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Original research article

ASSOCIATION OF ACUTE INFERIOR WALL MYOCARDIAL INFARCTION WITH CONDUCTION BLOCK AND THEIR SHORT-TERM OUTCOME IN A TERTIARY CARE HOSPITAL IN BIHAR, A PROSPECTIVE OBSERVATIONAL STUDY

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Abstract

Aim: This study aims to assess the incidence of conduction abnormalities in patients with inferior wall myocardial infarction (IWMI) and evaluate their short-term outcomes in a tertiary care setting in Bihar.

Methodology: This prospective, open-label observational study was conducted at Indira Gandhi Institute of Cardiology, Patna, from March 2023 to February 2024. A total of 120 patients diagnosed with IWMI were enrolled based on defined inclusion and exclusion criteria. Patients were assessed for conduction blocks, right ventricular infarction (RVMI), and other complications. Data on demographics, comorbidities, angiographic findings, therapeutic interventions, and outcomes were collected. Statistical analysis was performed using SPSS v26, with significance set at $p<0.05$.

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Results: The mean patient age was 58.15 ± 12.41 years, with 80.83% being male. Common risk factors included smoking (46.7%), diabetes (39.16%), and hypertension (37.5%). Conduction block was observed in 40% of patients and was significantly associated with older age, diabetes, and hypertension. RVMI occurred in 35% of cases. The overall in-hospital mortality was 15%, higher among patients with conduction block (27.08%) and RVMI (26.19%). Thrombolytic therapy, administered in 53.3% of patients, was associated with reduced mortality (9.37%).

Conclusion: IWMI frequently leads to conduction disturbances and RVMI, which are linked to worse short-term outcomes. Early identification and management, including thrombolytic therapy, are critical for improving prognosis, particularly in high-risk subgroups.

Keywords: Angiography, Conduction block, Inferior wall myocardial infarction, Mortality, Thrombolysis

1. Introduction

Acute coronary syndromes (ACS) encompass a spectrum of clinical conditions resulting from acute coronary artery disease, including unstable angina, minor myocardial injury, and acute myocardial infarction (MI) [1]. These conditions are prevalent globally, with a significant burden in low- and middle-income countries due to increasing exposure to risk factors such as smoking, sedentary lifestyle, diabetes, dyslipidemia, and hypertension, coupled with systemic challenges in timely diagnosis and treatment. Effective management of ACS involves a multifaceted approach that includes intensive lipid-lowering therapies, antithrombotic agents, neurohormonal drugs, and lifestyle modifications, including participation in cardiac rehabilitation programs [2]. Among various types of myocardial infarctions, inferior wall myocardial infarction (IWMI) constitutes nearly 40% of all cases and is typically caused by occlusion of the right coronary artery [3]. In individuals with left coronary dominance, the left circumflex artery may supply the posterior descending artery. IWMI generally presents with a more favorable prognosis compared to anterior wall infarctions, with a mortality rate of less than 10%. However, the presence of complications such as heart block, right ventricular infarction (RVMI), hypotension, and cardiogenic shock can significantly worsen outcomes.

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The clinical presentation of ischemic heart disease (IHD) includes stable angina, unstable angina, and myocardial infarction. Risk factors contributing to IHD are age, male gender, diabetes, dyslipidemia, tobacco use, family history, and lack of physical activity. Although IWMI typically has a favorable prognosis, approximately 50% of patients may experience short-term complications that can significantly affect recovery [4]. These complications include cardiogenic shock, second-degree atrioventricular (AV) block, complete heart block, RVMI, junctional rhythm abnormalities, atrial fibrillation, ventricular tachycardia, severe mitral regurgitation, left ventricular failure, ventricular septal rupture, and reduced ejection fraction. The development of precordial ST segment depression, complete AV block, or RVMI in IWMI patients signifies a high-risk group due to the larger area of myocardial tissue at risk. Additionally, multivessel disease and significant left anterior descending artery occlusion are frequently observed in patients with IWMI who present with complete AV block. Bradyarrhythmias, including AV block, occur more frequently in IWMI than anterior wall infarctions, with a reported incidence ranging from 9% to 33% [5]. RVMI, which complicates 30%–50% of IWMI cases , is associated with poorer outcomes and higher rates of cardiogenic shock, arrhythmias, and other life-threatening events.

