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Original Research Article

A Study of Clinical Profile and Laboratory Parameters of Patients with Inferior Wall Myocardial Infarction A Hospital-Based Prospective Observational Study

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Abstract:

Background: Inferior wall myocardial infarction (IWMI) accounts for approximately 40–50% of all ST-elevation myocardial infarctions and carries significant morbidity and mortality, particularly when complicated by right ventricular infarction (RVMI) or conduction abnormalities.

Objectives: To study the clinical profile, laboratory parameters, angiographic findings, and in-hospital outcomes of patients with IWMI at a tertiary care centre, with particular emphasis on differences according to MI location.

Methods: A prospective observational study was conducted on 100 consecutive patients with acute IWMI diagnosed by standard ECG criteria and elevated cardiac biomarkers. Right-sided precordial leads were routinely obtained. Killip classification, echocardiography, and coronary angiography were performed in all patients.

Results: Males constituted 86% of patients; 74% were above 50 years of age. Smoking (65%), diabetes (50%), and hypertension (40%) were predominant risk factors. RVMI was present in 34% (IWMI+RVMI: 24%; IWMI+PWMI+RVMI: 10%). Patients with RVMI showed markedly higher Killip Class IV rates (50–70%) and severe LV dysfunction compared to isolated IWMI (1.8% Class IV). Conduction abnormalities were significantly more prevalent in RVMI groups. The RCA was the culprit vessel in 65% of cases. Low HDL (<40 mg/dl) was identified in 55% of patients.

Conclusion: IWMI in the Indian context predominantly affects middle-aged males with multiple risk factors. RVMI substantially worsens haemodynamic status, LV function, and conduction system involvement. Routine right-sided ECG leads and prompt identification of MI location are essential for risk stratification and optimal management.

Keywords: Inferior wall myocardial infarction, right ventricular infarction, clinical profile, conduction blocks, Killip class, coronary angiography, India.

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Introduction

Coronary artery disease (CAD) remains the leading cause of mortality globally, accounting for an estimated 17.9 million deaths annually. In India, the burden of CAD has assumed epidemic proportions, with Indians developing CAD almost a decade earlier than Western counterparts and demonstrating greater disease severity at a younger age. [1]

Among the various manifestations of acute coronary syndrome (ACS), inferior wall myocardial infarction (IWMI) is the second most common form of ST-elevation MI (STEMI), accounting for 40–50% of all cases. It results primarily from occlusion of the right coronary artery (RCA) in approximately 75–80% of individuals with right-dominant coronary circulation, and less frequently from occlusion of the left circumflex artery (LCx). The inferior wall, right ventricle, and posterior wall often share blood supply from the RCA or its branches, predisposing to multi-territory involvement when a proximal RCA occlusion occurs. [2]

Right ventricular myocardial infarction (RVMI) complicates IWMI in approximately 24–50% of cases and carries a distinctly different haemodynamic profile characterised by elevated jugular venous pressure, hypotension, and clear lung fields — the classical triad of right heart failure.

Such patients are uniquely sensitive to preload reduction and require diametrically opposite management compared to standard left ventricular failure. [3] Furthermore, the proximity of the AV node to the RCA territory renders patients with IWMI susceptible to conduction disturbances ranging from first-degree AV block to complete heart block (CHB), which significantly increase in-hospital mortality. [4]

The clinical profile of IWMI in Indian patients differs substantially from Western populations, with a higher prevalence of smoking, diabetes mellitus, and younger age at onset. Kumar et al., in a prospective study from Karnataka, found that 78% of IWMI patients were smokers with a mean age of 47 years. [5] More recently, Bagal et al. from Jammu reported smoking (42%), hypertension (40%), and diabetes (24%) as the leading risk factors in their IWMI cohort. [6] Khan et al. documented that chest pain and syncope were the most predictive presenting symptoms of concurrent RVMI. [7]

The inferolateral IWMI variant is associated with higher Killip class, increased incidence of mitral regurgitation, and significantly higher in-hospital mortality (15.3% versus 7.2% in isolated IWMI), as demonstrated by Panda et al. from Odisha. [8] A recent 2025 Indian study reported a RVMI incidence of 34% in IWMI cases admitted to a cardiac ICU, underscoring the importance of routine right-sided ECG leads in contemporary practice. [9]

Despite the high prevalence of IWMI, there is a paucity of comprehensive prospective data encompassing clinical presentation, cardiac function, lipid parameters, angiographic findings, and MI-location-specific outcomes in the Indian context. The present study was undertaken to address this gap and contribute to the evidence base for optimal management of IWMI in India.

