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Clinical Profile and Risk Factors of Acute Myocardial Infarction in Young Adults: A Prospective Observational Study.

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Abstract

Background: Acute myocardial infarction (AMI) is traditionally considered a disease of older adults; however, its occurrence in young adults is increasingly recognized as an important clinical problem. Young patients may present with a substantial burden of conventional and potentially modifiable cardiovascular risk factors. Early identification of these factors is essential for preventing premature coronary artery disease and recurrent cardiovascular events. ***Aim:*** The aim of the present investigation was to study the clinical profile of acute myocardial infarction in young patients aged 18–45 years and to study the incidence of various risk factors in young patients with myocardial infarction. ***Methods:*** A prospective observational study was conducted among 150 patients aged 18–45 years diagnosed with acute myocardial infarction. Patients were evaluated for demographic characteristics, presenting clinical features, smoking, family history of coronary artery disease, obesity, hypertension, diabetes mellitus and dyslipidemia. Clinical examination, electrocardiography, laboratory investigations, cardiac biomarkers and echocardiography were performed as appropriate. Coronary angiographic findings were also documented wherever indicated. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Appropriate statistical tests were used for analysis, and a p-value <0.05 was considered statistically significant. ***Results:*** Among the 150 patients, 120 (80.0%) were males and 30 (20.0%) were females. The majority of patients, 72 (48.0%), belonged to the 36–40 years age group, followed by 42 (28.0%) patients in the 31–35 years age group. Smoking was the most prominent individual lifestyle risk factor, being present in 105 (70.0%) patients. A positive family history of coronary artery disease was reported in 54 (36.0%) patients. Overall, 120 (80.0%) patients had BMI ≥25 kg/m^2. Dyslipidemia was observed in 126 (84.0%) patients, with elevated LDL-C being the most frequent lipid abnormality. Hypertension was present in 24 (16.0%) patients, while diabetes mellitus was observed in 30 (20.0%) patients. Anterior wall myocardial infarction was the most common presentation, occurring in 90 (60.0%) patients. Echocardiography demonstrated moderate left ventricular dysfunction in 75 (50.0%) patients. ***Conclusion:*** Acute myocardial infarction in young adults is associated with a high prevalence of modifiable cardiovascular risk factors. Dyslipidemia, excess body weight and smoking were particularly prominent, while diabetes, hypertension and positive family history also contributed substantially to the overall risk profile. The findings emphasize the importance of early cardiovascular risk assessment, tobacco cessation, healthy weight management, lipid control and prevention of metabolic risk factors in young adults to reduce the burden of premature myocardial infarction.

Keywords: Acute myocardial infarction; young adults; cardiovascular risk factors; smoking; dyslipidemia; obesity; hypertension; diabetes mellitus; coronary artery disease.

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INTRODUCTION

Acute myocardial infarction (AMI) is one of the leading causes of morbidity and mortality worldwide and is traditionally considered a disease predominantly affecting older individuals. However, the occurrence of myocardial infarction among young adults has become an increasingly important clinical and public health concern. Myocardial infarction in young adults is generally associated with a distinct risk-factor profile and may have considerable social and economic consequences because it affects individuals during their most productive years [1,2].

The clinical presentation of AMI in young adults may vary from classical symptoms such as acute-onset chest pain, chest discomfort, dyspnoea and diaphoresis to less typical manifestations. Young patients may also have a lower burden of established coronary atherosclerosis compared with older patients, and therefore the underlying mechanisms of infarction may differ. Coronary artery disease, however, remains an important cause of AMI in this age group [1,2].

Several studies have demonstrated that conventional cardiovascular risk factors play an important role in the development of myocardial infarction among young adults. Smoking, hypertension, diabetes mellitus, dyslipidaemia, obesity and a positive family history of premature coronary artery disease have been frequently reported among young patients with AMI [2-5]. The presence of multiple risk factors in the same individual may further increase the likelihood of premature coronary artery disease.

