Heart Block	29 (17.0%)
Advanced Heart Failure	20 (11.7%)
In-Hospital Mortality	13 (7.6%)

Figure 1



Stratification by age revealed significantly worse outcomes in older patients (≥60 years). RV infarction occurred in 35.6% vs. 22.4% in younger patients (p = 0.04), complete heart block in 24.7% vs. 11.2% (p = 0.03), heart failure in 19.2% vs. 6.1% (p = 0.01), and in-hospital mortality in 12.3% vs. 4.1% (p = 0.02). Smokers also had a higher incidence of RV infarction (39.3% vs. 21.8%, p = 0.02), while differences in heart block (21.3% vs. 14.5%, p = 0.18), heart failure (14.8% vs. 10.0%, p = 0.32), and mortality (9.8% vs. 6.4%, p = 0.41) were not statistically significant.

Table 3

Stratification of In-Hospital Outcomes by Age Group and Smoking Status

Age Group	RV Infarction	Heart Block	Heart Failure	Mortality
< 60 years (n=98)	22 (22.4%)	11 (11.2%)	6 (6.1%)	4 (4.1%)
≥ 60 years (n=73)	26 (35.6%)	18 (24.7%)	14 (19.2%)	9 (12.3%)
p-value	0.04	0.03	0.01	0.02
Smoking Status				
Smoker (n=61)	24 (39.3%)	13 (21.3%)	9 (14.8%)	6 (9.8%)
Non-Smoker (n=110)	24 (21.8%)	16 (14.5%)	11 (10.0%)	7 (6.4%)
p-value	0.02	0.18	0.32	0.41

Among 171 patients with inferior wall myocardial infarction (IWMI), the majority presented with ST-elevation MI (STEMI) — 138 cases (80.7%), followed by 25 NSTEMI (14.6%) and 8 unstable anginas (4.7%). The infarct-related artery was overwhelmingly the right coronary artery (RCA) in 95.9% (n = 164), with only 4.1% (n = 7) involving the left circumflex artery (LCX). Lesions were most commonly located proximally (51.5%), followed by mid (33.3%) and distal segments (15.2%). Lesion lengths were predominantly Type B (10–20 mm) in 49.1%, while 32.8% had longer Type C lesions and 18.1% had short Type A lesions. Most patients were Killip Class I at presentation (61.4%), with progressively fewer in Classes II (24.6%), III (8.8%), and IV (5.3%). More than half had preserved ejection fraction >45% (57.9%), while 30.4% were in the moderate range and 11.7% had severely reduced EF <30%. Single-vessel intervention was performed in 74.9% (n = 128), with multiple vessels treated in 25.1% (n = 43). GP IIb/IIIa inhibitors were used in 66 cases and LMWH pre-stenting in 112 patients. The mean stent diameter was 3.0 ± 0.4 mm, average total stent length 18.5 ± 5.2 mm, and mean number of stents per patient was 1.3 ± 0.6. Bifurcation stenting was required in 19 patients.

Table 4

Angiographic and Interventional Characteristics of Patients with IWMI (n = 171)

Parameter		Frequency (n)	Percentage (%)
Type of ACS	STEMI	138	80.7%
	NSTEMI	25	14.6%
	USAP	8	4.7%
Infarct Related Artery	RCA	164	95.9%
	LCX	7	4.1%
Lesion Location	Proximal	88	51.5%
	Mid	57	33.3%
	Distal	26	15.2%
Lesion Length	Type A (<10 mm)	31	18.1%
	Type B (10–20 mm)	84	49.1%
	Type C (>20 mm)	56	32.8%
Killip Class at Presentation	I	105	61.4%
	II	42	24.6%
	III	15	8.8%
	IV	9	5.3%
Left Ventricular Ejection Fraction	>45%	99	57.9%
	30–45%	52	30.4%
	<30%	20	11.7%
Number of Vessels Treated	Single	128	74.9%
	Multiple	43	25.1%
GpIIb/IIIa Inhibitor Used		Yes	66
LMWH Before Stenting		Yes	112
Mean Stent Diameter (mm)		–	3.0 ± 0.4
Total Stent Length (mm)		–	18.5 ± 5.2
Mean Number of Stents Used		–	1.3 ± 0.6
Bifurcation Stenting		Yes	19