Materials and Methods

Study Design and Setting: This was a prospective, hospital-based observational study conducted over a period of two years in Department of General Medicine, C. U. Shah Medical College, Surendranagar, Gujarat, India. The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all enrolled participants prior to inclusion.

Patient Selection: A total of 100 consecutive patients diagnosed with acute inferior wall myocardial infarction were enrolled. The diagnosis of IWMI was established on the basis of: (a) typical ischaemic chest pain of ≤24 hours duration; (b) ST-segment elevation of ≥1 mm in two or more contiguous inferior leads (II, III, aVF) on a standard 12-lead ECG; and (c) elevation of cardiac biomarkers (Troponin-T or CK-MB). Right-sided precordial leads (V3R, V4R, V5R, V6R) were routinely recorded in all patients to detect concurrent RVMI. The diagnosis of RVMI was made on the basis of ST-segment elevation of ≥0.1 mV in at least one right-sided precordial lead.2

Inclusion Criteria: All adult patients (≥18 years) of either sex presenting with acute IWMI based on the above diagnostic criteria within 24 hours of symptom onset were eligible for inclusion.

Exclusion Criteria: Patients with a prior history of myocardial infarction, previous coronary revascularisation (percutaneous coronary intervention or coronary artery bypass grafting), significant valvular heart disease, left bundle branch block on presenting ECG, cor pulmonale, suspected pulmonary embolism, pericarditis, chronic kidney disease requiring dialysis, and those who did not provide informed consent were excluded from the study.

Data Collection and Investigations: A structured pro forma was used to record all relevant clinical information including demographic profile, presenting symptoms, history of comorbidities, and cardiovascular risk factors (smoking, hypertension, diabetes mellitus, family history of premature CAD, and hypercholesterolaemia). Physical examination findings at the time of admission — including blood pressure, pulse rate, jugular venous pressure, cardiac auscultation, and presence of signs of heart failure — were systematically documented.

Biochemical investigations included fasting blood glucose and HbA1c (for diabetics), complete lipid profile [total cholesterol, LDL, HDL, and triglycerides], serum creatinine, and cardiac enzymes. Killip classification was used to assess haemodynamic severity at presentation. [10]

Transthoracic echocardiography (2D echo) was performed within 24 hours of admission to assess left ventricular ejection fraction (LVEF) using modified Simpson's biplane method, regional wall motion abnormalities, and right ventricular function. Coronary angiography was performed in all eligible patients during the index hospitalisation or within 30 days of discharge to characterise the extent and distribution of coronary artery disease and to identify the culprit vessel.

Continuous ECG monitoring was performed throughout the hospital stay. All arrhythmias and conduction abnormalities were documented and classified according to standard definitions. In-hospital complications including acute pulmonary oedema, cardiogenic shock, arrhythmias requiring intervention, acute kidney injury, and death were systematically recorded.

Statistical Analysis: Data were entered and analysed using SPSS version 25.0. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequency

and percentage. The chi-square test was used for comparison of proportions where applicable. A p-value of <0.05 was considered statistically significant.

Results

Table 1: Demographic Characteristics, Smoking Status and Risk Factors of Patients (n=100)

Age Group	Number	Percentage (%)
<30 Years	1	1%
30–50 Years	25	25%
>50 Years	74	74%
Gender		
Males	86	86%
Females	14	14%
Smoking Status		
Smoker	65	65%
Non-Smoker	35	35%
Risk factor		
Pre-Diabetes	10	10%
Diabetes	50	50%
Hypertensives	40	40%

The study enrolled 100 patients with confirmed IWMI. The majority (74%) were aged above 50 years, with only 25% in the 30–50 years age group and a single patient below 30 years of age. Males constituted a substantial majority at 86%, with females comprising only 14%. Smoking was the most prevalent traditional risk factor, documented in 65% of patients. Diabetes mellitus was present in 50% of patients (with an additional 10% classified as pre-diabetic), while systemic hypertension was recorded in 40%.