The burden of myocardial infarction among young Indians is of particular concern. Earlier Indian studies have demonstrated that young patients with myocardial infarction may have significant coronary artery disease and identifiable cardiovascular risk factors. Smoking, dyslipidaemia and a family history of coronary artery disease have been reported as important contributors to myocardial infarction in young Indian patients [3]. The coronary angiographic profile of young patients may also demonstrate significant single- or multi-vessel coronary involvement.

South Asian populations have been reported to experience cardiovascular disease at a comparatively younger age. In young South Asian adults, conventional risk factors together with metabolic abnormalities and familial predisposition have been associated with myocardial infarction [4]. The increasing prevalence of sedentary lifestyle, unhealthy dietary practices, tobacco use and metabolic risk factors has further increased concern regarding premature cardiovascular disease in this population.

Clinical studies from different populations have shown that young patients with a first myocardial infarction frequently have one or more modifiable risk factors that may have remained undiagnosed or inadequately controlled before the cardiac event [5]. Identification of these risk factors is therefore important not only for the management of affected patients but also for developing preventive strategies aimed at reducing premature cardiovascular morbidity.

Indian studies have also reported variation in the clinical presentation and pattern of coronary artery involvement among young adults with myocardial infarction [6-8]. The AMIYA study demonstrated that very young patients with AMI can present with significant cardiovascular risk factors and angiographically demonstrable coronary artery disease, emphasizing the need for early recognition and appropriate risk-factor assessment [8].

The increasing recognition of myocardial infarction in young adults has generated interest in understanding the specific contribution of modifiable and non-modifiable risk factors in this population. Recent evidence suggests that young adults experiencing their first myocardial infarction frequently have identifiable and potentially modifiable cardiovascular risk factors, highlighting an important opportunity for primary and secondary prevention [9,10].

Despite improvements in cardiovascular care, myocardial infarction occurring between 18 and 45 years of age remains clinically important because of its potential for long-term morbidity, recurrent cardiovascular events and premature mortality. Furthermore, regional differences in lifestyle, socioeconomic conditions, tobacco exposure and prevalence of metabolic risk factors may influence the clinical profile of young patients.

Therefore, assessment of the clinical characteristics and associated risk factors among young adults presenting with AMI is essential for understanding the pattern of premature coronary artery disease. Such information can assist clinicians in early identification of high-risk individuals and may contribute to targeted preventive interventions.

Aim of the study:

The aim of the present investigation was to study the clinical profile of acute myocardial infarction in young patients aged 18–45 years and to study the incidence of various risk factors in young patients with myocardial infarction.

MATERIALS AND METHODS

Study Design

The present study was designed as a prospective observational study to assess the clinical profile and risk factors associated with acute myocardial infarction among young adults aged 18–45 years.

Study Setting
The study was conducted in the Department of Medicine/Cardiology of a tertiary care hospital. Patients presenting to the emergency department or admitted to the cardiology/medicine unit with a diagnosis of acute myocardial infarction were evaluated prospectively during the study period.

Study Population
The study population consisted of consecutive young adult patients aged 18–45 years who presented with acute myocardial infarction and fulfilled the predefined eligibility criteria.

Ethical Considerations
The study was conducted after obtaining approval from the Institutional Ethics Committee. All eligible participants were informed regarding the purpose and procedures of the study. Written informed consent was obtained before enrolment. Patient confidentiality was maintained throughout the study, and the collected information was used solely for research purposes.

Sample Size
A total of 150 patients diagnosed with acute myocardial infarction and fulfilling the inclusion criteria were enrolled in the study.

Sampling Technique
Patients were recruited using a consecutive sampling technique. All eligible patients presenting during the study period were assessed, and those fulfilling the eligibility criteria and providing consent were included until the required sample size of 150 participants was achieved.

Inclusion Criteria
Patients were included in the study if they fulfilled all of the following criteria:
1. Patients aged 18–45 years.
2. Patients diagnosed with acute myocardial infarction.
3. Patients presenting within the clinically relevant acute phase of myocardial infarction.
4. Patients willing to participate in the study.
5. Patients providing written informed consent.

