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Clinical profile and risk factors of patients presenting with acute myocardial infarction at RIMS, Imphal

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ABSTRACT

Background: Cardiovascular diseases are the leading cause of mortality in India. Ischemic heart disease is a result of an inadequate supply of blood to a portion of the myocardium caused by atherosclerotic disease of an epicardial coronary artery. The increasing incidence of myocardial infarction (MI) and associated mortality is a concern. **Aims and Objectives:** The aims and objectives of the study were to evaluate the clinical profile and determine the association of risk factors in patients presenting with acute MI. The study highlights the trend of occurrence of acute MI so as appropriate measures can be taken to mitigate the incidence of coronary artery disease (CAD). **Materials and Methods:** A cross-sectional study was conducted among 100 patients with acute MI admitted to the intensive coronary care unit and medicine wards of a tertiary center in North-East India. The study was carried out for a period of 2 years from September 2019 to August 2021. **Results:** The mean age of the study population was 63.13 ± 10.47 years, with an age range from 41 to 90 years. The study population had 75% males and 25% females. The most common presenting symptom was chest pain in 96% of patients. Hypertension in 75% of patients was the most common risk factor studied. About 97% of patients had at least one cardinal risk factor for MI. Inferior wall MI in 47% of patients was the most common site of MI. The highest mortality was seen in those who presented with Killip Class IV. **Conclusions:** Increasing age and male gender predisposed to MI. The association of risk factors such as hypertension, diabetes, obesity, and family history was higher in females. To bring about a reduction in the risk of CAD, emphasis should be laid on the adoption of a healthy lifestyle particularly for those at risk of CAD.

Key words: Coronary artery disease; Myocardial infarction; Risk factors; Killip class

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INTRODUCTION

Cardiovascular disease encompasses the most prevalent serious disorders in both the developed and the developing nations accounting for an estimated 17.9 million deaths worldwide in 2015, representing about 32% of all global deaths. Ischemic heart disease results from an inadequate supply of blood and oxygen to a portion of the myocardium caused by atherosclerotic disease of an epicardial coronary artery.[1]

Acute myocardial infarction (MI) is diagnosed by the detection of a rise and or fall of cardiac troponins (cTn) with at least one value above the 99th percentile of the upper reference limit and with at least one of the following: Symptoms of myocardial ischemia, new ischemic electrocardiographic (ECG) changes, development of pathological Q waves, imaging evidence of new loss of viable myocardium or new regional wall motion abnormality (RWMA) in a pattern consistent with an ischemic etiology, and identification of a coronary thrombus by angiography,

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including intracoronary imaging or by autopsy.[2] MI presents with varied symptoms, the most common being chest pain described as pressure, tightness, squeezing, crushing, a weight on the chest, or uneasiness. Symptoms may include profound fatigue, dizziness, palpitations, diaphoresis, nausea, vomiting, and shortness of breath. An ashen gray pallor with sweaty, clammy skin is a classical finding and an anxious or frightened facial expression is frequent.[3]

Hypertension is the leading risk factor for cardiovascular disease including ischemic heart disease, heart failure, peripheral arterial disease, hemorrhagic, and ischemic stroke.[4] It leads to serious morbid events in the early post-acute MI periods and worsens the long-term course by left ventricular dysfunction and congestive heart failure.[5] Killip classification is used to assess the severity of heart failure in patients with acute MI. High Killip class on admission to the hospital is associated with an increased risk of in-hospital mortality.[6]

This study was undertaken to evaluate the clinical profile and risk factors of patients presenting with acute MI at RIMS Hospital, Imphal. The increasing incidence of MI and associated mortality in Manipur is a concern and this study was done with the expectation to reflect the occurrence and trend of acute MI in Manipur, so as to help mitigate the problem.

Aims and objectives

The aims and objectives of the study was to evaluate the clinical profile and determine the association of risk factors in patients presenting with acute Myocardial Infarction.

MATERIALS AND METHODS

A hospital-based cross-sectional study was conducted in the intensive coronary care unit (ICCU) and Medicine wards of the Department of Medicine, Regional Institute of Medical Sciences, Imphal, Manipur, for a period of 2 years from September 2019 to August 2021. The objective of the study was to evaluate the clinical profile and determine the association of risk factors in patients presenting with acute MI at the Regional Institute of Medical Sciences, Imphal.

