

# Clinical and angiographic profile of very young adults presenting with first acute myocardial infarction: A study from tertiary care hospital

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## Abstract:

**Introduction:** “Coronary artery disease (CAD)”, a primary cause of death worldwide, is rising in India due to a shift from communicable to non-communicable diseases. Though rarer, young adults can be affected, causing physical, psychological, and financial problems. Lifestyle, genetics, and substance misuse are risk factors, and young and older patients have different angiographic profiles and treatment techniques. Effective management and prognosis need to understand these issues. Aims and objectives: This study was done retrospectively to evaluate and analyze the clinical and angiographic profile of the young patients less than 35 years presenting as acute myocardial infarction. **Method:** The retrospective study at Himalayan Institute of Medical Sciences, India, analyzed 104 Acute Myocardial Infarction patients from August 2022 to Aug 2023. Patients underwent angiography, with data analyzed by gender. Inclusion criteria: history of acute MI, angiography, specialist examination. Exclusion: chronic non-cardiological conditions, incomplete specialist diagnosis. Statistical analysis used SPSS 25, ANOVA, mean/SD for continuous data, frequency/percentage for discrete data ( $p < 0.05$  significance level). **Result:** Risk factors were male gender (90%), dyslipidemia, and smoking (29.3%). Anterior wall myocardial infarction (AWMI) was the most common presentation (82.9%) with obstructive CAD noted in 61% cases frequently due to LAD coronary artery involvement was more common. **Conclusion:** The study has concluded that Acute Myocardial Infarction is more common in male population with smoking as most important risk factor.

**Keywords:** myocardial infarction, chest pain, diabetes, smoking, females, coronary artery disease.

## Introduction:

Currently acknowledged as the leading cause of death is coronary artery disease (CAD) on a global scale, and it is projected to become the main contributor to impairment by the year 2020. India is

currently experiencing an epidemiologic transition characterized by a gradual decrease in the prevalence of communicable diseases and a simultaneous rapid increase in the prevalence of

non-communicable diseases (NCDs). As a result, India is confronted with the challenge of managing a dual burden of disease. According to current The incidence of coronary heart disease (CHD) according to epidemiological studies is estimated to be between 7% and 13% in metropolitan areas, from 2% to 7% in rural communities [1,2]. Coronary artery disease (CAD) usually manifests as acute myocardial infarction (AMI). Despite the relatively low frequency of coronary artery disease (CAD) among those under the age of 40, comprising only 3% It is significant to highlight that of the overall patient population this demographic is not entirely exempt from the condition [3]. Furthermore, there is limited literature regarding acute myocardial infarction (AMI) in individuals who are  $\leq 35$  years old, however, it is believed to occur in less than 2% of cases. Furthermore, the occurrence of this condition at a young age imposes a considerable cost on the patient and their family, including not just physical health implications but also psychological distress and financial strain. This is particularly noteworthy since it affects individuals in their prime working years [4].

Globally, coronary artery disease (CAD) is recognised as a prominent contributor to mortality rates among individuals of all genders. The prevalence of computer-aided design (CAD) is diminishing in emerging countries, a trend that can be attributed to various economic and societal influences. The rate of coronary artery disease (CAD) has a proportional increase as the number of risk factors escalates [5]. There exists a wide range of risk factors, angiographic data, and clinical conditions that exhibit variability between young and old patients. These variations have significant implications for the prognosis of individuals. By conducting thorough investigations and implementing appropriate care strategies, it is possible to achieve a more favourable prognosis for young adults with coronary artery disease (CAD). Regarding the clinical signs, screening, therapy, and avoidance of coronary artery disease (CAD), gender is equally important to take into account [6].

Additional danger signs for coronary artery disease (CAD) include hypertriglyceridemia, dietary habits, high lipoprotein-a, decreased levels of density lipoprotein cholesterol (HDL-C), metabolic syndrome, and the unwanted effects of modernization, which often lead to a sedentary yet stressful lifestyle [7]. In addition to tobacco consumption, the occurrence of elevated Individuals under the age of 30 who experience Drug or alcohol addiction is usually present in patients with elevated ST segments acute myocardial infarction (STEMI). other unusual risk factors, such as hyperhomocysteinemia. The present state of knowledge on the treatment and results for young

children and newborns There are few studies on ST-elevation myocardial infarction (STEMI), and its definition is unclear. Acute myocardial infarction (AMI) in young persons who have undergone coronary angiography (CAG) had a comparably high proportion for non-obstructive stenosis and single-vessel disease [8,9].

