

Clinical Profile and Outcome of Acute Myocardial Infarction among Young Adults at a Tertiary Care Centre in Manipur, India: A Cohort Study

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ABSTRACT

Introduction: The incidence of Acute Myocardial Infarction (AMI) is rising in young adults. Timely control of cardiovascular risk factors is important to prevent the increasing incidence of AMI in young adults.

Aim: To analyse the clinical profile, risk factors, and outcomes of AMI among the young adult population in Manipur, India.

Materials and Methods: A hospital-based cohort study was conducted in a tertiary care centre at Department of Medicine, Regional Institute of Medical Sciences, Imphal, Manipur, India from January 1, 2021, to December 31, 2022, among patients aged 45 years or younger attending the medicine Outpatient Department (OPD), admitted to the Intensive Care Unit (ICU) and Intensive Coronary Care Unit (ICCU) with the first attack of AMI. Cases involving pregnancy, known cases of pericarditis, and Congenital Heart Disease (CHD) were excluded. Data were collected using a performa regarding demographic profile, clinical presentation, risk factors, and treatment outcomes. The data were analysed using Statistical Package for Social Sciences (SPSS) 21.0 and expressed as descriptive statistics.

Results: A total of 39 cases were reported with a mean age of 40.2±4.6 years, with a male-to-female ratio of 9:1. The majority of cases presented with chest pain (74.3%), followed by shortness of breath (40%), nausea (13%), and collapse (10%). 75% of cases presented with multiple clinical features. The most common risk factors in young adults were smoking (84.6%), alcohol consumption (56.4%), family history of heart disease (25.6%), hypertension (20.5%), substance abuse (20.5%), diabetes (17.9%), and dyslipidemia (25.6%). Cases showed elevated cardiac enzymes - Creatine Kinase-Myocardial Band (CK-MB) (92.3%) and Troponin I (94.9%). Electrocardiogram (ECG) changes revealed ST segment elevation MI (89.7%). Only one case resulted in death during the hospital stay.

Conclusion: The incidence of AMI among young adult populations is increasing, emphasising the need to raise awareness regarding cardiovascular risk factors and lifestyle modifications. However, the cases have shown good clinical outcomes among young adults with the disease.

Keywords: Electrocardiogram, Presentation, Risk-factors, Substance abuse

INTRODUCTION

The burden of Cardiovascular Disease (CVD) is among the highest in India worldwide. The annual number of deaths from CVD in India is projected to rise from 2.26 million (1990) to 4.77 million (2020) [1]. The prevalence rates of coronary heart disease in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural populations and from 1% to 13.2% in urban populations [2]. The INTERHEART study revealed that, even at younger ages, Indians have higher rates of CVD risk factors compared to other ethnic groups, including diabetes, hypertension, and abdominal obesity [3]. Over the past 25 years, India has witnessed a sharp increase in the prevalence rates of CVD risk factors, particularly in metropolitan areas. The reasons behind this high burden of risk factors are not well understood. Cohort studies, in this regard, provide objective estimations of the relationship between exposure and outcomes, which can improve understanding of the factors contributing to CVD [4].

Overall, the prevalence estimates vary due to the poorly-defined clinical profiles of atherosclerotic and non atherosclerotic phenotypes. This lack of definition is especially true for patients presenting with Myocardial Infarction with Non Obstructive Coronary Arteries (MINOCA) because differentiation based on angiography alone, without routine intracoronary imaging and non uniform work-up, has led to poor identification of non plaque mechanisms [5]. The incidence of Coronary Artery Disease (CAD) in the young has been

reported to be 12%-16% among Indians. Approximately 25% of AMI cases and half of all deaths in India from CVDs (i.e., 52% of CVDs) occur in individuals under the age of forty. Heart diseases are occurring in Indians 5 to 10 years earlier than in other populations around the world [6].