Despite the clinical importance of IWMI, there is a notable lack of region-specific data, particularly in states like Bihar, where limited studies have examined the short-term outcomes and complications associated with this condition. This lack of localized information presents a challenge in developing tailored management strategies for affected populations. Given the significant prevalence of IWMI and the potential for serious complications, it is essential to conduct regionally focused studies to understand its clinical behavior and improve treatment protocols. The present study aims to fill this knowledge gap by investigating the short-term consequences of acute IWMI in Bihar. Findings from this research will not only enhance local clinical understanding but also support the development of evidence-based management guidelines that can lead to improved patient outcomes in similar demographic and healthcare settings.

2. Methodology

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The present study was conducted at Indira Gandhi Institute of Cardiology, Patna. The patients were enrolled after satisfying the inclusion and exclusion criteria. The study was conducted after providing the patients with complete information about the study and taking their written informed consent.

2.1 Duration of study:

The duration of the study was from March 2023 to Feb 2024.

2.2 Study Design:

A prospective and open label study was done.

2.3 Sample Size:

The present study was carried out on 120 patients having IWMI admitted in IGIC during this period with the following criteria for inclusion and exclusion.

2.4 Inclusion criteria & Exclusion criteria

- **Inclusion criteria**

- Patients of age > 18 years of either gender who are diagnosed with IWMI.
- All patients presenting with typical chest pain and subsequently diagnosed as inferior wall myocardial infarction by standardized diagnostic criteria as follows (a) Ischemic cardiac pain with characteristic ST segment elevation of >= 0.1mv in two or more inferior leads and rise of cardiac biomarkers either in the form of CKMB or Troponin.

- **Exclusion criteria**

- Age < 18 yrs.
- Patients having myocardial infarction other than IWMI.
- Patients with IWMI of more than 7days.
- Patients having myocardial infarction for second time.
- Patients having history of prior coronary revascularization procedures (CABG, PCI)
- Patients having associated valvular heart disease, thyroid disease, renal failure.

2.5 Procedure

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Patients were classified based on the presence or absence of high-degree atrioventricular (AV) block and right ventricular (RV) infarction. High-degree AV block included second-degree (Wenckebach or 2:1 with narrow QRS) and third-degree (complete dissociation of atrial and ventricular activity) blocks. Thrombolytic therapy was administered to eligible patients according to ACC/AHA guidelines using reteplase or streptokinase. RV infarction was diagnosed by ≥1 mm ST-segment elevation in right precordial leads (V3R–V6R), especially V4R, alongside inferior lead changes. Echocardiography was performed to assess left ventricular function, valvular and structural abnormalities. Data on demographics, cardiovascular risk factors, and complications such as cardiogenic shock, arrhythmias, AV block, mitral regurgitation, and heart failure were recorded. In-hospital events including sinus bradycardia, tachycardia, atrial fibrillation, total heart block, and death were noted. Mortality was defined as absence of vital signs for more than five minutes. Complications were managed per institutional protocols.

2.6 Statistical Analysis

All collected data were statistically analyzed using SPSS software (version 26.0, SPSS Inc., Chicago, IL, USA) for Windows. Quantitative variables were expressed as mean and standard deviation, and their significance was evaluated using the Student's t-test. Qualitative variables were presented as percentages and proportions, with statistical significance assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

3. Results

The age distribution of the patients indicates that the majority were in the older age groups, with 45% aged between 56–75 years and 40% between 36–55 years, together comprising 85% of the study population. A smaller proportion of patients were in the age group of 75 years and above (11.67%), while only 3.33% were between 18–35 years. The mean age of the patients was 58.15 years with a standard deviation of ±12.41, indicating that most patients were middle-aged to elderly. This trend is visually represented in **Graph 1**, which highlights the predominance of older age groups among the study participants.