Ethical clearance

The study was carried out after obtaining ethical approval from the Research Ethics Board, Regional Institute of Medical Sciences, Imphal, through letter No. A/206/REB-Comm(SP)/RIMS/2015/562/40/2019. All participants were informed about the nature of the study which was fully explained in the participant information sheet and only those who agreed to undergo the study were enrolled. Their participation was completely voluntary and the right to deny to participate in the study was reserved. Privacy and confidentiality were maintained at all costs for each participant.

Inclusion criteria

Patients aged above 18 years diagnosed with acute MI and who gave consent to undergo the study.

Exclusion criteria

Patients under 18 years of age and those diagnosed with acute MI but not willing to participate were excluded from the study.

Independent variables

Age, gender, height, weight, body mass index (kg/m^2), smoking, hypertension, diabetes, dyslipidemia, obesity, physical inactivity, psychosocial stress, and family history of coronary artery disease (CAD).

Dependent variables

Clinical examination, 12-lead electrocardiogram (ECG), echocardiography, serum cardiac markers creatine kinase-MB (CK-MB), Troponin I, glycated hemoglobin (HbA1c), and serum lipid profile.

Procedure

The patients were subjected to history taking using a preformed comprehensive pro forma and clinical examination was done as per Joint European Society of Cardiology/American College of Cardiology/American Heart Association/World Heart Federation task force guidelines. ECG was done using Clarity Med, model: ECG 100D-3Ch, manufactured in India. Echocardiography was done using SONOACE X8 Version 2.03.00. M345-E20300-00, manufactured in Korea. cTnI was measured using cTnI Fluorescent Immuno Assay Test Kit. CK-MB and serum lipid profile were measured using RANDOX RX IMOLA auto-analyzer RX4900. HbA1c was measured using ADAMSTM A1c HA-8180T. Other miscellaneous tests were done as and when required. Total confidentiality was maintained by coding of patient's data throughout the study. All the data collected were documented and analyzed statistically to draw a useful conclusion.

Statistical analyses

The collected data were analyzed using the Statistical Package for the Social Sciences software 22.0 and R environment version 3.2.2. Microsoft Word and Excel were used to generate graphs, tables, etc. Descriptive statistics such as frequency, percentage, mean, standard deviation, and proportions were used.

RESULTS

The study was conducted among 100 patients with acute MI admitted in the ICCU and Medicine wards of the

Department of Medicine, Regional Institute of Medical Sciences, Imphal, Manipur, for a period of 2 years from September 2019 to August 2021. The age of the study population ranged from 41 years to 90 years. The mean age of the study population was 63.13±10.47 years. The most common age group for the occurrence of MI was 51–60 years at 36%. The gender distribution of the study was 75% males and 25% females. The baseline characteristics of the study population are listed in Table 1.

The most common presenting symptom was chest pain in 96% of patients, while 35% of patients had radiation of pain to the left arm. On presentation, ECG changes noted were ST-segment elevation myocardial infarction (STEMI) in 78% (78/100) patients and non-ST-segment elevation myocardial infarction (NSTEMI) in 22% (22/100). Inferior wall myocardial infarction (IWMI) in 47% (47/100) patients was the most common site, followed by extensive anterior wall MI in 25% (25). Out of 78 patients with STEMI, 61.54% (48/78) patients presented within the window period and were thrombolysis, while 38.46% (30/78) were delayed presentation or had existing contraindications for thrombolysis. About 40% (40/100) patients presented to the center within 6 h of the onset of symptoms, while 24% (24/100) patients reached only after 24 h of the onset of symptoms. On clinical examination, 40% of patients had basilar rales, 34% had raised jugular venous pressure, and 13% had peripheral edema. The vital parameters revealed tachycardia in 30% of patients, bradycardia in 2%, tachypnea in 23%, cardiogenic shock in 7%, and 5% of patients had oxygen saturation below 90% in room air.