Table 2: Clinical Severity — Killip Classification, Left Ventricular Ejection Fraction, and Arrhythmia Profile (n=100)

Killip Class	Number	Percentage (%)
Class I	53	53%
Class II	19	19%
Class III	15	15%
Class IV	13	13%
LVEF Category		
>50%	1	1%
41–50%	24	24%
31–40%	47	47%
<30%	28	28%
Arrhythmia		
No	69	69%
Yes	31	31%
Type		
Sinus Bradycardia	**4**	**12.90%**
1st Degree AV Block	10	32.30%
2nd Degree AV Block	6	19.40%
Complete Heart Block	9	29.00%
Ventricular Tachycardia	1	3.20%
CHB + VT	1	3.20%

On clinical assessment, 53% of patients were categorised as Killip Class I (no signs of heart failure) at presentation, while 19% were Class II, 15% Class III, and 13% Class IV (cardiogenic shock). Echocardiographic assessment revealed that the majority (47%) had moderate left ventricular dysfunction with LVEF 31–40%, followed by severe dysfunction in 28% (LVEF <30%). Only 24% demonstrated mildly impaired LVEF of 41–50%, and a mere 1% had preserved systolic function.

Arrhythmias were documented in 31% of patients. Among these, the most frequent was first-degree AV block (32.3%), followed by complete heart block (29.0%), second-degree AV block (19.4%), sinus bradycardia (12.9%), and ventricular tachycardia (3.2% each for isolated VT and CHB with VT).

Table 3: Coronary Angiographic Findings — Vessel Disease Pattern, Culprit Vessels, and MI Location (n=100)

Angiographic Findings	**Number**	**Percentage (%)**
Single Vessel Disease	30	30%
Double Vessel Disease	52	52%
Triple Vessel Disease	18	18%
Culprit Vessels	**Number**	**Percentage (%)**
RCA	65	65%
LCX	15	15%
RCA + LAD	5	5%
RCA + LCX	3	3%
LAD + LCX	5	5%
LAD	3	3%
Other	4	4%
MI Location		
IWMI	57	57%
IWMI + PWMI	9	9%
IWMI + RVMI	24	24%
IWMI + PWMI + RVMI	10	10%

Coronary angiography demonstrated double vessel disease (DVD) as the most prevalent pattern (52%), followed by single vessel disease (SVD) in 30% and triple vessel disease (TVD) in 18%. The RCA was identified as the sole culprit vessel in 65% of cases. The LCX was the culprit in 15% of patients. Combined culprit vessel involvement was noted in the remaining cases. Regarding MI territory, isolated IWMI was present in 57% of patients. IWMI with right ventricular myocardial infarction (RVMI) accounted for 24% of cases, IWMI with posterior wall MI (PWMI) for 9%, and combined IWMI+PWMI+RVMI for 10%.

Table 4: Lipid Profile of Study Patients (n=100)

HDL Level (mg/dl)	**Number**	**Percentage (%)**
≥60 (High)	1	1%
50–59 (Near Optimal)	6	6%
40–49 (Low-Normal)	38	38%
<40 (Low / High Risk)	55	55%
LDL Level (mg/dl)		
<100 (Optimal)	55	55%
100–129 (Near Optimal)	21	21%
130–159 (Borderline High)	15	15%
160–189 (High)	7	7%
>190 (Very High)	2	2%

Lipid profile analysis revealed a striking prevalence of low HDL cholesterol, with 55% of patients having HDL levels below 40 mg/dl — a recognised independent cardiovascular risk marker in South Asians. Only 1% of patients had cardioprotective HDL levels (≥60 mg/dl). With respect to LDL cholesterol, the majority (55%) had LDL in the optimal range (<100 mg/dl), which likely reflects prior statin use or the natural LDL phenotype of Indian patients with low HDL but not necessarily elevated LDL.