Exclusion Criteria
The following patients were excluded:
1. Patients aged below 18 years or above 45 years.
2. Patients with a previous history of myocardial infarction, where assessment of a first acute event was required.
3. Patients with significant congenital or structural heart disease that could substantially influence the clinical presentation.
4. Patients with severe systemic illness that could interfere with assessment of cardiovascular risk factors.
5. Patients unwilling to participate or unable to provide informed consent.
6. Patients for whom adequate clinical or laboratory information could not be obtained.

Diagnosis of Acute Myocardial Infarction
The diagnosis of AMI was established on the basis of clinical presentation, electrocardiographic findings and cardiac biomarker evidence, supported by appropriate imaging or coronary angiographic findings wherever indicated.
Patients were evaluated for symptoms suggestive of acute myocardial ischemia, particularly chest pain or discomfort, radiation of pain, dyspnoea, diaphoresis, nausea, vomiting, palpitations and syncope. Electrocardiography was performed at presentation and repeated whenever clinically indicated.
Cardiac biomarkers, particularly cardiac troponins, were assessed according to the hospital protocol. Patients were classified clinically according to the type of AMI, including ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI), wherever applicable.

Clinical Assessment
A detailed clinical history was obtained from every participant using a structured data collection proforma. The following variables were recorded:
- Age
- Sex
- Residence
- Presenting symptoms

- Duration of symptoms
- Previous medical history
- Family history of premature coronary artery disease
- Smoking/tobacco use
- Alcohol consumption
- History of hypertension
- History of diabetes mellitus
- History of dyslipidaemia
- Physical activity and sedentary lifestyle
- Dietary habits
- Previous cardiovascular disease
- Medication history

A complete physical examination was performed, including measurement of pulse rate, blood pressure, respiratory rate, height, weight and body mass index (BMI).

Assessment of Cardiovascular Risk Factors

The following major cardiovascular risk factors were specifically assessed:

Smoking

Patients were categorized according to current, former or never-smoking status. Details regarding duration and approximate quantity of tobacco consumption were recorded wherever available.

Hypertension

A history of previously diagnosed hypertension and/or use of antihypertensive medication was recorded. Blood pressure was measured using a standardized technique.

Diabetes Mellitus

Known diabetes mellitus and antidiabetic medication use were documented. Laboratory evaluation of blood glucose and/or glycated haemoglobin was performed according to clinical requirements.

Dyslipidaemia

A fasting or clinically appropriate lipid profile was obtained. Serum total cholesterol, triglycerides, high-density lipoprotein cholesterol and low-density lipoprotein cholesterol were recorded.

Family History

A positive family history was defined as the presence of premature coronary artery disease or myocardial infarction among first-degree relatives at a young age.

Obesity and Body Mass Index

Height and weight were recorded, and BMI was calculated using the formula:

$BMI = Weight\ (kg) / Height^2\ (m^2)$

Patients were categorized according to BMI-based classification.

Other Risk Factors

Additional factors such as sedentary lifestyle, unhealthy dietary habits, alcohol consumption and other relevant cardiovascular risk factors were documented wherever applicable.

Laboratory Investigations

Routine investigations were performed as clinically indicated. These included:

- Complete blood count
- Blood glucose
- Glycated haemoglobin
- Renal function tests
- Serum electrolytes
- Liver function tests
- Lipid profile
- Cardiac biomarkers
- Other investigations considered necessary by the treating physician

Electrocardiographic Evaluation

A standard 12-lead electrocardiogram was obtained for all patients at presentation. ECG findings were documented with respect to:

- ST-segment elevation or depression
- T-wave abnormalities
- Pathological Q waves

- Site/localization of myocardial infarction
- Presence of arrhythmias or conduction abnormalities

Based on ECG findings and clinical assessment, patients were categorized as having STEMI or NSTEMI as appropriate.

Echocardiographic Assessment

Two-dimensional transthoracic echocardiography was performed where clinically indicated. Left ventricular ejection fraction, regional wall-motion abnormalities and other relevant structural or functional abnormalities were documented.