In the study, 97% (97/100) patients had at least one risk factor for MI, while 3% (3/100) patients had no known risk factors. The association of risk factors of MI in the study population had hypertension in 75% (75/100) patients as the most common risk factor. A higher prevalence of hypertension in females at 76% (19/25) was noted compared to males at 74.67% (56/75). Smoking as a risk factor in 60% (60/100) patients had a higher prevalence in males at 68% (51/75) compared to females at 36% (9/25), with a statistically significant P=0.0046. Dyslipidemia was a risk factor in 46% (46/100) patients, with a higher prevalence in females at 52% (13/25) than males at 44% (33/75). Diabetes was a risk factor in 49% (49/100) patients, with a higher prevalence in females at 56% (14/25) than males at 46.67% (35/75). Obesity and physical inactivity were a risk factor in 45% (45/100) patients, with a higher prevalence of obesity in females at 52% (13/25) compared to males at 42.67% (32/75). A family history of CAD was present in 15% (15/100) patients, with a higher prevalence in females at 16% (4/25) than males at 14.67% (11/75). Psychosocial stress was a risk factor in 14% (14/100) patients, with a higher prevalence in females at 24% (6/25) compared to males at 10.67% (8/75).

Table 1: Baseline characteristics of the study population with myocardial infarction

Characteristics	Percentage (n)
Gender	
Male	75 (75)
Female	25 (25)
Age in years	
41–50	10 (10)
51–60	36 (36)
61–70	29 (29)
71–80	20 (20)
81–90	5 (05)
Presenting symptoms	
Chest Pain	96 (96)
Shortness of breath	28 (28)
Palpitation	42 (42)
Sweating	23 (23)
Nausea and vomiting	25 (25)
Syncope	8 (08)
Radiation of pain in left arm	35 (35)
Risk factor	
Hypertension	75 (75)
Smoking	60 (60)
Diabetes	49 (49)
Dyslipidemia	46 (46)
Obesity and physical inactivity	45 (45)
Psychosocial stress	14 (14)
Family history of CAD	15 (15)
Electrocardiogram	
STEMI	78 (78)
NSTEMI	22 (22)
Site of myocardial infarction	
Extensive anterior wall MI	25 (25)
Anteroseptal MI	19 (19)
Anterolateral MI	6 (06)
Inferior wall MI	47 (47)
Inferolateral MI	3 (03)
Killip classification	
Class I	60 (60)
Class II	24 (24)
Class III	9 (09)
Class IV	7 (07)
Time to hospitalization (hours)	
0–6	40 (40)
6–12	23 (23)
12–18	11 (11)
18–24	2 (02)
>24	24 (24)
Thrombolysis in STEMI	
Yes	61.54 (48)
No	38.46 (30)
Regional wall motion abnormality	
Present	88 (88)
Absent	12 (12)
Left ventricular ejection fraction (%)	
Normal (50–70)	47 (47)
Mild dysfunction (40–49)	38 (38)
Moderate dysfunction (30–39)	12 (12)
Severe dysfunction (<30)	3 (03)

CAD: Coronary artery disease, STEMI: ST-segment elevation myocardial infarction, NSTEMI: Non-ST-segment elevation myocardial infarction, MI: Myocardial infarction

On echocardiography, RWMA was present in 88% (88/100) of the study population with MI. The assessment of left ventricular systolic dysfunction by measurement of left ventricular ejection fraction (LVEF) had 47% (47/100) patients with normal left ventricular systolic function with LVEF 50–70%, 38% (38/100) patients with mild dysfunction with LVEF 40–49%, 12% (12/100) patients with moderate dysfunction with LVEF 30–39%, and 3% (3/100) patients with severe left ventricular systolic dysfunction with LVEF below 30%.

The biochemical parameters of the study population are listed in Table 2. On presentation to the center, 96% (96/100) patients were positive for CK-MB and 98% (98/100) were positive for cTnI. In the study, among 49% (49/100) patients with diabetes as a risk factor, 71.43% (35/49) patients had uncontrolled diabetes with HbA1c ≥7%, while 28.57% (14/49) had controlled diabetes with HbA1c <7%. In the study, lipid profile levels were noted 46% (46/100) patients with high levels of triglyceride (TG) and 42% (42/100) patients with high levels of low-density lipoprotein (LDL). About 45% (45/100) patients had abnormal low levels of high-density lipoprotein (HDL), while total cholesterol level was raised in 41% (41/100) patients.