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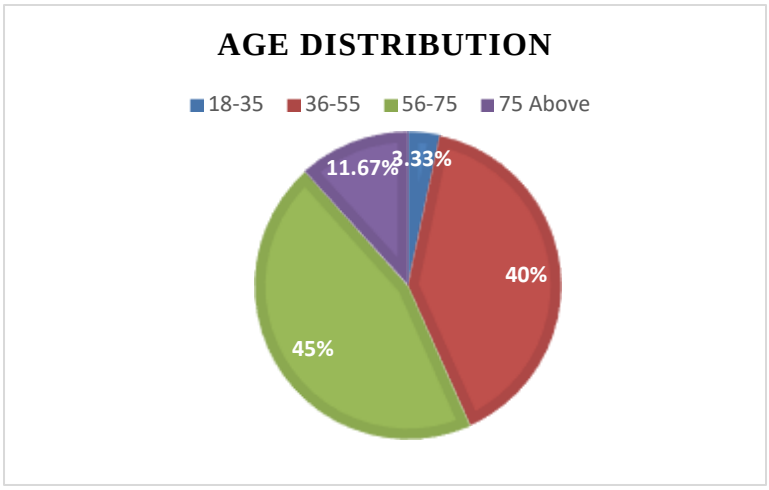
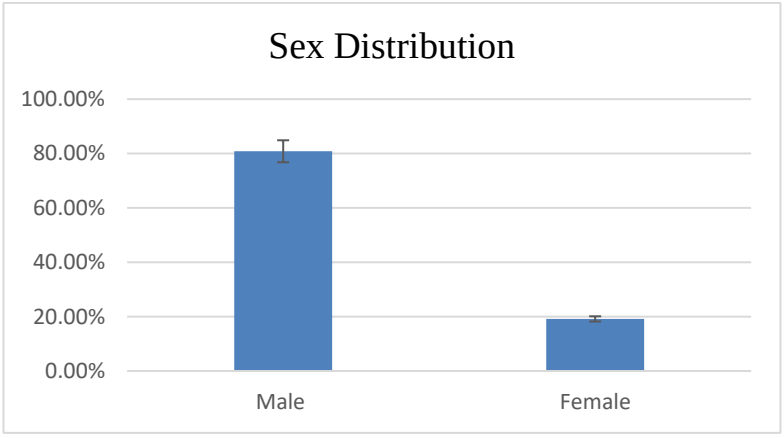


Graph 1: Age Distribution of Patients

The sex distribution of the study participants shows a marked predominance of males, who constituted 80.83% (n=97) of the total population, while females accounted for only 19.17% (n=23). This significant gender disparity suggests a higher representation or prevalence of the condition among males in the studied group. The distribution is clearly illustrated in **Graph 2**, emphasizing the male dominance in the patient cohort.



Graph 2: Sex Distribution of patients

Table 1 shows the distribution of risk factors among the participating patients, indicating that smoking was the most common risk factor, present in 46.70% of the individuals. This was followed by diabetes in 39.16%, hypertension in 37.50%, and obesity in 33.30% of the patients.

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Dyslipidemia was the least prevalent, observed in 28.30% of the participants. These findings underscore the high burden of modifiable lifestyle-related risk factors among the study population, with many patients likely exhibiting multiple concurrent risk factors contributing to disease progression.

Table 1: Distribution of risk factors among the participating patients

	No.	%
Diabetes	47	39.16%
Hypertension	45	37.50%
Obesity	40	33.30%
Dyslipidemia	34	28.30%
Smoking	56	46.70%

Graph 3 presents the angiographic findings among coronary patients (n=64). The most common lesion observed was single vessel disease, present in 40.60% of the cases, followed closely by double vessel disease in 37.50% of patients. Triple vessel disease was identified in 15.60% of the patients, while only 6.20% had normal coronary arteries. These findings indicate a high prevalence of significant coronary artery involvement among the study group, with the majority showing either single or double vessel disease.