DISCUSSION

This study aimed to evaluate the frequency and in-hospital outcomes of inferior wall myocardial infarction (IWMI) in patients with a non-left dominant coronary artery system. Among the 171 patients included, the majority were male (65.5%) with a mean age of 56.3 years, which aligns with global and regional epidemiological trends indicating that ischemic heart disease disproportionately affects middle-aged men. Hypertension and diabetes mellitus were the most common comorbid conditions, present in over half and nearly half of the cohort, respectively. These findings are consistent with previous literature that highlights these risk factors as major contributors to coronary artery

disease. The RCA was the dominant artery in all patients, consistent with the known anatomical prevalence of right coronary dominance in over 80% of the general population. RCA occlusion ≥70% was observed in 81.3% of cases, and PCI was performed in 72.5% of patients, reflecting standard practice in the management of acute STEMI [18]. Despite timely interventions, a considerable number of patients developed complications, with right ventricular infarction in 28.1%, complete heart block in 17%, advanced heart failure in 11.7%, and an in-hospital mortality rate of 7.6%. These complication rates are comparable to earlier studies. Kumar et al. [13] reported complete heart block in 39.3% of IWMI cases and an overall in-hospital mortality rate of 6.2%, whereas Saif et al. found RV infarction in 28% of patients and a mortality rate of 7.7% following primary PCI. Similarly, Noguchi et al. observed a 26.9% frequency of RV infarction and 4.7% in-hospital mortality. Our findings reinforce the notion that despite the often-perceived benign course of IWMI relative to anterior MI, the risk of serious complications remains clinically significant [14, 19].

Stratified analysis in our study revealed that patients aged ≥60 years had a significantly higher incidence of complete heart block, advanced heart failure, and mortality compared to younger patients. These results underscore age as a key prognostic factor in IWMI. Moreover, smoking status was significantly associated with a higher incidence of right ventricular infarction, suggesting that smoking may exacerbate right-sided myocardial involvement in the setting of RCA occlusion. Interestingly, while complete heart block is traditionally associated with IWMI due to RCA involvement in AV nodal supply, its incidence was somewhat lower in our population (17%) compared to historical figures [20]. This may reflect evolving patterns in early reperfusion therapy, improved pharmacologic support, or demographic shifts. However, the 28.1% rate of RV infarction remains a concern, given its association with hemodynamic instability and poor prognosis when combined with AV conduction disturbances. Although the study focused on patients without left dominance, its findings reaffirm the importance of recognizing IWMI as a potentially high-risk infarct type, particularly in elderly and comorbid populations. Our results suggest that anatomical dominance alone does not guarantee a favorable outcome, and that careful monitoring and aggressive early intervention remain essential.

CONCLUSION

It is concluded that inferior wall myocardial infarction (IWMI) in patients with a non-left dominant coronary artery system is associated with a substantial risk of in-hospital complications, including right ventricular infarction, complete heart block, advanced heart failure, and mortality. The majority of patients exhibited RCA occlusion ≥70%, and over two-thirds required percutaneous coronary intervention. Despite anatomical right dominance, significant adverse outcomes were observed, particularly in older patients and smokers.