Coronary Angiographic Evaluation

Coronary angiography was performed according to standard clinical indications. The findings were recorded with respect to the presence and distribution of coronary artery disease, including involvement of the left anterior descending artery, left circumflex artery and right coronary artery. The number of vessels involved and significant coronary stenosis were documented wherever angiography was performed.

Data Collection

All relevant information was recorded prospectively in a structured case record form. Each participant was assigned a study identification number to maintain confidentiality. Data included demographic characteristics, presenting symptoms, clinical findings, cardiovascular risk factors, laboratory parameters, ECG findings and relevant cardiac investigations.

Statistical Analysis

The collected data were entered into a computerized database and analyzed using appropriate statistical software.
Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range, depending on the distribution of data. Categorical variables were expressed as frequency and percentage. The incidence/proportion of individual cardiovascular risk factors among the study participants was calculated. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, wherever appropriate. For comparison of continuous variables between groups, the Student's t-test or an appropriate non-parametric test was used.
A p-value <0.05 was considered statistically significant.

RESULTS

Table 1 shows the age and sex distribution of the 150 study participants. The majority of participants belonged to the 36–40 years age group, comprising 72 (48.0%) patients, followed by the 31–35 years age group with 42 (28.0%) patients. The 26–30 years age group accounted for 18 (12.0%) patients, while 14 (9.3%) patients were aged 41–45 years and 4 (2.7%) were below 25 years. Males constituted the majority of the study population, with 120 (80.0%) patients, whereas 30 (20.0%) were females. The mean age of the study population was 36.18 ± 4.25 years.

Table 2 depicts the prevalence and distribution of smoking according to cigarette/beedi consumption in pack-years. Overall, 105 (70.0%) patients were smokers, while 45 (30.0%) patients had no history of smoking. Among smokers, 30 (20.0%) had 1–5 pack-years of exposure, followed by 27 (18.0%) with 6–10 pack-years and 21 (14.0%) with 11–15 pack-years. Fifteen (10.0%) patients had 16–20 pack-years, whereas 12 (8.0%) patients had more than 20 pack-years. The mean number of pack-years smoked was 8.48 ± 5.46.

Table 3 presents the distribution of patients according to family history of coronary artery disease. A positive family history of CAD was present in 54 (36.0%) patients. Among these, 36 (24.0%) reported a history of CAD in a single parent, while 18 (12.0%) reported a history in both parents. The remaining 96 (64.0%) patients had no reported family history of CAD.
Table 4 shows the distribution of patients according to BMI. Thirty (20.0%) patients had a BMI below 25 kg/m² and were classified as having normal BMI. Overweight was observed in 54 (36.0%) patients, while 48 (32.0%) patients had obesity with BMI between 30.0 and 34.9 kg/m². Fifteen (10.0%) patients had BMI between 35.0 and 39.9 kg/m², and 3 (2.0%) patients had morbid obesity with BMI ≥40 kg/m². Overall, 120 (80.0%) patients had BMI ≥25 kg/m².

Table 5 demonstrates the prevalence of different lipid abnormalities among the study participants. A normal lipid profile was observed in 24 (16.0%) patients. Elevated LDL-C was the most frequently observed lipid abnormality, present in 60 (40.0%) patients, followed by low HDL-C in 57 (38.0%), elevated triglycerides in 48 (32.0%), and elevated total cholesterol in 45 (30.0%) patients. The mean total cholesterol level was 196.48 ± 31.42 mg/dL, mean LDL-C was 134.26 ± 48.37 mg/dL, mean HDL-C was 39.86 ± 9.12 mg/dL, and mean triglyceride level was 172.35 ± 51.18 mg/dL. Since individual patients could have more than one lipid abnormality, the percentages were not mutually exclusive.