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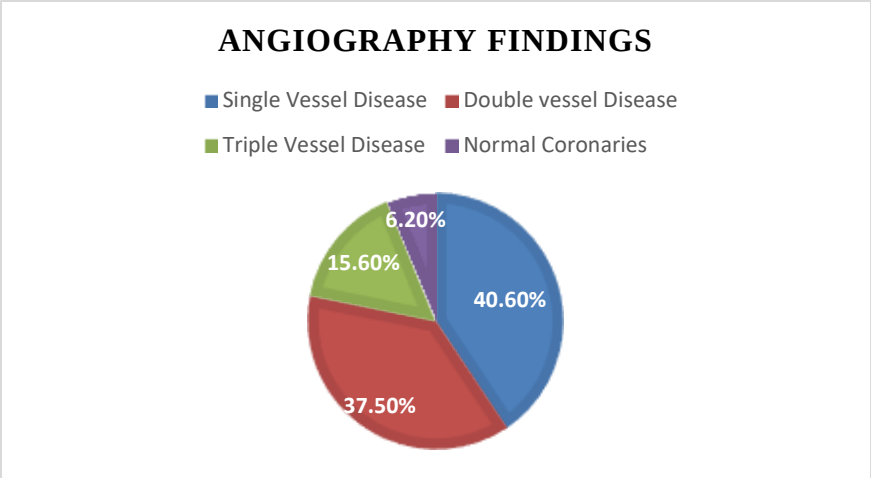
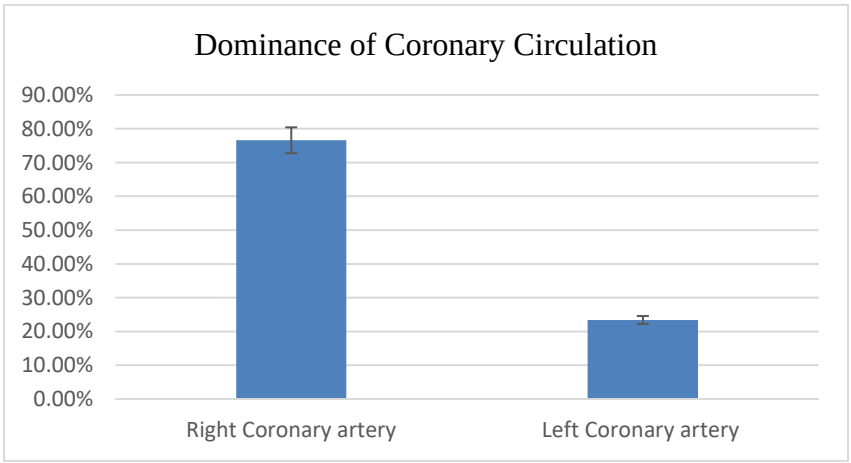


Graph 3: Angiography findings of patients

Graph 4 illustrates the dominance pattern of coronary circulation among the 64 patients studied. A right coronary artery dominance was observed in the majority of cases (76.60%), whereas left coronary artery dominance was present in 23.40% of the patients. The distribution difference was not statistically significant, as indicated by a p-value of 0.311. This pattern aligns with the general population trend where right dominance is more commonly observed.



Graph 4: Dominance of Coronary Circulation

Table 2 summarizes the clinical outcomes of the participating patients. Right ventricular myocardial infarction (RVMI) was the most frequent outcome, occurring in 35% of cases,

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followed by complete heart block in 20.80% and second-degree AV block in 11.70% of patients. Junctional rhythm and cardiogenic shock were each seen in 7.50% of patients, while atrial fibrillation, severe mitral regurgitation, and left ventricular failure were less common, affecting 2.50%, 5.80%, and 5.80% respectively. Ventricular tachycardia and ventricular septal rupture were rare, reported in 1.70% and 0.80% of patients. The average ejection fraction was 51.09 ± 6.46, indicating moderate left ventricular function overall. Thrombolytic therapy was administered to 53.30% of patients, and the overall mortality rate was 15%. These findings highlight a varied spectrum of cardiac complications with a significant impact on patient morbidity and mortality.

Table 2: Outcome of the participating patients

Outcome	**No.**	**%**
Second degree Av Block	14	11.70%
Complete heart block	25	20.80%
Junctional Rhythm	9	7.50%
Atrial Fibrillation	3	2.50%
Ventricular tachycardia	2	1.70%
RVMI (Right ventricular myocardial infarction)	42	35%
Cardiogenic Shock	9	7.50%
Severe mitral Regurgitation	7	5.80%
Left ventricular failure	7	5.80%
Ventricular Septal rupture	1	0.80%
Ejection fraction	51.09±6.46	
Thrombolytic therapy	64	53.30%