Mild myocardial infarction (MI) is a diagnosis that can be established using a combination of electrocardiogram (ECG), cardiac biomarkers, and clinical presentation findings. The clinical manifestation Most young adults' acute myocardial infarction (MI) bears a resemblance to that observed in older individuals, with the majority of people displaying chest symptoms discomfort. The likelihood of a delayed diagnosis Among young individuals the risk of acute myocardial infarction (MI) arises since there is less suspicion and the presence of unusual symptoms in certain patients [10]. The contractile apparatus present inside The cardiac troponins I & T (cTnI & cTnT) are a component of myocardial cells exhibiting a nearly unique expression pattern exclusive to the cardiac tissue. Elevated cardiac troponin I (cTnI) readings are observed solely in cases of cardiac tissue damage. Both heart-related troponins I (cTnI) & T (cTnT) are well-accepted biomarkers for assessing myocardial damage and are advised for regular clinical utilization [11,12].

Young individuals who experience elevated ST-segment myocardial infarction (STEMI) often tend to misinterpret their chest pain as being caused by alternative factors, resulting in delayed presentation. Furthermore, healthcare providers attending to these patients are also less inclined to recognize cardiac aetiology as the origin of such discomfort in the pediatric population, leading to the withholding, inadequacy, or delay of appropriate medical attention [13]. The characterization of care and outcomes for infants and young children diagnosed with elevated Myocardial infarction with ST-STEMI section is still not fully comprehended. Young adults with acute myocardial infarction who undergo coronary angiography (CAG) have a substantial incidence of single-vessel disease, undamaged coronary arteries, and non-obstructive coronary artery disease stenosis. It appears that individuals in the younger age group have reduced morbidity rates while maintaining comparable mortality rates [14].

In angiographic terms, there exists a distinction between young individuals and older patients, since the former often exhibit normal coronary arteries or single vessel disease, while the latter tend to present with complex disease. Consequently, the therapy strategies employed for these patients may necessitate divergence [15,16]. Three main risk

factors have been linked to according to a study, coronary artery disease (CAD) among young persons research by Zeitouni *et al.* Smoking, elevated blood pressure, and having a history of the illness in the family are some of these risk factors. It is important to comprehend the typical course CAD), a kind of coronary artery disease. According to a study, there are three primary risk factors associated with coronary artery disease (CAD) among young people research by Zeitouni *et al.* Smoking, elevated blood pressure, and having a history of the illness in the family are some of these risk factors. It is important to comprehend the typical course of coronary artery disease (CAD). Three main risk factors have been linked to coronary artery disease (CAD) in young people, according to research by Zeitouni *et al.* Smoking, elevated blood pressure, and having a history of the illness in the family are some of these risk factors. It is important to comprehend the typical course of coronary artery disease (CAD) of utmost significance due to its implications on treatment modalities and the overall prognosis of the disease [17,18]. This current study has explored the clinical and angiographic findings and analyzed between males and females.

## Methods

### Research Design

This is a retrospective study which was conducted at the Himalayan Institute of Medical Sciences, Uttarakhand, India. The study considered 104 patients with Acute Myocardial Infarction who visited the Outpatient department of the hospital between December, 2022 and August, 2023. The patients were asked for a detailed history and underwent angiography. The data was obtained by the study authors and were analyzed with respect to the gender. The patients underwent coronary angiography and the artery blockage was also determined. The final diagnosis was made by two specialized cardiologists blinded to each other.

### Inclusion and Exclusion Criteria

The study included patients who visited the hospital and had a history of acute MI. The patients who also underwent coronary angiography and other biochemical tests, leading to his or her diagnosis, were only included. The patients who had been examined by two specialized cardiologists blinded to each other, were included. The patients who had chronic underlying non-cardiological conditions like diabetes or compromised kidney, may affect our study and so, they were excluded. The patients who did not complete the diagnosis by two specialized cardiologists, were also excluded.