Table 6 shows the distribution of patients according to blood pressure status. Normotension was observed in 96 (64.0%) patients, while 30 (20.0%) patients had prehypertension. Hypertension was present in 24 (16.0%) patients. Thus, hypertension constituted an important cardiovascular risk factor among the young adults included in the study.
Table 7 depicts the prevalence of diabetes mellitus. Diabetes mellitus was present in 30 (20.0%) patients, whereas 120 (80.0%) patients did not have diabetes mellitus. Thus, one-fifth of the study participants with acute myocardial infarction had concomitant diabetes mellitus.

Table 8 demonstrates the distribution of patients according to the type and anatomical presentation of myocardial infarction. Anterior wall MI was the most common presentation, observed in 90 (60.0%) patients, followed by inferior wall MI in 45 (30.0%) patients. Anteroseptal MI was observed in 15 (10.0%) patients.

Table 9 shows the left ventricular function assessed by two-dimensional echocardiography. Mild left ventricular dysfunction with an ejection fraction of 40–45% was observed in 48 (32.0%) patients. Moderate LV dysfunction, with an ejection fraction of 30–39%, was present in 75 (50.0%) patients and represented the most common category. Severe LV dysfunction with an ejection fraction below 30% was observed in 27 (18.0%) patients.

Table 10 summarizes the major cardiovascular risk factors observed among the study participants. Dyslipidemia was the most frequently observed risk factor, affecting 126 (84.0%) patients, followed by overweight/obesity in 120 (80.0%) and smoking in 105 (70.0%) patients. A positive family history of CAD and hypertension were each observed in 54 (36.0%) patients, while diabetes mellitus was present in 30 (20.0%) patients. Overall, the findings demonstrate a high prevalence of multiple modifiable cardiovascular risk factors among young adults presenting with acute myocardial infarction.

Table 1. Age and sex distribution of study participants (n=150)

Age group (years)	Male, n (%)	Female, n (%)	Total, n (%)
<25	03 (2.0)	01 (0.7)	04 (2.7)
26–30	12 (8.0)	06 (4.0)	18 (12.0)
31–35	35 (23.3)	07 (4.7)	42 (28.0)
36–40	58 (38.7)	14 (9.3)	72 (48.0)
41–45	12 (8.0)	02 (1.3)	14 (9.3)
Total	**120 (80.0)**	**30 (20.0)**	**150 (100.0)**

Table 2. Prevalence of smoking among study participants (n=150)

Cigarettes/Beedis (pack-years)	No. of patients	Percentage (%)
0	45	30.0
1–5	30	20.0
6–10	27	18.0
11–15	21	14.0
16–20	15	10.0
>20	12	8.0
Total smokers	**105**	**70.0**

Mean number of pack-years smoked: 8.48 ± 5.46

Table 3. Prevalence of family history of coronary artery disease (CAD) (n=150)

Family history of CAD	No. of patients	Percentage (%)
Single parent	36	24.0
Both parents	18	12.0
No family history	96	64.0
Total	**150**	**100.0**

Table 4. Prevalence of obesity according to body mass index (BMI) (n=150)

BMI (kg/m²)	Classification	No. of patients	Percentage (%)
<25	Normal	30	20.0
25.0–29.9	Overweight (Grade 1)	54	36.0
30.0–34.9	Obesity (Grade 2)	48	32.0
35.0–39.9	Obesity (Grade 3)	15	10.0
≥40	Morbid obesity	03	2.0
Total		**150**	**100.0**

Overall prevalence of BMI ≥25 kg/m²: 80.0%

Table 5. Prevalence of dyslipidemia among study participants (n=150)

Type of dyslipidemia	No. of patients	Percentage (%)
Normal lipid profile	24	16.0
High total cholesterol (>200 mg/dL)	45	30.0
High LDL-C (>100 mg/dL)	60	40.0
High triglycerides (>200 mg/dL)	48	32.0
Low HDL-C (<40 mg/dL)	57	38.0

Mean total cholesterol: 196.48 ± 31.42 mg/dL
Mean LDL-C: 134.26 ± 48.37 mg/dL
Mean HDL-C: 39.86 ± 9.12 mg/dL
Mean triglycerides: 172.35 ± 51.18 mg/dL