In South Asia (Bangladesh, India, Nepal, Pakistan, and Sri Lanka), the median age for the first presentation of AMI is 53 years, whereas in Western Europe, China, and Hong Kong, it is 63 years, with a higher incidence rate among males than females, according to the INTERHEART study. Men were four times more likely than women to experience AMI incidents between the ages of 20 and 64, based on data from the Singapore Myocardial Infarction (MI) Registry collected between 1988 and 1997 [3,7]. Asian women presented with their first MI at a higher median age (58 years) compared to Asian males (54 years), which aligns with the findings of the INTERHEART study. The age-standardised incidence rate for both sexes in Indians is higher than for any other Asian community, including Chinese, Malay, and Indians. Around 4.4% of Asian women and 9.7% of males under 40 experience their first MI attack, which is two to 3.5 times higher than the population in Western Europe and the third-highest among all the regions studied globally [3,8]. Myocardial Infarction with Non Obstructive Coronary Arteries (MINOCA) is more common in women than in males and is estimated to affect 6% to 8% of patients diagnosed with MI [9]. Cigarette smoking has been strongly associated with CAD in young adults, while other traditional risk

factors have shown a weaker association. Hypertension and lack of exercise are well-established risk factors for CAD in general, but they appear to contribute only marginally in this population. Literature has demonstrated surprisingly good prognosis up to three years after the diagnosis of CAD in young adults [10]. Among young individuals with MI, plaque rupture accounts for approximately 60% to 65% of cases, which is similar to older individuals. Studies have shown that the use of cocaine, amphetamines, oral contraceptives (especially in combination with smoking), and marijuana can be associated with the cause of MI [11,12].

To the best of authors' knowledge, there is a scarcity of data in Manipur compared to data accumulated elsewhere in other parts of India to evaluate the clinical profile and risk factors of young patients presenting with AMI. The increasing trend of MI and associated mortality in Manipur is a concern, and the need of the hour is a better understanding of the disease and its associated risk factors in order to prevent the rising trend of AMI. Hence, the present study was undertaken to evaluate the clinical profile, risk factors, and treatment outcomes of young patients presenting with AMI at Regional Institute of Medical Sciences (RIMS) Hospital, Imphal, Manipur.

MATERIALS AND METHODS

A hospital-based cohort study was conducted among young adults aged 45 years or less, diagnosed with the first attack of AMI, attending the Department of Medicine and admitted to the ICU and ICCU at Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, from January 1, 2021, to December 31, 2022.

The sample size was not calculated as the study aimed to include all eligible cases during the study period. Ethical clearance was obtained from the Research Ethics Board (Ref. No. A/206/REB-Comm(SP)/RIMS/2015/698/40/2020), RIMS, Imphal. Informed consent was obtained from the study participants before data collection, and confidentiality was maintained by limiting the identifying variables to a minimum.

Inclusion criteria: The study included thirty-nine (39) patients of both sexes aged forty-five years or less, diagnosed with the first attack of AMI, attending the Department of Medicine and admitted to the ICU and ICCU, who provided consent.

Exclusion criteria:

- i) Patients under 18 years of age
- ii) Known cases of pericarditis
- iii) Congenital Heart Diseases (CHD)
- iv) Pregnancy

A predefined performa was used to collect socio-demographic profiles, risk factors, clinical characteristics, treatment outcomes (death or recovery), ECG findings, cardiac enzymes such as CK-MB and Troponin I, serum lipid profile, glycated haemoglobin, chest X-ray (PA view), 2D echocardiography, coronary angiogram, and other biochemical investigation details. MI and Body Mass Index (BMI) were defined according to the Fourth Universal definition of MI (2018) and the WHO (Asia Pacific classification) as per Thygesen K et al., [9] and WHO guidelines [10].

STATISTICAL ANALYSIS

Data were analysed using IBM SPSS 21.0 for Windows. Continuous variables were expressed as mean±Standard Deviation (SD), while categorical variables were presented as frequency (percentages). Only descriptive statistics were used to analyse the data.

