

# Emerging Trends: Myocardial Infarction in Young Adults - Exploring Patterns of Coronary Artery Involvement and Underlying Risk Factors



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## Abstract

**Background:** Myocardial infarction (MI) in young adults, defined as those aged less than 45 years, presents unique challenges due to its atypical etiology and potential long-term impact. This study aims to investigate the pattern of coronary artery involvement in this demographic, shedding light on the underlying factors contributing to MI in this age group. Historically considered as a disease of the elderly, MI in the young has been largely overlooked due to its relatively infrequent occurrence. Nevertheless, the potential consequences are far-reaching, affecting not only the individual's quality of life but also societal healthcare costs and productivity. The unique characteristics and distinct etiology of MI in young adults demand a comprehensive understanding to facilitate targeted prevention, accurate diagnosis, and effective management strategies.

**Methods:** A retrospective analysis was conducted on a cohort of 118 young patients diagnosed with MI between 20th December 2021 and 20th December 2022. Demographic, clinical, and angiographic data were collected from medical records and angiogram reports. The distribution of coronary artery involvement and associated risk factors were analyzed.

**Results:** A total of 118 patients (mean age 39.4 years) were included in the study. Among them, 97 (82.2%) were male, 21 (17.8%) were females. The most common risk factors observed were Smoking (45%), Diabetes (23%), Hypertension (22%). The pattern of coronary artery involvement exhibited variations from the classic distribution seen in older MI patients. 85.5% of patients displayed single-vessel disease, 11.8% had two-vessel disease, and 2.5% exhibited three-vessel disease. Notably 57% of cases showed involvement of the left anterior descending artery, 20% involved the right coronary artery and 18% affected the left circumflex artery. Mortality is seen in 3 patients.

**Conclusion:** The prevalence of MI in people under the age of 40 was mainly seen in males with single vessel disease. Major risk factors seen in our study are smoking, hypertension and diabetes. Early detection and appropriate management of risk factors are crucial in preventing heart attacks in young people. Further research is warranted to elucidate the underlying mechanisms contributing to MI in this demographic, enabling targeted prevention and management strategies.

**Keywords:** Myocardial infarction; Young adults; Coronary artery involvement; Risk factors; Angiography; Retrospective analysis

**Abbreviations:** MI: Myocardial Infarction; CVDS: Cardiovascular Diseases; CAD: Coronary Artery Disease; ACS: Acute Coronary Syndrome; AMI: Acute Myocardial Infarction; BMI: Body Mass Index; FMD: Fibromuscular Dysplasia

## Introduction

Cardiovascular diseases (CVDs) have now become the leading cause of mortality globally and also in India [1]. Although the primary cause of coronary artery disease (CAD), atherosclerosis, frequently begins in childhood, symptoms of CAD and acute

coronary syndrome (ACS) typically first appear after the sixth decade of life [2]. The most frequent presentation of CAD is acute coronary syndrome (ACS) [3]. According to data, Asian Indians are more likely than the general population in the west to have CAD, with symptoms appearing ten years earlier [4]. In India,

there may be over 30 million people with CAD, according to estimates. Despite the paucity of available information, it has been found that young patients' clinical and coronary angiographic profiles differ significantly from those of individuals who develop CAD later in life [5]. Acute myocardial infarction (AMI) in young adults is typically uncommon compared to the elderly, and its etiology is frequently complex and variable, with several underlying medical and behavioural risk factors [6]. Lifestyle changes, including sedentary behavior, poor dietary habits, and increasing stress, have created fertile ground for cardiovascular risk factors to manifest earlier in life. Moreover, the interplay of genetic predisposition, inflammatory processes, and potential environmental triggers further complicates the understanding of MI pathophysiology in this age group. The goal of the current study is to investigate the risk factors and coronary angiographic profile of very young adults who were presented with STEMI. The alarming rise in MI incidence among the young population has garnered attention from clinicians, researchers, and public health experts alike.

## Materials and Methods

This study was carried out in the cardiology department of a large multi-specialty hospitals in South India. Patients over 20 years and less than 45 years who were diagnosed with Acute MI and presented to the coronary care unit within 24 hours of their symptoms were included in the study. The exclusion criteria for the study were acute decompensated heart failure, advanced malignancies, acute pulmonary thromboembolism, chronic kidney disease (eGFR <30 ml per minute), advanced chronic obstructive lung disease, LVEF <30%, intractable life-threatening ventricular arrhythmias at the time of admission. Every patient underwent a detailed medical history to assess the cardiac risk factors for coronary artery disease (CAD). These risk factors are comprised of age, gender, presenting symptoms, hypertension, smoking, obesity, diabetes mellitus and previous history of CAD. Acute Myocardial infarction was defined as the characteristic rise and fall of cardiac markers of myocardial necrosis with at least one of the following:

- i) Echocardiographic evidence of new regional wall motion abnormality.
- ii) Electrocardiogram (ECG) changes indicative of ischaemia (ST elevation or depression)
- iii) Ischaemic symptoms
- iv) Development of Pathological Q waves in ECG

Hypertension was defined as self-reported high blood pressure and the consumption of antihypertensive drugs. It was also defined as a blood pressure of >140/90 mm Hg by a standardized blood pressure measuring device in those without a history. Diabetes mellitus was defined as a fasting glucose level of >126 mgs or a history of consumption of hypoglycemic drugs. Hypercholesterolemia was defined as fasting serum total

cholesterol of >200 mg/dl. The body mass index (BMI) was calculated using the WHO criteria for Asian population by using the formula: body weight (in kgs)/square of the height in metre (m<sup>2</sup>). The treatment of ACS, dyslipidemia and hypertension was carried out as per the guideline-based recommendations. Written informed consent was taken from all the subjects who participated in this study. The study protocol was approved by the Institutional Ethics Committee on human research.