### Statistical Analysis

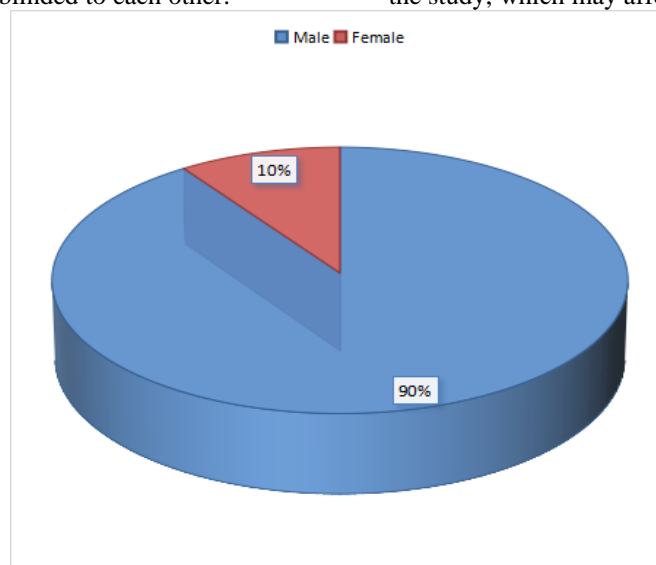
The study used SPSS 25 for effective analysis. The study has employed MS excel for creating graphs while ANOVA was employed to analyze the data between male and female. The continuous data has been written in mean  $\pm$  standard deviation while the discrete data has been presented as frequency and its respective percentage. The level of significance was considered to be  $p < 0.05$ .

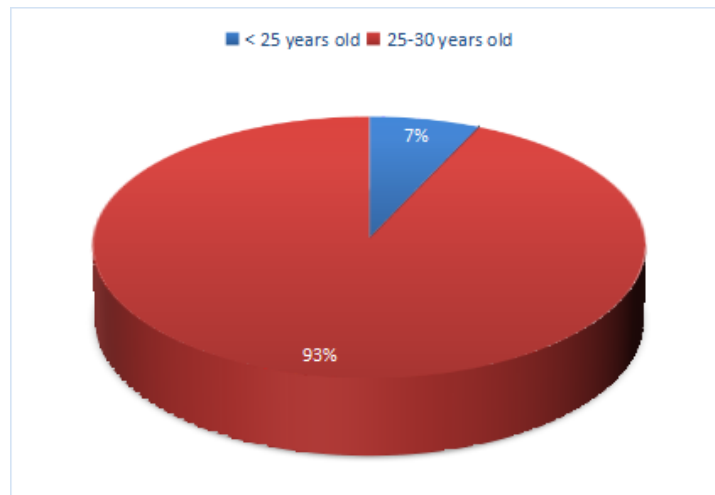
### Ethical Approval

All the patients were informed about the study and consent of the hospital authority was duly taken. The Ethical Committee of the hospital approved the study process and the data privacy was maintained.

### Results

Figure 1 shows the study's patient demographics by age and gender. Note that 90% of the research patients are male and 10% are female. The bulk of patients, 93%, are 25-30 years old. Young people under 25 make up only 7%. This shows a gender imbalance among study participants, with a higher number of men. The high number of 25-30-year-old patients shows that this demographic is important to the study, which may affect its findings.





**Figure 1:** Sex distribution and age group distribution among the patients in this study

Table 1 presents diagnostic data categorised by gender, demonstrating significant variations between males and females. The prevalence of history of Coronary Arterial Grafting procedure is substantially higher in males (26 instances) than in females (4 cases), with a p-value of 0.043, suggesting males underwent CAG significantly higher than females. The authors also found that there is a higher incidence of Percutaneous Transluminal Coronary Angioplasty diagnoses

among males (61 instances) compared to females (6 cases), as indicated by a p-value of 0.0421. The results of this study indicate that there may be gender-related differences in the prevalence and outcomes of these two cardiac disorders. Therefore, it is necessary to conduct additional research in order to gain a deeper understanding of the potential risk factors or treatment strategies that may vary between males and females in these specific situations.

**Table 1:** Diagnosis or diagnostic tests that males and females separately underwent and their analysis

Diagnosis	N	Male	Female	p-value
Single Vessel Disease	89	1	0	-
Double vessel disease	5	1	0	-
Multivessel disease	4	1	0	-

Table 2 shows the arteries involved in male and female cardiac diagnoses. The Left Anterior Descending artery (LAD) is most often damaged in men, with 53 occurrences compared to 3 in women. Males have 17 Right Coronary Artery (RCA) instances compared to 3 females. Males (9 cases) have higher Left Circumflex artery (LCX)

involvement than females (1 case). Furthermore, LAD/LCX involvement is documented in 90% of males (3 cases) and 100% of females (1 case). This suggests a gender gap in artery involvement in cardiac diagnosis, with LAD and RCA involvement being more common in men. These differences need further study to determine clinical implications.