Table 5: Clinical Profile According to MI Location (n = 100)

Variable	IWMI (n=57)	IWMI + PWMI (n=9)	IWMI + RVMI (n=24)	IWMI + PWMI + RVMI (n=10)	Total (n=100)
Killip Class					
Class I	44 (77.2%)	5 (55.6%)	2 (8.3%)	1 (10.0%)	52 (52%)
Class II	10 (17.5%)	2 (22.2%)	3 (12.5%)	1 (10.0%)	16 (16%)
Class III	2 (3.5%)	0 (0%)	7 (29.2%)	1 (10.0%)	10 (10%)
Class IV	1 (1.8%)	2 (22.2%)	12 (50.0%)	7 (70.0%)	22 (22%)
LVEF					
>50%	1 (1.8%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)
41–50%	14 (24.6%)	3 (33.3%)	3 (12.5%)	4 (40.0%)	24 (24%)
31–40%	30 (52.6%)	4 (44.4%)	11 (45.8%)	2 (20.0%)	47 (47%)
<30%	12 (21.1%)	2 (22.2%)	10 (41.7%)	4 (40.0%)	28 (28%)
Arrhythmia Type					
Sinus Bradycardia	1 (1.8%)	0 (0%)	3 (12.5%)	0 (0%)	4 (4%)
1st Degree AV Block	2 (3.5%)	1 (11.1%)	5 (20.8%)	2 (20.0%)	10 (10%)
2nd Degree AV Block	1 (1.8%)	1 (11.1%)	3 (12.5%)	1 (10.0%)	6 (6%)
Complete Heart Block	3 (5.3%)	0 (0%)	4 (16.7%)	2 (20.0%)	9 (9%)
Ventricular Tachycardia	0 (0%)	0 (0%)	0 (0%)	1 (10.0%)	1 (1%)
VT + CHB	0 (0%)	0 (0%)	1 (4.2%)	0 (0%)	1 (1%)

Patients with right ventricular infarction presented with higher Killip class, with 50.0% of IWMI + RVMI and 70.0% of IWMI + PWMI + RVMI patients in Class IV, compared to only 1.8% in isolated IWMI. Severe LV dysfunction (<30%) was more common in patients with RV involvement (41.7% in IWMI + RVMI and 40.0% in combined involvement) than in isolated IWMI (21.1%). Conduction abnormalities were also more frequent in RVMI groups, particularly first-degree AV block and complete heart block.

Table 6: In-Hospital Outcomes and Management Summary (n=100)

Outcome / Complication	Number (n=100)	Percentage (%)
Pulmonary Oedema (LVF)	15	15%
Cardiogenic Shock	13	13%
Significant Arrhythmia requiring intervention	11	11%
Acute Kidney Injury	8	8%
Thrombolysis performed	62	62%
Primary PCI performed	38	38%
In-Hospital Mortality	9	9%
Mean Length of Hospital Stay (days)	6.4 ± 2.1	—

In-hospital mortality was recorded in 9% of patients, predominantly among those with cardiogenic shock (Killip Class IV) and complete heart block. Cardiogenic shock occurred in 13% of patients, while left ventricular failure (acute pulmonary oedema) was noted in 15%. Significant arrhythmias requiring pharmacological or electrical intervention were documented in 11% of patients. Acute kidney injury complicated the course in 8% of patients. Thrombolytic therapy (streptokinase or tenecteplase) was administered to 62% of patients, while 38% underwent primary percutaneous coronary intervention (PCI). The mean length of hospital stay was 6.4 ± 2.1 days.

Discussion

The present study provides a comprehensive characterisation of the clinical, echocardiographic, angiographic, and MI-location-specific profile of IWMI patients at a tertiary care institution. Our findings align closely with and, in several important respects, extend the emerging body of literature from the Indian subcontinent.

Demographic Profile and Gender Distribution: In the present study, the strong male predominance (86%) is consistent with most published Indian IWMI series. Bagal et al. from Jammu reported 78% males among 100 IWMI patients, [6] Kumar et al. from Karnataka noted 90% males, [5] and Khan et al. documented 80% males in their Bangladeshi

cohort. [7] The predominance of patients above 50 years (74%) mirrors findings from Bagal et al. (peak 51–60 years, 35%) and Khan et al. (peak 51–60 years for RVMI), and confirms the established pattern of an earlier age of MI onset in Indians compared to Western populations, driven by accelerated atherosclerosis, metabolic dysregulation, and a more atherogenic lipid phenotype.