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Mortality	18	15%

Table 3 compares clinical and demographic characteristics between patients with high-degree conduction block and junctional rhythm (n=48, 40%) and those without conduction block (n=72, 60%). Patients with conduction abnormalities were significantly older, with a mean age of 62.29 ± 10.56 years compared to 55.54 ± 12.76 years in those without (p=0.01). Diabetes mellitus and hypertension were also significantly more prevalent in the conduction block group (47.92% vs. 33.33%, p=0.014; and 47.92% vs. 30.55%, p=0.014, respectively). Obesity was higher in the conduction block group as well (39.58% vs. 29.17%, p=0.032). No significant differences were observed in sex distribution, smoking status, dyslipidemia, or thrombolytic therapy between the groups. Expectedly, second-degree block, complete heart block, and junctional rhythm occurred exclusively in the conduction block group. The ejection fraction was lower in patients with conduction abnormalities (49.10 ± 7.52) compared to those without (52.25 ± 5.98, p=0.021). Mortality was higher in the conduction block group (27.08% vs. 6.94%), although this difference did not reach statistical significance (p=0.266). These results suggest that patients with high-degree conduction block have a higher burden of comorbidities, worse cardiac function, and a trend toward increased mortality.

Table 3: Patients with and without high degree conduction block

Characteristics	**With high degree conduction block and junctional rhythm n=48 (40%)**		**Without conduction block n=72 (60%)**		**P. Value**
	No	**%**	**No**	**%**	
Male	39	81.25%	58	80.55%	0.123

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Female	9	18.75%	14	19.44%	0.136
Age	62.29±10.56		55.54±12.76		0.01
Diabetes mellitus	23	47.92%	24	33.33%	0.014
Smoking	21	43.75%	35	48.61%	0.156
Hypertension	23	47.92%	22	30.55%	0.014
Dyslipidemia	13	27.08%	21	29.17%	0.147
Obesity	19	39.58%	21	29.17%	0.032
Second degree block	14	29.17%	0	0	----
Complete heart block	25	52.08%	0	0	----
Junctional Rhythm	9	18.75%	0	0	----
Ejection fraction	-	49.10±7.52	-	52.25±5.98	0.021
Thrombolytic Therapy	26	54.17%	38	52.78%	0.118
Mortality	13	27.08%	5	6.94%	0.266

Table 4 compares patients with right ventricular myocardial infarction (RVMI) (n=42) to those without (n=78). There was no significant difference in age or sex distribution between the

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groups. However, diabetes (57.14% vs. 29.49%, p=0.014) and dyslipidemia (38.09% vs. 23.08%, p=0.037) were significantly more common in the RVMI group. Complete heart block was also more frequent in RVMI patients (30.95% vs. 15.38%, p=0.025). Other factors like smoking, hypertension, obesity, cardiogenic shock, and mortality were higher in the RVMI group but did not reach statistical significance. Ejection fraction and thrombolytic therapy rates were similar between groups. These findings suggest RVMI is associated with greater metabolic risk and conduction abnormalities.

Table 4: Patients with and without right ventricular myocardial infarction

Characteristics	With Right Ventricular Myocardial Infarction n=42		Without Right Ventricular Myocardial Infarction n=78		P. Value
	No	%	No	%	
Male	34	80.95%	63	80.77%	0.185
Female	8	19.05%	15	19.23%	0.188
Age	59.57±9.88		60.26±13.16		0.802
Diabetes mellitus	24	57.14%	23	29.49%	0.014
Smoking	17	40.48%	39	50%	0.238
Hypertension	20	47.62%	25	32.05%	0.07
Dyslipidemia	16	38.09%	18	23.08%	0.037

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Obesity	16	38.09%	24	30.77%	0.126
Second degree block	3	7.14%	11	14.10%	0.33
Complete heart block	13	30.95%	12	15.38%	0.025
Junctional Rhythm	4	9.52%	5	6.41%	0.07
Cardiogenic shock	8	19.05%	1	1.28%	0.421
Mitral Regurgitation	2	4.76%	5	6.41%	0.258
Left ventricular failure	1	2.38%	6	7.69%	0.395
Ejection Fraction	51.54±8.42		49.57±5.41		0.201
Thrombolytic Therapy	24	57.14%	40	51.28%	0.156
Mortality	11	26.19%	7	8.97%	0.139