Table 6. Prevalence of hypertension among study participants (n=150)

Blood pressure status	No. of patients	Percentage (%)
Normotension (<120/80 mmHg)	96	64.0
Prehypertension (120–139/80–89 mmHg)	30	20.0
Hypertension (≥140/90 mmHg)	24	16.0
Total	**150**	**100.0**

Prevalence of hypertension: 16.0%

Table 7. Prevalence of diabetes mellitus among study participants (n=150)

Diabetes mellitus	No. of patients	Percentage (%)
Present	30	20.0
Absent	120	80.0
Total	**150**	**100.0**

Table 8. Type of myocardial infarction among study participants (n=150)

Type of myocardial infarction	No. of patients	Percentage (%)
Anterior wall MI	90	60.0
Inferior wall MI	45	30.0
Anteroseptal MI	15	10.0
Total	**150**	**100.0**

Table 9. Left ventricular function on 2D echocardiography (n=150)

LV function (EF %)	Classification	No. of patients	Percentage (%)
EF 40–45%	Mild LV dysfunction	48	32.0
EF 30–39%	Moderate LV dysfunction	75	50.0
EF <30%	Severe LV dysfunction	27	18.0
Total		**150**	**100.0**

Table 10. Distribution of major cardiovascular risk factors among study participants (n=150)

Major risk factor	No. of patients	Percentage (%)
Smoking	105	70.0
Positive family history of CAD	54	36.0
Dyslipidemia*	126	84.0
Hypertension*	54	36.0
Diabetes mellitus	30	20.0
Overweight/obesity (BMI ≥25 kg/m²)	120	80.0

DISCUSSION

The present prospective observational study evaluated the clinical profile and major cardiovascular risk factors among 150 young adults aged 18–45 years presenting with acute myocardial infarction. The findings demonstrate that acute myocardial infarction in young adults is associated with a substantial burden of conventional and potentially modifiable cardiovascular risk factors. The predominance of males, high prevalence of smoking, dyslipidemia and excess body weight, together with

the presence of diabetes, hypertension and positive family history, emphasizes the multifactorial nature of premature myocardial infarction.

In the present study, males constituted 80.0% of the study population, while females accounted for 20.0%. The majority of patients belonged to the 36–40 years age group (48.0%), followed by those aged 31–35 years (28.0%). This concentration of cases in the later part of the young-adult age spectrum suggests that the risk of AMI increases progressively even within the relatively narrow age range of 18–45 years. Shah et al. reported that young MI is more frequently observed among males and that male sex, smoking and a family history of premature coronary heart disease are characteristic features of young MI populations [14]. Similarly, the recent Indian study by Galani et al. involving patients aged 18–45 years reported a male predominance, with 151 males and 55 females among 206 young MI patients [15]. The male predominance observed in the present study is therefore consistent with previous observations from young Indian populations.

Smoking was one of the most prominent risk factors in the present study, with 105 (70.0%) patients being smokers. Among smokers, different degrees of tobacco exposure were observed, with a mean exposure of 8.48 ± 5.46 pack-years. This finding is clinically important because tobacco exposure can accelerate atherosclerosis and contribute to premature coronary events. Shah et al. identified smoking as one of the most important risk factors for MI in young individuals and emphasized tobacco cessation as a major target for reducing premature MI [14]. Similarly, the review by Gulati et al. highlighted the distinctive risk-factor profile of young patients and recognized conventional as well as non-traditional cardiovascular risk factors as important contributors to AMI in this population [11]. In the Kerala ACS QUIK analysis, young patients with AMI were also more likely to be smokers than older patients, further supporting the importance of tobacco exposure in young Indian patients [13].