RESULTS

The demographic profile, such as the age and BMI of the participants, is shown in [Table/Fig-1]. The cases of AMI among

young adults were predominantly seen in males (89.7%) and overweight individuals (59%). Different symptoms were observed in young adult AMI cases upon presentation at the hospital, as shown in [Table/Fig-2], with chest pain being the most common presenting symptom (74.3%). The most common risk factor observed in young adults with AMI was smoking (84.6%), as shown in [Table/Fig-3]. Among smoking habits, the most common pack years of smoking reported in the present study were 5-10 pack years (69.6%). Elevated levels of CK-MB were found in 92.3% of the young adult AMI patients, while elevated levels of Troponin I were observed in 94.9% of the patients, as shown in [Table/Fig-4]. The most common ECG finding related to the site of MI in young adults was the anterior wall (43.6%), followed by the anteroseptal wall (25.6%), as shown in [Table/Fig-5]. The ECG findings of the study population upon presentation at the hospital showed that 89.7% of patients had ST-Segment Elevation Myocardial Infarction (STEMI), while 10.3% had non ST Segment Elevation Myocardial Infarction (NSTEMI), as shown in [Table/Fig-6]. Echocardiography studies conducted on the population revealed Regional Wall Motion Abnormality (RWMA) in 34 patients (87.2%), Left Ventricular Ejection Fraction (LVEF) ≥50% in 20 patients (51.4%), LVEF 40-49% in 14 patients (35.8%), and LVEF <40% in 5 patients (12.8%), as shown in [Table/Fig-7]. The most common blood vessel involved in young adult AMI patients was the Proximal Left Anterior Descending Artery (PLAD) (69.2%). The overall in-hospital mortality in the study population due to MI in young patients was 3.0%, while the remaining 97% of patients recovered from AMI, as shown in [Table/Fig-8].

Demographic characteristics	Frequency (%) / Mean±SD
Age in years	40.2±4.6
Gender	
Male	35 (89.7)
Female	4 (10.3)
BMI (Kg/m ²)	
Normal	11 (30.8)
Overweight	23 (59)
Obese	4 (10.3)

[Table/Fig-1]: Demographic characteristics of the study participants (N=39).

Presenting signs and symptoms	Frequency	Percentage
Chest pain	29	74.3
Shortness of breath	15	40
Nausea	5	13
Sudden collapse	4	10
Epigastric pain	3	7.6
Sweating	2	5.1
Raised Jugular Venous Pulse (JVP)	2	13
Basilar rales	5	13

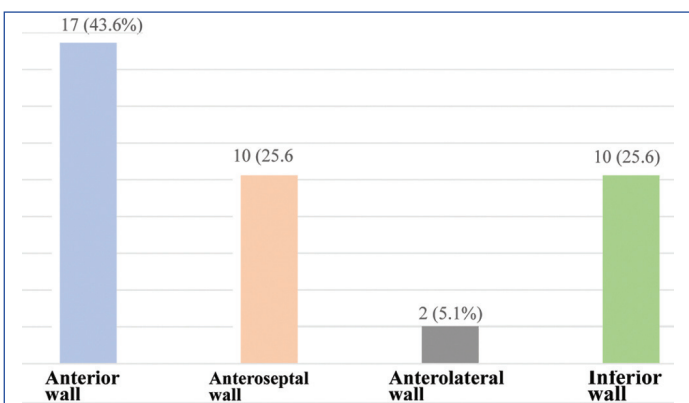
[Table/Fig-2]: Presenting features of Acute Myocardial Infarction (AMI) cases (N=39).