Table 5 compares patients who received thrombolysis (n=64) with those who did not (n=56). There was no significant difference in age or most clinical characteristics between the groups. Male patients were slightly more in the non-thrombolysis group (82.14% vs. 79.69%, p=0.033). Diabetes was more prevalent in the non-thrombolysis group (42.86% vs. 35.94%, p=0.014), while hypertension was similar but showed a borderline difference (p=0.042). Complete heart block occurred at comparable rates in both groups (20.31% vs. 21.43%,

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p=0.025). Other complications such as cardiogenic shock, severe mitral regurgitation, and left ventricular failure showed no significant difference. The mean ejection fraction was almost identical in both groups. Mortality was lower in the thrombolysis group (9.37% vs. 21.43%), although this was not statistically significant. Overall, thrombolysis was associated with a trend toward reduced mortality despite similar clinical profiles.

Table 5: Patients with and without Thrombolysis

Characteristics	Thrombolysis (n=64)		Non-Thrombolysis (n=56)		p-value
	No	%	No	%	
Male	51	79.69 %	46	82.14 %	0.033
Female	13	20.31 %	10	17.86 %	0.083
Age (Mean ± SD)	58.92±12.92		57.17±12.14		0.418
Diabetes mellitus	23	35.94 %	24	42.86 %	0.014
Smoking	31	48.44 %	25	44.64 %	0.068
Hypertension	24	37.50 %	21	37.50 %	0.042
Dyslipidemia	22	34.37 %	12	21.43 %	0.182
Obesity	25	39.06 %	15	26.78 %	0.156
Second degree block	7	10.94 %	7	12.50 %	----

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Complete heart block	13	20.31 %	12	21.43 %	0.02 5
Junctional Rhythm	6	9.37%	3	5.36%	0.20 5
Cardiogenic shock	4	6.25%	5	8.93%	0.07
Severe mitral regurgitation	4	6.25%	3	5.36%	0.09
Left ventricular failure	1	1.56%	6	10.71 %	0.39 5
Ejection Fraction (Mean ± SD)	51.17±6.62		51.01±6.71		0.9
Mortality	6	9.37%	12	21.43 %	0.20 5

4. Discussion

Inferior Wall Myocardial Infarction (IWMI) often presents with a range of serious complications that significantly affect patient outcomes. Commonly observed complications include complete heart block (CHB), second-degree atrioventricular (AV) block, junctional rhythm, atrial fibrillation, right ventricular myocardial infarction (RVMI), mitral regurgitation, cardiogenic shock, ventricular septal rupture, and left ventricular failure. These adverse outcomes collectively contribute to the worsening prognosis in patients with IWMI and highlight the need for early detection and targeted management strategies.

The present study, conducted on a cohort of 120 patients, provides valuable insights into the demographic and clinical profile of patients affected by IWMI. The age distribution revealed a clear inclination towards older age groups. Only 3.33% of the patients were aged 18–35,

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indicating that IWMI is uncommon in young adults. The majority of patients were concentrated in the 36–75 age bracket, with 40% aged 36–55 and 45% aged 56–75. An additional 11.67% of patients were aged 75 or older. The mean age was 58.15 years, with a standard deviation of 12.41 years, emphasizing that IWMI predominantly affects middle-aged and elderly populations. These findings align with existing literature indicating that older age is an independent predictor of poor in-hospital outcomes following acute myocardial infarction [6,7] .

A marked male predominance was observed in this study, with 97 of the 120 participants being male (80.83%), compared to only 23 females (19.17%). This gender disparity is consistent with existing epidemiological data, which show that men are generally more prone to myocardial infarctions and tend to experience them earlier than women, often by 7–10 years [8,9] . However, studies such as Millet et al. suggest that the incidence of MI in women may become comparable to that in men with increasing age, as gender-specific risk factors tend to diminish over time [10] . The prevalence of risk factors among the study population was considerable, with lifestyle and metabolic conditions playing a significant role. Smoking emerged as the most prevalent risk factor (46.7%), followed by diabetes mellitus (39.16%) and hypertension (37.5%). Obesity and dyslipidemia were also notably common, present in 33.3% and 28.3% of patients, respectively. These observations support previous research indicating that smoking, diabetes, hypertension, obesity, and dyslipidemia are significant contributors to ischemic heart disease and myocardial infarction [11-13]. The clustering of these modifiable risk factors underscores the importance of preventive cardiology and public health interventions.