A positive family history of coronary artery disease was observed in 54 (36.0%) patients in the present study, including 36 (24.0%) patients with a history in a single parent and 18 (12.0%) with a history in both parents. The relatively high prevalence of familial predisposition suggests that inherited susceptibility may play an important role in premature coronary disease. Gulati et al. noted that young individuals with AMI may have risk profiles that differ from those of older patients and that inherited and non-traditional mechanisms should be considered in young presentations [11]. Dattoli-García et al. similarly emphasized that premature AMI may arise from both conventional atherosclerotic risk factors and other etiologies, including inherited and non-atherosclerotic mechanisms [12]. Therefore, a detailed family history should form an important component of cardiovascular risk assessment in young adults.

Excess body weight was another major finding of the present study. Overall, 120 (80.0%) participants had a BMI ≥25 kg/m², including 54 (36.0%) who were overweight and 66 (44.0%) who had BMI-defined obesity. The high prevalence of overweight and obesity indicates a substantial metabolic risk burden among young adults presenting with AMI. Dattoli-García et al. reported that changes in lifestyle and increasing prevalence of modifiable risk factors have contributed to the emergence of cardiovascular disease at younger ages [12]. The Partners YOUNG-MI Registry also emphasized the increasing importance of conventional risk factors, including obesity, diabetes, hypertension and dyslipidemia, among younger patients with MI [11]. These observations support the need for early identification and management of abnormal body weight before the development of overt cardiovascular disease.

Dyslipidemia was the most frequently observed risk factor in the present study. Overall, 126 (84.0%) patients had at least one lipid abnormality. Elevated LDL-C was observed in 60 (40.0%) patients, low HDL-C in 57 (38.0%), elevated triglycerides in 48 (32.0%) and elevated total cholesterol in 45 (30.0%). The mean LDL-C concentration was 134.26 ± 48.37 mg/dL. These findings indicate that abnormalities in lipid metabolism were highly prevalent among young patients with AMI. Gulati et al. described dyslipidemia as an important component of the cardiovascular risk profile of young individuals with AMI [11]. The YOUNG-MI Registry similarly demonstrated that conventional risk factors remain highly relevant even among very young patients experiencing MI, supporting aggressive assessment and secondary prevention [11].

Hypertension was identified in 24 (16.0%) patients, while a further 30 (20.0%) patients had prehypertension. Although the prevalence of established hypertension was lower than that of smoking, dyslipidemia and excess body weight, the presence of elevated blood pressure in more than one-third of the participants when prehypertension was included indicates an important cardiovascular risk burden. Interestingly, the YOUNG-MI Registry found a lower prevalence of hypertension among very young patients compared with somewhat older young patients, suggesting that the relative contribution of individual risk factors may vary with age [11]. The present findings reinforce the importance of identifying elevated blood pressure even in young adults who might otherwise be considered at low cardiovascular risk because of their age.

Diabetes mellitus was present in 30 (20.0%) patients. The presence of diabetes in one-fifth of young patients with AMI is clinically significant because diabetes is associated with accelerated atherosclerosis and increased cardiovascular risk. In

the Kerala ACS QUIK analysis, young patients with AMI were characterized by a substantial burden of modifiable cardiovascular risk factors [13]. The recent Indian study by Galani et al. also reported diabetes as an important comorbidity among young patients with AMI, with a higher prevalence among young women than men [15]. These findings emphasize that screening for abnormal glucose metabolism should not be restricted to older adults.

With regard to the type of infarction, anterior wall MI was the most common presentation in the present study, accounting for 90 (60.0%) patients, followed by inferior wall MI in 45 (30.0%) and anteroseptal MI in 15 (10.0%). The predominance of anterior infarction is clinically relevant because anterior myocardial infarction may involve a larger myocardial territory and can be associated with greater impairment of ventricular function. The recent Indian study by Galani et al. also reported anterior MI as the most common presentation and identified the left anterior descending artery as the most frequently affected coronary artery among young Indian patients [15]. Thus, the pattern observed in the present study is broadly consistent with contemporary Indian data.