**Table 2:** Involved arteries in males and females

Arteries	Male	Female
LAD	63	3
RCA	17	3
LCX	9	1
Double vessel disease	5	1
TVD	4	0

Minor RCARCA 50%	2	0
MINOR CAD-LAD	4	0

LAD - Left Anterior Descending (coronary artery); RCA - Right Coronary Artery; LCX - Left Circumflex (coronary artery); LAD/LCX 90% - Left Anterior Descending/Left Circumflex arteries are 90% blocked; TVD - Triple Vessel Disease (refers to significant blockages in all three main coronary arteries); LAD 80% LCX 70% RCA 90% - Left Anterior Descending artery is 80% blocked, Left Circumflex artery is 70% blocked, Right Coronary Artery is 90% blocked; RCA 50% - Right Coronary Artery is 50% blocked; MINOR CAD-LAD - Minor Coronary Artery Disease in the Left Anterior Descending artery; MID/ LAD - Middle of the Left Anterior Descending artery; LAD/RCA 90% - Left Anterior Descending/Right Coronary Artery are 90% blocked

Table 3 shows the distribution of MI risk variables in men and women and their p-values. The data shows numerous notable trends. First, SMOKER/DYSLIPIDEMIA is more common in men (64 cases) than women (7 cases), with a p-value of 0.047. Non-obstructive conditions are more common in men (24 instances) than women (2 cases) (p-value 0.0365). Additionally, SVD and TVD are recorded in both genders but do not demonstrate statistical significance in gender distribution. One girl has Diabetes Mellitus (DM), but no males do. These findings show that smoking and dyslipidemia are more likely to be risk factors for MI in men, while diabetes may be more common in women. Further research is needed to understand how these variables affect MI prevention and care in both genders.

**Table 3:** The risk factors of Myocardial Infarction found in males and females

Risk Factors	Total	Male	Female	P-value
SMOKER	71	64	7	0.047
Dyslipidemia	26	24	2	0.0365
Obesity	4	4	0	-
Physical inactivity	1	1	0	-
DM	1	0	1	-

SVD - Single Vessel Disease (refers to significant blockage in one coronary artery); TVD - Triple Vessel Disease (refers to significant blockages in all three main coronary arteries); DM - Diabetes Mellitus

## Discussion

India is presently situated at the fourth stage of epidemiological changes, when cardiovascular disease has replaced other causes as the main contributors to morbidity and mortality. The purpose of this study was to evaluate the risk variables, medical history, angiographic persona (including severity), and in-hospital outcome of individuals in the young adult age group (30 years) who experienced their initial episode of acute myocardial infarction (AMI) in the fourth stage of epidemiological transitions, where heart disease has been recognised as the leading cause of both mortality and morbidity. In this investigation, risks, clinical manifestation, angiographic image (including severity), as well as in-hospital prognosis

were assessed in initially acute myocardial infarction (AMI) patients in the young adult age range (30 years) [19]. Acute myocardial infarction (AMI) tends to manifest more frequently in the male population during early adulthood. The prevalence of smoking emerged as the predominant risk factor [20]. The most prevalent manifestation was acute wall motion abnormality (AWMI), mostly attributed to the involvement of the left anterior descending (LAD) artery. The average duration between the beginning of symptoms and the commencement of the presentation was found to be 16.9 hours. In comparison to the population in Western countries, this particular population exhibits distinct characteristics such as an earlier beginning of the



condition, delayed presentation, greater intensity of symptoms, a more widespread manifestation of the disease, and increased morbidity. However, it is worth noting that despite these factors, there is a relatively positive outcome in terms of death rates inside the hospital setting [22,23].

A retrospective In order to determine the risk factors & clinical symptoms of acute coronary artery disease (MI) among individuals under the age spanning 40 who seek medical treatment in the emergency room (ED) of a community hospital, a cross-sectional study was conducted over a period of seven years. A total of 209 consecutive instances of first myocardial infarction (MI) that satisfied the criteria set by the World Health Organisation (including chest pain, electrocardiogram abnormalities, and elevated blood enzymes) and were admitted to one of the five hospitals included in the study were examined [24]. Tobacco use emerged as the primary risk factor, with family history, hypertension, and hyperlipidemia following suit. A total of 183 patients had electrocardiographic (ECG) indications of cardiac ischemia, damage, or infarction upon entry into an emergency department (ED). Angiography results showed that 24.2% of the patients exhibited multi-vessel coronary atherosclerosis, while 62% displayed single-vessel disease [20,21]. Additionally, 14.3% of the patients had normal coronary arteries. The inferior wall was identified as the most prevalent anatomical site for myocardial infarction (MI). The present study aims to provide an academic characterization that Discusses the epidemiology of young people's acute myocardial infarction (MI). The results showed many crucial observations: First of all, smoking became the primary danger signal for coronary events in this population. Secondly, atherosclerosis remained the predominant cause of acute MI. Thirdly, angiography commonly revealed single-vessel disease, which led to a weakening of the lower wall. Last but not least, the in-hospital death rate was noticeably low at 1.9%, despite the fact that the rate of complications in young individuals was comparable to that seen in older groups [23,25].