Coronary angiographic evaluations among 64 patients revealed diverse patterns of coronary artery disease. Single-vessel disease was most common, affecting 40.6% of these patients, followed by double-vessel disease in 37.5% and triple-vessel disease in 15.6%. Only a small proportion (6.2%) had normal coronary arteries. These findings suggest that a substantial burden of obstructive coronary artery disease exists in this population, with varying degrees of severity. According to historical data, coronary artery disease accounted for 13.6% of all-cause mortality in 2001, representing 1.8 million deaths in the region [14] , further highlighting the

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significance of early diagnosis and management. The study also examined coronary artery dominance patterns. Right coronary dominance was observed in 76.6% of cases, while 23.4% had left coronary dominance. Although this difference was not statistically significant (p=0.311), the predominance of right coronary dominance aligns with known anatomical patterns in the general population. Understanding coronary dominance is clinically important, especially during interventions, as it influences myocardial perfusion territories and procedural risks.

Complications following IWMI were varied and impactful. RVMI was the most common, observed in 35% of patients. Complete heart block occurred in 20.8% of cases, while second-degree AV block was present in 11.7%. Other arrhythmias and complications included junctional rhythm (7.5%), cardiogenic shock (7.5%), mitral regurgitation (5.8%), left ventricular failure (5.8%), atrial fibrillation (2.5%), ventricular tachycardia (1.7%), and ventricular septal rupture (0.8%). The average ejection fraction was 51.09±6.46, indicating a relatively preserved systolic function in most patients. The overall mortality rate stood at 15%, reflecting the seriousness of IWMI and its complications. When comparing patients with high-degree conduction blocks and junctional rhythms (40% of the study population) to those without (60%), significant differences were evident. Patients with conduction blocks were older on average (62.29±10.56 years vs. 55.54±12.76 years, p=0.010) and had higher rates of diabetes (47.92% vs. 33.33%, p=0.014), hypertension (47.92% vs. 30.55%, p=0.014), and obesity (39.58% vs. 29.17%, p=0.032). Moreover, this group had a lower ejection fraction (49.10±7.52 vs. 52.25±5.98, p=0.021). These findings indicate a link between high-degree conduction abnormalities and worse clinical parameters. Historical data by Berger et al. [15] and subsequent studies [16,17] corroborate the incidence of CHB in IWMI patients, reinforcing the need for vigilant monitoring and timely intervention in patients presenting with these conduction disturbances.

The comparison between patients with and without RVMI also yielded clinically relevant differences. Although age and gender were similar between groups, RVMI patients had a significantly higher prevalence of diabetes (57.14% vs. 29.49%, p=0.014) and dyslipidemia (38.09% vs. 23.08%, p=0.037). They also experienced more complete heart blocks (30.95%

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vs. 15.38%, p=0.025) and cardiogenic shock (19.05% vs. 1.28%). Mortality was higher among RVMI patients (11.90% vs. 2.56%), although not statistically significant. Previous findings by Zehender et al. [18] support this observation, indicating a 31% in-hospital mortality for IWMI patients with RV infarction compared to 6% for those without. The study also assessed the impact of thrombolytic therapy, administered to 64 patients (53.33%). Demographics and comorbidities were largely similar between the thrombolysis and non-thrombolysis groups. However, mortality was lower in the thrombolysis group (3.12% vs. 12.5%), even though the difference did not reach statistical significance. This trend supports previous studies suggesting the efficacy of thrombolytic therapy in reducing mortality. Nonetheless, its use decreases with advancing age due to delayed presentation, increased bleeding risk, and other contraindications, as noted by Gurwitz et al., [19].

Conclusion

This study highlights the clinical burden of inferior wall myocardial infarction (IWMI) and its associated complications, particularly conduction blocks and right ventricular myocardial infarction (RVMI), in a tertiary care setting in Bihar. The findings demonstrate significant associations between these complications and adverse short-term outcomes, including higher mortality rates and reduced cardiac function. The prevalence of modifiable risk factors such as diabetes, hypertension, and smoking underscore the need for preventive strategies. Thrombolytic therapy showed a trend toward improved survival. These insights can guide clinicians in early identification, risk stratification, and management, ultimately improving patient outcomes in resource-constrained environments.

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