Risk factors	Frequency	Percentage
Smoking	33	84.6
Alcoholic	22	56.4
Diabetes	7	17.9
Hypertension	8	20.5
Family history of heart disease	10	25.6
H/o Substance abuse	8	20.5
H/o Dyslipidemia	10	25.6

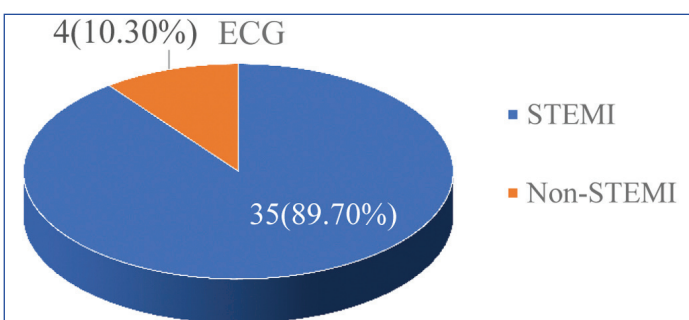
[Table/Fig-3]: Risk factors associated with young adult patients with Acute Myocardial Infarction (AMI) (N=39).

Parameters	Frequency	Percentage
Lipid profile		
Triglyceride >150	29	74.4
LDL >100	27	69.2
HDL <50	20	51.3
Cardiac markers		
CK-MB	36	92.3
Troponin I	37	94.9

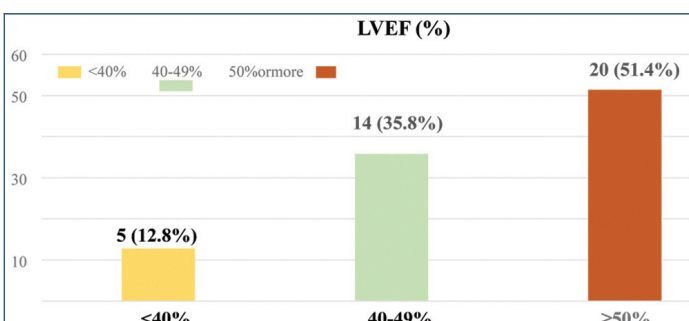
[Table/Fig-4]: Lipid profile and cardiac markers of Acute Myocardial Infarction (AMI) cases (N=39).



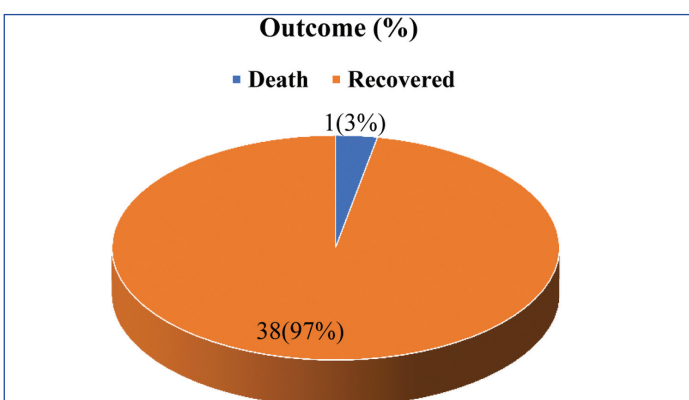
[Table/Fig-5]: ECG findings of site of Myocardial Infarction (MI) (%) (N=39).



[Table/Fig-6]: Electrocardiogram (ECG) findings of the young adult patients with Acute Myocardial Infarction (AMI) (N=39).



[Table/Fig-7]: Echocardiography presenting with different LVEF (N=39).



[Table/Fig-8]: Distribution of patients according to the outcome of Acute Myocardial Infarction (AMI) in young patients (N=39).

DISCUSSION

The present study provides insight into the clinical profile, risk factors, and treatment outcomes of young adults with MI. The study included 39 young patients (45 years or less) presenting to RIMS hospital with their first attack of AMI. The mean (SD) age of the young patients with MI in this study was 40.2 (\pm 4.6) years. Similar findings were reported in studies conducted by Bhardwaj R et al., (mean age 35.4 years), Neki NS et al., (mean age 38.7 years), whereas Sricharan KN et al., demonstrated different results with a mean age of 26 years [11-13]. The majority of the young patients with AMI in the present study were males (89.7%), with only four female patients. Comparable findings were seen in studies conducted by Bhardwaj R et al., and Neki NS et al., [11,12]. This may be due to a higher prevalence of risk factors in males compared to females, as supported by the comparison of risk factor prevalence between males and females. Although current smoking posed a similar risk in men and women, former smoking carried a higher risk in men [3].