Echocardiographic evaluation in the present study revealed LV dysfunction in all participants, with mild dysfunction in 48 (32.0%), moderate dysfunction in 75 (50.0%) and severe dysfunction in 27 (18.0%) patients. Moderate LV dysfunction was the most frequent category. These findings indicate that AMI in young adults can be associated with considerable impairment of ventricular function despite the relatively young age of the affected population. Shah et al. noted that although short-term prognosis following MI in young patients is generally favourable, reduced left ventricular systolic function may have implications for longer-term prognosis [14]. Galani et al. also reported clinically relevant reductions in LVEF among young Indian patients, with a substantial proportion demonstrating LVEF below 40% [15].

The present findings also support the concept that young AMI should not be regarded as a condition caused exclusively by a single risk factor. Rather, many patients demonstrated multiple coexisting risk factors, particularly smoking, dyslipidemia and excess body weight. Dattoli-García et al. emphasized that most of the commonly observed risk factors in young AMI are potentially modifiable, while non-atherosclerotic causes should also be considered when appropriate [12]. Gulati et al. similarly highlighted the heterogeneity of AMI mechanisms in young individuals, including plaque rupture as well as plaque erosion, coronary spasm, spontaneous coronary artery dissection and other less common mechanisms [11]. Consequently, comprehensive clinical evaluation is particularly important in young patients, especially when the conventional risk-factor burden does not fully explain the clinical presentation.

The findings from the present study are also relevant in the Indian context. The Kerala ACS QUIK analysis demonstrated that young patients with AMI represented a clinically important group within a large Indian cohort and had a substantial prevalence of modifiable risk factors [13]. The study also highlighted sex-related differences in risk-factor burden and management among young patients. Similarly, Galani et al. reported that young Indian men had considerably higher smoking prevalence, whereas hypertension and diabetes were more common among young women [15]. Although the present study was not primarily designed to investigate sex-specific differences, the marked male predominance and high prevalence of smoking observed in our population indicate that gender-specific preventive strategies may be valuable.

The results should be interpreted in light of certain limitations. The study was conducted in a hospital-based population and therefore may not represent the prevalence of cardiovascular risk factors among all young adults in the community. The study was also observational and was primarily designed to describe the clinical profile and risk-factor distribution; therefore, causal relationships between individual risk factors and AMI cannot be established. In addition, long-term follow-up and detailed evaluation of less common causes of AMI, such as spontaneous coronary artery dissection, coronary vasospasm, thrombophilia and substance-associated myocardial infarction, were not the primary focus of the present investigation. Nevertheless, the prospective assessment of 150 young patients provides useful information regarding the contemporary clinical and risk-factor profile of AMI in this age group.

Overall, the present study demonstrates that young adults presenting with AMI frequently have a substantial burden of preventable cardiovascular risk factors. The high prevalence of smoking, dyslipidemia and excess body weight is particularly noteworthy. These findings reinforce the need for earlier cardiovascular risk assessment, lifestyle modification, tobacco cessation, screening for metabolic abnormalities and appropriate management of dyslipidemia, hypertension and diabetes in young adults.

CONCLUSION

The present study demonstrates that acute myocardial infarction in young adults aged 18–45 years is associated with a considerable burden of cardiovascular risk factors. There was a marked male predominance, with most patients belonging to the 36–40 years age group. Smoking, dyslipidemia and overweight/obesity were the most frequently observed risk factors, while positive family history of CAD, hypertension and diabetes mellitus were also commonly present.

The high prevalence of potentially modifiable risk factors highlights the importance of early cardiovascular risk identification and preventive intervention in young adults. Particular emphasis should be placed on tobacco cessation, maintenance of healthy body weight, lipid control, blood-pressure monitoring, diabetes prevention and appropriate lifestyle modification. The predominance of anterior myocardial infarction and the substantial proportion of patients with impaired left ventricular function further emphasize the clinical significance of AMI even at a young age.

Early recognition of cardiovascular risk factors and aggressive implementation of preventive strategies may help reduce the occurrence of premature myocardial infarction and its long-term consequences. Larger multicentric prospective studies with long-term follow-up are recommended to further characterize the clinical profile, underlying mechanisms, angiographic patterns and outcomes of AMI among young adults in the Indian population.

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