A retrospective analysis was conducted on the medical records of 2,400 people who had cardiac catheterizations in a row in USAF Medical Centre Keesler during the period from 1978 to 1984. The study identified a total of 35 patients, accounting for cardiac catheterization performed in 1.5% of patients having a cardiac catheterization who were 35 years of age or younger (as well as a mean age of 32 years) subsequent to experiencing a myocardial infarction [26, 27]. A cohort of 35 patients (designated as group 1) and a randomly chosen cohort of 100 patients (designated as group 2), both of whom were 55 years of age or older and had undergone a cardiac catheterization for the same

period of time to assess coronary artery disease. The examination of risk factors indicated that In both groups, smoking was the main risk factor. In group 2, diabetes and hypertension were more common. Despite their asymptomatic state and capacity to complete None among the 19 patients in group 1 who had cardiac catheterization completed stage 4 of the Bruce protocol activity test and predictive assessment had any symptoms exhibited any surgically correctable remaining disease [24].

In another study, A total of 68 individuals who had experienced cardiovascular disease before the age of thirty-six were included in this study. Selective coronary cine arteriograms were conducted on all participants, irrespective of their symptoms. The study identified three distinct patient groups. The first group consisted of 56 patients, accounting for 82 per cent of the total, who exhibited obstructive coronary arterial disease. The second group comprised nine patients, representing 13 per cent of the total, who displayed normal coronary arteries. The third group consisted of three patients, making up 4 per cent of the total, who exhibited congenital coronary arterial malformations. Due to the varying prognoses shown within these three cohorts, it is recommended that all young individuals who have experienced myocardial infarction receive coronary arteriographic examinations following an appropriate time of recuperation. Myocardial infarction's incidence in younger individuals is distinct from that in older individuals due to a greater diversity in the underlying structure of the coronary arteries, a much higher proportion of male patients, and a comparatively more favourable prognosis as documented in studies [25].

Global cardiovascular mortality is significantly influenced by ST-elevation myocardial infarction (STEMI). The demographics of young individuals having ST-segment elevation myocardial infarction (STEMI) and their older counterparts differ significantly [20]. The purpose of this study is to examine the clinical signs and demographic characteristics of a group of young people who have ST-segment elevation myocardial infarction (STEMI). There was a greater frequency of various risk variables in the cohort of young people with an ST-elev myocardial infarction (STEMI), including male gender, cigarette smoking, previous history of coronary artery disease, & elevated levels of triglycerides. A significant percentage of the adolescent patients exhibited multi-vessel coronary disease. The younger patients showed a preference for PCI or medical treatment as their primary choice of treatment, while the older patients more frequently opted for CABG as a means of revascularization [26].

One sign of coronary artery disease is thought to be acute myocardial infarction (AMI) and is believed to be more prevalent among those in younger age groups within this particular geographical area [21]. The primary purpose of the research was to evaluate the angiographic, biochemical, and clinical aspects of individuals experiencing their initial episode of acute myocardial infarction. The study demonstrates that the age at which individuals experienced their first acute myocardial infarction (AMI) was similar to that observed in Western countries. Women have increased rates of diabetes and hypertension. Individuals who are younger, do not have diabetes and engage in smoking behaviour display single-vessel disease more frequently. People who have diabetes the elderly population exhibit a higher propensity for the presence of diffuse illness, specifically three-vessel disease (TVD) [27].

### Conclusion

The study has concluded that Acute Myocardial Infarction is predominantly male preponderance, including the diagnosis or diagnostics they had and the risk factors. The males had significantly higher smoking history as compared to females. However, SVD and TVD is almost similar among the males and females. On the other hand, diabetes was found to be more prevalent among the females. The observed gender imbalance among participants, with a predominance of males, underscores the need for further investigation into potential gender-related differences in prevalence and outcomes. Significantly higher incidences of Coronary Arterial Graft diagnoses and Percutaneous Transluminal Coronary Angioplasty diagnoses in males highlight the importance of tailored treatment approaches. The analysis of MI risk variables reveals distinct patterns, with smoking and dyslipidemia emerging as prominent risk factors in men, while diabetes may play a more significant role in women. These findings underscore the importance of gender-specific considerations in the prevention and management of myocardial infarction. Additional research is warranted to elucidate the underlying mechanisms and refine targeted interventions for both male and female populations.

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