Risk Factor Profile: In the present study, Smoking was the most prevalent traditional cardiovascular risk factor (65%). This is consistent with Indian literature, though with wide variation across series: Kumar et al. (78%), Bagal et al. (42%), Khan et al. (76.67%), and the INTERHEART study documenting smoking as a powerful independent predictor of acute MI across 52 countries. [5,6,7,14] The unusually high prevalence of diabetes mellitus in our cohort (50%), substantially exceeding that reported by Bagal et al. (24%), Kumar et al. (16%), and Khan et al. (20%), likely reflects the well-characterised propensity of South Asians to develop type 2 diabetes at lower BMI thresholds, compounded by insulin resistance and central adiposity. The 10% pre-diabetic fraction further amplifies this risk burden. Hypertension (40%) matched the Framingham study (40%) and the findings of Bagal et al. (40%), reinforcing the consistency of this risk factor profile across IWMI cohorts. [11,6]

Haemodynamic Profile According to MI Location: In isolated IWMI, only 1.8% of patients presented in Killip Class IV, whereas 50.0% of IWMI+RVMI and 70.0% of IWMI+PWMI+RVMI patients were in cardiogenic shock at admission. This gradient is physiologically consistent with the unique haemodynamic consequences of right ventricular infarction: loss of RV contractility impairs pulmonary blood flow, reduces left ventricular preload, and, through ventricular interdependence and paradoxical septal displacement, further compromises LV filling and output. The net result is a profound reduction in cardiac output despite preserved lung fields — a presentation that can easily be mismanaged if RVMI is not recognised and nitrates or diuretics are inadvertently administered. [3] Bagal et al. similarly documented hypotension in 28.57% of their RVMI group versus 6.94% in NRVI patients (p=0.004), and bradycardia in 28.57% versus 8.33% (p=0.009). [6] Khan et al. reported that 70.0% of RVMI patients had a complicated clinical course compared to 60.0% without RVMI, and mortality in the RVMI group reached 83.33% in non-thrombolysed patients. [7] Our data extend these observations by providing a simultaneous four-group comparison that captures the incremental haemodynamic deterioration as the MI territory expands from isolated IWMI to involve the posterior wall and right ventricle. Notably, the addition of PWMI to RVMI (IWMI+PWMI+RVMI) increased Killip Class IV rates from 50.0% to 70.0%, demonstrating that biventricular and multi-territory involvement carries the highest haemodynamic burden.

LV Function According to MI Location: In the present study, Severe LV dysfunction (LVEF <30%) was observed in 41.7% of IWMI+RVMI and 40.0% of IWMI+PWMI+RVMI patients, compared to 21.1% in isolated IWMI. Interestingly, isolated IWMI showed the highest rate of moderate dysfunction (LVEF 31–40%: 52.6%), which reflects ischaemic impairment of the inferior wall without the catastrophic preload-dependent failure associated with RVMI. The IWMI+PWMI group showed a relatively preserved LVEF distribution (41–50% in 33.3%), possibly because posterior wall extension — while widening MI territory — may not impair global LV function as severely as RV infarction due to the relatively smaller posterior wall mass. These findings are in line with the inferolateral IWMI study by Panda et al., who demonstrated that 26.2% of inferolateral MI patients had clinical signs of LVF versus 2.7% in restricted inferior IWMI, and that mortality was significantly higher in the inferolateral group (15.3% versus 7.2%, p=0.0482). [8] The consistent pattern across studies underscores that MI territory size and right ventricular involvement are among the strongest determinants of post-MI haemodynamic profile and survival.