Killip classification was done on presentation to the center by taking into account physical examination and the development of heart failure to predict and stratify the risk of mortality 60% of patients categorized as Killip Class I and 7% of patients in Killip Class IV. The highest mortality of 28.57% (2/5) was seen in patients who presented with Killip Class IV and lowest in patients with Killip Class I at 3.33% (2/58), with statistically significant P=0.0479 (Table 3).

Table 2: Biochemical parameters of the study population with myocardial infarction

Characteristics	Percentage (n)
Creatine kinase MB (CK-MB)	
Positive	96 (96)
Negative	4 (04)
Cardiac Troponin I (cTnI)	
Positive	98 (98)
Negative	2 (02)
HbA1c (%)	
HbA1c<7	28.57 (14)
HbA1c≥7	71.43 (35)
Total cholesterol	
Normal (125–200 mg/dL)	59 (59)
High (>200 mg/dL)	41 (41)
Triglycerides	
Normal (<150 mg/dL)	54 (54)
High (more than 150 mg/dL)	46 (46)
LDL cholesterol	
Normal (<100 mg/dL)	58 (58)
High (more than 100 mg/dL)	42 (42)
HDL cholesterol	
Normal (40 mg/dL or higher)	55 (55)
Abnormal (<40 mg/dL)	45 (45)

CK-MB: Creatine kinase-MB, cTnI: Cardiac Troponins I, LDL: Low-density lipoprotein, HDL: High-density lipoprotein: HbA1c: Glycated hemoglobin

DISCUSSION

In our study of 100 patients with acute MI, the mean age of the study population was 63.13±10.47 years. The most common age group for occurrence of MI was 51–60 years at 36%.[7] Chest pain in 96% of patients was the most common presenting symptom, followed by palpitation in 42% of patients in our study, consistent with the findings of a study done by Deshmukh et al.[7]

The ECG changes noted were STEMI in 78% of patients and NSTEMI in 22%. Prasad and Kumari[8] in their study reported STEMI in 72.7% of patients and NSTEMI in 27.2%. IWMI in 47% of patients was the most common site in our study. Chavan and Bhaktavatsalam[9] in their study reported IWMI in 46% of patients. Out of the 78 patients with STEMI, 61.54% of patients who presented to the center within the window period were thrombolysis. Gopalakrishnan and Govindharaju[10] and Deshmukh et al.,[11] in their studies reported thrombolysis done in 68.22% of patients and 61% of patients, respectively.

The vitals parameters noted in the study population on presentation had tachycardia in 30%, bradycardia in 2%, and cardiogenic shock in 7% of patients.[7] Kumar and Durdana[12] in their study reported cardiogenic shock in 10.5% of patients with MI. In our study, echocardiography noted 47% patients with normal left ventricular systolic function, 38% patients with mild left ventricular systolic dysfunction, 12% patients with moderate left ventricular systolic dysfunction and 3% patients had severe left ventricular systolic dysfunction. Gopalakrishnan and Govindharaju[10] in their study reported left ventricular systolic function as normal in 26.61% of patients, mild left ventricular systolic dysfunction in 58.72% of patients, moderate left ventricular systolic dysfunction in 12.84% of patients, and 1.83% of patients as severe left ventricular systolic dysfunction. In our study, RWMA was present in 88% of patients. Deshmukh et al.,[11] in a similar study reported RWMA in 90.2% of patients.

In our study, the most common risk factor for MI was hypertension in 75% of patients, with a higher prevalence in females compared to males. Bahall et al.,[13] in their study reported hypertension in 74.3% of patients as the most common risk factor. The risk factors such as diabetes, dyslipidemia, and family history of CAD had a higher prevalence in females than males in our study. González-

Table 3: Killip classification in association with mortality in the study population

Killip class	Mortality		Total (n=100)	P-value
	Recovered (n=91) (%)	Death (n=9) (%)		
Killip Class I	58 (96.67)	2 (3.33)	60.0	0.0479
Killip Class II	21 (87.5)	3 (12.5)	24.0	
Killip Class III	7 (77.78)	2 (22.2)	9.0	
Killip Class IV	5 (71.43)	2 (28.57)	7.0	