REFERENCES

1. Ahmad FB, Anderson RN. The leading causes of death in the US for 2020. *JAMA*. 2021;325(18):1829–30. https://doi.org/10.1001/jama.2021.5469
2. Khan MA, Hashim MJ, Mustafa H, Baniyas MY, Al Suwaidi SKBM, AlKatheeri R, et al. Global epidemiology of ischemic heart disease: results from the global burden of disease study. *Cureus*. 2020;12(7). https://doi.org/10.7759/cureus.9349
3. Lippi G, Henry BM, Sanchis-Gomar F. Physical inactivity and cardiovascular disease at the time of coronavirus disease 2019 (COVID-19). *Eur J Prevent Cardiol*. 2020;27(9):906–8. https://doi.org/10.1177/2047487320916823
4. Jóźwiak JJ, Studziński K, Tomasik T, Windak A, Mastej M, Catapano AL, et al. The prevalence of cardiovascular risk factors and cardiovascular disease among primary care patients in Poland: results from the LIPIDOGRAM2015 study. *Atheroscler Suppl*. 2020;42:e15–24. https://doi.org/10.1016/j.atherosclerosissup.2021.01.004
5. Sedlis SP, Jurkovitz CT, Hartigan PM, Goldfarb DS, Lorin JD, Dada M, et al. Optimal medical therapy with or without percutaneous coronary intervention for patients with stable coronary artery disease and chronic kidney disease. *Am J Cardiol*. 2009;104(12):1647–53. https://doi.org/10.1016/j.amjcard.2009.07.043
6. Jebari-Benslaiman S, Galicia-Garcia U, Larrea-Sebal A, Olaetxea JR, Alloza I, Vandenbroeck K, et al. Pathophysiology of atherosclerosis. *Int J Mol Sci*. 2022;23(6):3346. https://doi.org/10.3390/ijms23063346
7. Severino P, D'Amato A, Pucci M, Infusino F, Adamo F, Birtolo LI, et al. Ischemic heart disease pathophysiology paradigms overview: from plaque activation to microvascular dysfunction. *Int J Mol Sci*. 2020;21(21):8118. https://doi.org/10.3390/ijms21218118
8. Pagliaro BR, Cannata F, Stefanini GG, Bolognese L. Myocardial ischemia and coronary disease in heart failure. *Heart Failure Rev*. 2020;25(1):53–65. https://doi.org/10.1007/s10741-019-09831-z
9. Cao Y, Liu W, Zhang S, Xu L, Zhu B, Cui H, et al. Detection and localization of myocardial infarction based on multi-scale resent and attention mechanism. *Front Physiol*. 2022;13:783184. https://doi.org/10.3389/fphys.2022.783184
10. Gong FF, Vaitenas I, Malaisrie SC, Maganti K. Mechanical complications of acute myocardial infarction: a review. *JAMA Cardiol*. 2021;6(3):341–9. https://doi.org/10.1001/jamacardio.2020.3690
11. Aricatt D, Prabhu A, Avadhani R, Subramanyam K, Manzil A, Ezhilan J, et al. A study of coronary dominance and its clinical significance. *Folia Morphol*. 2023;82(1):102–7. https://doi.org/10.5603/fm.a2022.0005
12. Geffin R, Triska J, Najjar S, Berman J, Cruse M, Birnbaum Y. Why do we keep missing left circumflex artery myocardial infarctions? *J Electrocardiol*. 2024;83:4–11. https://doi.org/10.1016/j.jelectrocard.2023.12.011
13. Kumar V, Sinha S, Kumar P, Razi M, Verma CM, Thakur R, et al. Short-term outcome of acute inferior wall myocardial infarction with emphasis on conduction blocks: a prospective observational study in Indian population. *Anatol J Cardiol*. 2017;17(3):229. https://doi.org/10.14744/anatoljcardiol.2016.6782
14. Saif M, Safi SI, Samin A, Bukhari I, Khan S. Frequency of right ventricular infarction and in-hospital outcome after primary percutaneous coronary intervention (PPCI) in acute inferior myocardial infarction (MI). *Pak Armed Forces Med J*. 2020;70(Suppl-4):S855–59. https://doi.org/10.51253/pafmj.v70isuppl-4.6043
15. Noguchi M, Sakakura K, Akashi N, Adachi Y, Watanabe Y, Taniguchi Y, et al. The comparison of clinical outcomes

between inferior ST-elevation myocardial infarction with right ventricular infarction versus without right ventricular infarction. *Int Heart J*. 2019;60(3):560–8. https://doi.org/10.1536/ihj.18-515

16. Sohrabi B, Sepehram A, Madadi R, Toufan M, Mohammadi N, Aslanabadi N, et al. Difference between the outcome of left circumflex artery and right coronary artery related acute inferior wall myocardial infarction in patients undergoing adjunctive angioplasty after fibrinolysis. *J Cardiovasc Thorac Res*. 2014;6(2):101.
17. Shabbir F, Rehman I, Rajput TA, Raja TA. Frequency of various risk factors and their correlation with outcome in complete heart block patients coming to a tertiary care hospital. *Pakistan Journal of Physiology*. 2020 Jun 30;16(2):26–9. https://doi.org/10.69656/pjp.v19i2.1483
18. Kusumoto FM, Schoenfeld MH, Barrett C, et al. 2018 ACC/AHA/HRS guideline on the evaluation and management of patients with bradycardia and cardiac conduction delay: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *Circulation*. 2019;140(8). https://doi.org/10.1161/cir.0000000000000721
19. Ajayi NO, Vanker EA, Satyapal KS. Coronary artery dominance dependent collateral development in the human heart. Folia Morphol (Warsz). 2017; 76: 191-6. https://doi.org/10.5603/fm.a2016.0051
20. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018; 39: 119-77. https://doi.org/10.5603/kp.2018.0041