## Results

Out of 118, 97 (82.2%) were males and 21(17.8 %) were females with a mean age of 39.4 years.76% belonged to age group 36-40 years, 23% belonged to age group 31-35 years and 1.6% belonged to the age group 25-30 years. Most of the patients were presented with chest pain. Similarly, some of them also presented with complaints like sweating, breathlessness, palpitation and restlessness. Most of the patients were presented with STEMI 103 (87.2%) followed by NSTEMI 15 (12.7%). It can be seen that smoking constitutes about 45.7% of the risk factors followed by Hypertension (22%) and Diabetics (23.7%) (Table 1).

Significant coronary stenosis was found in 89 patients (75.4%). 36 patients were thrombolysed (30.5%). Most of the patients has single vessel disease 101(85.5%) followed by double vessel disease 14(11.8%). Mortality was seen in 3 patients (2.5%) (Table 2).

## Discussion

Despite the fact that myocardial infarction (MI) primarily affects the elderly, data indicate that between 2-10% of all patients hospitalized with acute MI are under 45 years old [6], with some research indicating a higher incidence of CAD in very young kids [7]. Young people with MI can be classified into two groups: those with coronary arteries that are angiographically healthy and those with coronary artery disease (CAD). Young MI patients with normal coronary arteries are not uncommon. They may develop MI due to spasm, embolization, thrombosis, or arteritis. Similar to venous thrombosis, protein C and protein S deficiency, antiphospholipid syndrome, and nephrotic syndrome are hypercoagulable conditions that can cause coronary thrombosis [8]. Coronary artery spasm in young individuals could be due to cocaine abuse as well as in conjunction with alcohol binges [9]. The second group of young MI is mostly due to atherosclerotic process which starts in early childhood. Athermanous CHD's etiology is restricted to traditional risk factors, with some variations from adults. In our study, smoking was the common risk factor found in 87% of patients. Likewise, Zimmerman et al., reported 92% of young CAD patients are smokers [10]. Other high risk factors were hypertension (22%) and diabetics (23%). Poorly controlled diabetes in young individuals can contribute to the development of atherosclerosis and increase the risk of MI. Uncontrolled high blood pressure can damage blood vessel walls and increase the risk of MI, even in young individuals. Some of the risk factors are homozygous familial hypercholesterolemia, which appears to

have the strongest correlation with early atherosclerosis and MI [11]. Therapeutic and illegal drug use, hypercoagulable states, insulin resistance, obesity, inactivity, and stress are additional risk factors for MI in young people [12].

**Table 1:** Clinical profile and risk factors of the patients.

Details	Count	Percentage
Gender		
Male	97	82.2
Female	21	17.8
<b>Age group</b>		
25-30	2	1.69
31-35	23	19.49
36-40	76	64.4
40-45	17	14.44
Mean age		39.41yrs
<b>Presenting symptoms</b>		
Chestpain	112	94.9
Sweating	50	42.37
Breathlessness	30	25.42
Palpitations	10	8.47
Restlessness	6	5.08
<b>ECG changes</b>		
Nstemi	15	12.71
Stemi	103	87.29
Anterior wall mi	65	55.08
Inferior wall mi	32	27.12
Lateral wall mi	4	3.39
Inferoposterior wall mi	2	1.69
<b>LVEF</b>		
<40	9	7.63
40-45	30	25.42
45-50	30	25.42
50-55	15	12.71
>55	34	28.81
<b>Risk factors</b>		
Smoking	54	45.76
Alcoholic	19	16.1
Htn	26	22.03
Dm	28	23.73
Cad	3	2.54
Hypertriglyceredimia	16	
<b>BMI</b>		
18 to22	64	54.24
23 to 25	29	24.58
25 to 30	17	14.41
>30	8	6.78

**Table 2:** Coronary Angiography Findings.

Coronary artery stenosis		
Critical stenosis	89	75.42
Mild stenosis	9	7.63
Insignificant stenosis	20	16.95
Artery involved		
Lad	68	57.63
Rca	24	20.34
Lcx	22	18.64
Om	4	3.39
Thrombolysis	36	30.51
Vessels involved		
Single vessels diseases	101	85.59
Double vessels diseases	14	11.86
Multiple vessels diseases	3	2.54
No of stents		
Single stents	86	72.88
Two stents	32	27.12
Follow ups		
Dead	3	2.54
Lost follow up	8	6.78
Doing well	107	90.67

One of the uncommon causes of MI, particularly in young women during the peripartum period, is spontaneous coronary dissection. MI for younger people may potentially be brought on by a ruptured coronary artery. These could be inherited or acquired as a result of childhood Kawasaki’s disease [13]. Another extremely uncommon cause of MI in young people, particularly in women, is fibromuscular dysplasia (FMD). It is an idiopathic vasculopathy that affects small- to medium-sized arteries and is not atherosclerotic or inflammatory. Each time, the proximal vessel seemed normal, but the middle or distal segment abruptly changed from normal to have diffuse obliterative illness. The angiographic findings of young MI people are generally different from those in older adults. Most of the patients had single vessel disease (87%) which is in line with Xie et. Al. study conducted in young Asian women [14].

### Conclusion

The prevalence of MI in people under the age of 40 was mainly seen in males with single vessel disease. Major risk factors seen in our study are smoking, hypertension and diabetes. Early detection and appropriate management of risk factors are crucial in preventing heart attacks in young people. This paper aimed to delve into the epidemiology, risk factors, clinical presentation,

diagnostic challenges, and management considerations specific to MI in young adults. By exploring the multifaceted nature of MI in this demographic, we hope to pave the way for improved awareness, early detection, and tailored interventions that address the unique needs of young individuals experiencing this life-altering event.

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