Pacheco et al.,[14] reported hypertension, diabetes, and dyslipidemia in females as most frequent risk factors. Bajaj et al.,[15] in their study reported a higher prevalence of hypertension, diabetes, and family history of CAD among females with MI. However, dyslipidemia had a higher prevalence in males. Andresdottir et al.,[16] reported a family history of CAD in 15% of patients with MI, with higher prevalence in females. In our study, smoking was a major risk factor in 60% of patients with a higher prevalence in male. George et al.,[17] in their study reported a higher prevalence of smoking in males than females, with statistically significant P<0.001. In our study, 97% of patients had at least one risk factor for MI, while 3% of patients had no known risk factors for MI. González-Pacheco et al.,[14] in their study reported at least one risk factor in 95.7% of patients and no risk factor in 4.3% of patients. Yandrapalli et al.,[18] reported at least one risk factor for MI in 91.7% of patients.

In our study, 40% of patients presented to the center within 6 h of the onset of symptoms, while 24% of patients reached only after 24 h of the onset of symptoms. Seetharama et al.,[19] reported 46.87% of patients presenting within 6 h of onset of symptoms and 21.87% of patients presenting after 24 h of onset of symptoms.

In our study, 96% of patients were positive for CK-MB and 98% of patients were positive for cTnI on presentation to the center. Ambali and Bomman[20] reported elevated levels of CK-MB in 84% of patients. Giménez et al.,[21] in their study reported initial detectable high-sensitivity cardiac Troponin I levels (≥1.9 ng/L) in 100% of patients with acute MI.

In our study, among 49 patients with diabetes, 71.43% of patients had uncontrolled diabetes with HbA1c ≥7%, while 28.57% of patients had controlled diabetes with HbA1c <7%. Altamirano et al.,[22] in their study reported uncontrolled diabetes (HbA1c ≥7%) in 67.33% of patients and controlled diabetes with HbA1c <7% in 32.67% of patients.

In our study, 46% of patients had high levels of TG and 42% of patients had high level of LDL. About 45% of patients had abnormal low levels of HDL, while total cholesterol level was raised in 41% of patients. The finding is comparable to a study done by González-Pacheco et al.,[14] with high TG level in 50.3% of patients, high levels of LDL in 20.3% of patients, low levels of HDL level in 68.6% of patients, and abnormal high total cholesterol level in 24.1% of patients.

In this study, 60% of patients were categorized in Killip Class I, 24% of patients in Killip Class II, 9% of patients in Killip Class III, and 7% of patients in Killip Class IV on presentation to the center. The findings are comparable to a study done by Kumar and Durdana[12] with reported 58.5% of patients in Killip Class I, 25% of patients in Killip Class II, 6% of patients in Killip Class III, and 10.5% of patients in Killip Class IV. Gopalakrishnan and Govindharaju[10] in their study reported 48.72% of patients in Killip Class I, 33.05% of patients in Killip Class II, 8.47% of patients in Killip Class III, and 9.75% of patients in Killip Class IV.

The overall in-hospital mortality of the study population was 9%. The mortality was highest in patients with Killip Class IV at 28.57% and lowest in patients with Killip Class I at 3.33%. Vicent et al.,[23] in their study reported mortality of 36.7% in patients with Killip Class IV and 1.5% in patients with Killip Class I.

Limitations of the study

The limitation of this study can be attributed to it being a single-center study with a limited sample size of 100 patients, which may not be enough to generalize the findings to the entire population. Hence, a study in a larger group is needed for further validation. It is to be noted that in-hospital outcomes may vary depending on the availability of facilities and trained workforce for intensive management of patients with acute MI.

CONCLUSION

In our study, increasing age and male gender predisposed to MI among the Manipuri population. However, the association of risk factors of MI such as hypertension, diabetes, obesity, and family history was higher in females compared to males. The increasing incidence of MI and associated mortality in Manipur is a concern. To bring about a reduction in the risk of CAD, emphasis should be

laid on the adoption of a healthy lifestyle particularly for those at risk to help mitigate the problem.

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Authors' Contribution:
MMK- Definition of intellectual content, literature survey, implementation of the study protocol, data collection, data analysis, manuscript preparation, and submission of an article; **DSC-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **NK-** Design of study, statistical analysis and interpretation; **LG-** Statistical analysis and interpretation, review manuscript; **BM-** Coordination and manuscript revision.

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