Conduction Abnormalities According to MI Location: In isolated IWMI, conduction abnormalities were relatively infrequent (first-degree AV block 3.5%; CHB 5.3%) in the present study. In stark contrast, the IWMI+RVMI group showed first-degree AV block in 20.8% and CHB in 16.7%, while the IWMI+PWMI+RVMI group demonstrated first-degree AV block in 20.0%, CHB in 20.0%, and the highest rate of ventricular tachycardia (10.0%). Sinus bradycardia, a marker of sinoatrial node ischaemia, was exclusively seen in RVMI groups (12.5% in IWMI+RVMI). Braat et al. demonstrated that right ventricular involvement in IWMI identifies a high-risk subset for developing AV nodal conduction disturbances. [6] Khan et al. reported complete heart block in 40.0% of their RVMI group versus 5.0% in those without RVMI. [7] The landmark Kanpur study by Kumar V et al. found conduction blocks in 39.3% of 573 IWMI patients and demonstrated that conduction blocks were associated with 12% mortality compared to 3.4% in those without (p<0.03). [4] A recent cross-sectional Indian study by Sheth et al. confirmed that complete heart block carried the highest in-hospital mortality (11.4%) among all conduction abnormalities in STEMI. [13] These data collectively establish the conduction system as a critical target in RVMI management, with

continuous ECG monitoring and early temporary pacemaker insertion remaining the cornerstone of care in haemodynamically compromised CHB.

Arrhythmia and Conduction Abnormalities: In the present study, arrhythmias occurred in 31% of patients. First-degree AV block was the most common (10 patients, 10%), followed by CHB (9 patients, 9%), and second-degree AV block (6 patients, 6%). Ventricular tachycardia and the combined CHB+VT pattern each occurred in 1% of cases. Bagal et al. reported bradycardia in 28.57% of RVMI versus 8.33% in NRVI patients, and Khan et al. found ventricular fibrillation in 30.0% of their RVMI group — a significantly higher incidence attributed to the greater electrophysiological instability of ischaemic right ventricular myocardium. [6,7]

Angiographic Findings and Culprit Vessel: In the present study, The RCA was the culprit vessel in 65%, consistent with its role as the primary supplier of the inferior wall, AV node, and RV in right-dominant coronary circulation. The LCx was responsible in 15% of cases, corresponding to left-dominant or co-dominant anatomy. Double vessel disease was the predominant angiographic pattern (52%), underscoring the high burden of multivessel CAD in Indian IWMI patients. This is clinically significant as multivessel disease is an independent predictor of recurrent MI and long-term mortality. The Panda et al. inferolateral IWMI study also noted a high burden of multivessel disease in their cohort, reporting that lateral wall extension was associated with more frequent multivessel involvement.[8]

Lipid Profile: In the present study, Low HDL (<40 mg/dl) in 55% of patients — with only 1% achieving cardioprotective levels — and paradoxically optimal LDL in the majority (55%) reflects the characteristic South Asian atherogenic dyslipidaemia: a phenotype defined by elevated triglycerides, small dense LDL particles, and disproportionately low HDL, independent of LDL concentration. [15] This pattern is particularly treacherous in clinical practice because routine LDL-centric risk stratification underestimates true cardiovascular risk. Non-HDL cholesterol, apolipoprotein B, and triglyceride levels should be prioritised alongside LDL in Indian IWMI patients, and lipid-modifying therapy should not be withheld on the basis of a normal LDL value.

Incidence of RVMI: The overall RVMI incidence in our cohort was 34% (IWMI+RVMI: 24%; IWMI+PWMI+RVMI: 10%), closely mirroring published data: Bagal et al. (28%), [6] Khan et al. (33.33%), [7] the 2025 PIMSR Islampur study (34%), [9] and the established published range of 24–50% from autopsy and clinical series. [3] This consistency across institutions and time periods validates the routine use of right precordial ECG leads in all IWMI presentations.

Conclusion

Inferior wall myocardial infarction in the Indian context predominantly affects middle-aged males burdened by multiple modifiable cardiovascular risk factors — particularly smoking, diabetes mellitus, and hypertension. RVMI complicates one-third of cases and exerts a disproportionate and demonstrably incremental impact on haemodynamic severity, LV function, and conduction system integrity, as evidenced by the striking clinical gradient from isolated IWMI to combined IWMI+PWMI+RVMI involvement. Conduction abnormalities, especially complete heart block, are significantly concentrated in RVMI groups and carry substantially elevated mortality. Routine right-sided ECG leads, early echocardiography, and timely coronary angiography are essential in all IWMI patients to facilitate risk stratification, identify RVMI, and guide individualised management decisions.

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