The present study revealed that the majority of the cases were overweight individuals. This finding is similar to the study conducted by Gupta R et al., where overweight and abdominal obesity were identified as important risk factors associated with MI in young patients [4]. An alarming rate of 35% and 58% of patients under the age of 45 years after MI were found to be obese [14-17]. The presenting complaint of AMI in young adults in this study was similar to the classical presentation of worsening angina that culminates in MI. Similar presentations have been observed in previous literature [11,14,15].

The most common ECG finding regarding the site of MI in young adults was the anterior wall (43.6%), followed by the anteroseptal wall (25.6%), inferior wall (25.6%), and antero-lateral wall (5.1%). Of the 39 patients, 35 had STEMI and only four had NSTEMI in the present study. Similar findings were reported in studies conducted by Sricharan KN et al., Deshmukh PP et al., and Rathod KS et al., where the majority of the AMI cases were ST segment elevation MI [13,15,16]. ST segment elevation in the ECG is often observed if the patient presents to the emergency department soon after the onset of chest pain. Serial ECGs are of utmost importance as dynamic changes can be observed, which might be associated with substance abuse or treatment effects after the administration of vasodilators [17].

The study showed that on clinical examination, two patients had raised JVP and five patients had basilar rales on auscultation. In a similar study conducted by Deshmukh PP et al., the number of patients presenting with raised JVP and basilar rales was higher. These differences may be attributed to the smaller sample size in our study population, but the clinical significance should also be considered [15].

On echocardiography, RWMA was observed in 87.2% of the patients, and half of the patients (51.4%) had an LVEF of \geq 50% in the present study. Similar findings have been reported by many previous authors in their literature [17-19]. Cardiac enzymes are consistently elevated in all individuals with MI. Cardiac-specific Troponin-T elevation is considered the most sensitive marker of myocardial damage. False-positive increases in creatinine kinase levels are seen in patients who misuse cocaine [20,21].

The most common blood vessel involved in young adults with AMI in the present study was the PLAD (69.2%). Similar findings were reported in studies conducted by Sinha SK et al., and Singh A et al., [2,22].

The most common risk factors observed in young adults with AMI in the present study were smoking (84.6%), alcohol consumption (56.4%), family history of heart disease (25.6%), hypertension (20.5%), and diabetes (17.9%). Among the patients who were smokers, the most common pack years of smoking were five to ten pack years (69.6%) in the present study. These findings are

consistent with the results of studies conducted by Sood N et al., and Pandya T et al., [23,24]. Gulati R et al., showed that smoking was the most common risk factor in young Indian males [25]. Additionally, there were one or more risk factors present in young adults as the cause of MI. Studies conducted by Sinha SK et al., Gupta R et al., Neki NS, Deshmukh PP et al., and Chandregowda et al., showed a higher percentage of mortality, at 10% and 6%, respectively [2,4,12,15,26]. This difference in mortality rates may be attributed to the smaller sample size in the present study.

Limitation(s)

One limitation of the study is the relatively small sample size, which may limit the generalisability of the findings. Conducting a multicentric longitudinal study with a larger sample size would help increase the robustness of the study. Additionally, due to logistic constraints, certain risk factors such as testing of apolipoprotein could not be included in the study. Including these factors could have added more power to the study.

CONCLUSION(S)

The study concluded that young adult males, around 40 years of age, with co-morbidities, are commonly presented with AMI, with chest pain being the most common symptom. Sedentary lifestyles and multiple risk factors may contribute to the development of the disease. AMI in young patients typically showed ST segment elevation on ECG, elevated cardiac enzymes such as CK-MB and Troponin I, and regional wall motion abnormality on echocardiography. The most commonly involved blood vessel on coronary angiogram was the LAD. Treatment outcomes were favourable in this young population if timely intervention was provided. The study recommends timely identification and control of modifiable cardiovascular risk factors at an early age to help prevent the rise of the disease in the young adult population.

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