

# Clinical, Angiographic Profile and Short-term Prognosis in Patients with ST Elevation Myocardial Infarction- A Cross-sectional Study

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## ABSTRACT

**Introduction:** Acute Myocardial Infarction (MI) is one of the most common causes of death and disability throughout the world. The most common of all Acute Coronary Syndrome (ACS) in Indian patients is acute ST Elevation Myocardial Infarction (STEMI). Although acute MI more commonly occurs in patients older than 45 years of age, young men and women can also have MI.

**Aim:** To study the risk factors, clinical presentation, angiographic profile and short-term prognosis in patients with STEMI with age  $\leq 45$  years.

**Materials and Methods:** A cross-sectional study was carried out in the Department of Cardiology, SCB Medical College and Hospital, Cuttack, Odisha, India. A total of 198 patients of age  $\leq 45$  years with acute STEMI, of both genders diagnosed based on symptoms, Electrocardiogram (ECG), Echocardiogram (Echo) and biomarkers were enrolled from June 2019 to November 2020. Categorical variables were tabulated in frequency with percentage distribution and continuous variables were summarised in mean $\pm$ SD (Standard Deviation).

**Results:** This study included 198 patients, aged  $\leq 45$  years, with STEMI. STEMI was more common in males. The mean age was 38.28 and 42.15 years for males and females, respectively. Smoking (63.5%) was the most common risk factor, followed by dyslipidemia (28.5%). Most of the patients (86.5%) presented with typical chest pain. Killip's Class I was most common (92.5%) at the time of admission. Anterior Wall Myocardial Infarction (AWMI) was the presentation in the majority (61%). Most patients (47%) had Single Vessel Disease (SVD). One third of the patients had re-canalysed vessels. Type A lesion was commonly seen (61%) and 60% patients underwent coronary angioplasty.

**Conclusion:** In young STEMI patients males were commoner and smoking and dyslipidemia were found to be the common risk factors, smoking being twice more common than dyslipidemia. Typical chest pain of Killip Class I and AWMI were seen in majority. Half of the patients had SVD and one third was found to be re-canalysed. Type A was the commonest lesion and two thirds of the study population could undergo coronary angioplasty.

**Keywords:** Acute coronary syndrome, Coronary artery disease, Young myocardial infarction

## INTRODUCTION

Acute MI is one of the most common causes of morbidity and mortality in the whole world as well as developed nations. Despite respectable advancements within the management of infarction, there is a substantial scope for the betterment of end result of the patients. India has a huge burden of ACS [1]. A lot of the knowledge about patients with ACS is from registries which provide data on the demography, treatments and outcomes. In India, the most frequent among all ACS is acute STEMI [2]. More often than not, younger patients are more likely to be male, have a history of smoking and hyperlipidemia but less likely to have other co-morbidities and demonstrate less extensive Coronary Artery Disease (CAD) or normal on coronary angiography. A study showed that smoking played a predominant role in 82% patients whereas cocaine in 4% patient with STEMI [3]. Traditionally, CAD is disease of elderly. However, younger people less than 45 years of age also bear the brunt of CAD. An age threshold of 45 years has been used in different studies to define "young" patients with CAD or MI [4,5]. CAD in younger people of age less than 40 years was found to represent solely 3% of all patients with CAD. CAD in the young is being recognised with increasing frequency and is as high as 12% in India. The reason for this early presentation of CAD is not very clear. There is an upward tendency of acute MI in the younger population [2].

In India, the incidence of STEMI is 12-16% [6]. One centre has reported a 47 times increase in the incidence of first MI below the age of 40 years in the last 20 years. This population

is noteworthy because of greater expected longevity. Long-term management of young patients who have survived a MI is particularly challenging because there are few data regarding prognosis in these patients [5]. Moreover, it is yet to be determined whether young patients with normal coronaries and MI have a different prognosis from those with obstructive coronary disease. Angiographic knowledge concerning the extent and severity of CAD in the young patients with manifest CAD is incredibly scarce [7]. The available data is suggestive of a higher burden of single vessel CAD and less of triple vessel disease in the younger population [8]. The disease causes significant morbidity, psychological trauma and financial burden for the whole family when it occurs at a younger age [3]. But unfortunately, the data regarding demographic, clinical and angiographic profile of this population is lacking in India [9,10].

Even in western countries data regarding STEMI in young patients is limited and MI in patients  $\leq 45$  years has been poorly described. This, prompting the present authors to undertake the study to provide insight about the population aged  $\leq 45$  years about the risk factors, clinical presentation, angiographic profile and short-term prognosis.

## MATERIALS AND METHODS

A cross-sectional study was carried out in the Department of Cardiology, SCB Medical College and Hospital, Cuttack, Odisha, India, from June 2019 to November 2020. The study protocol was approved by Institutional Ethics Committee, SCB Medical College and Hospital, Cuttack, Odisha, India (IEC No.:443).

A total of 198 patients of age  $\leq 45$  years with acute STEMI admitted in the institution who gave consent and satisfied the inclusion criteria during the study period were enrolled.

#### Inclusion criteria:

- Patients with acute STEMI age  $\leq 45$  years, both male and female.
- Patients with history of MI and presenting with recurrent infarction.
- MI diagnosed by:

Detection of a rise and/or fall in cardiac biomarkers values preferably cardiac troponin (cTn), with at least one value above the 99<sup>th</sup> percentile of the Upper Reference Limit (URL) and with at least one of the following: symptoms of ischaemia, new or presumed new significant ST-T wave changes or new left bundle branch block, development of the pathologic Q wave in the electrocardiogram, evidence of new loss of viable myocardium on imaging or new regional wall motion abnormality or identification of an intracoronary thrombus by angiography or autopsy.

- Symptoms of ischaemia
- New or presumed new significant ST-T wave changes or new left bundle branch block.
- Development of the pathologic Q wave in the electrocardiogram.
- Evidence of new loss of viable myocardium on imaging or new regional wall motion abnormality.
- Identification of an intracoronary thrombus by angiography or autopsy.

#### Exclusion criteria:

- Patients with MI age  $>45$  years and  $<18$  years.
- Patients with Non STEMI (NSTEMI) or unstable angina.

## STATISTICAL ANALYSIS

Data was entered in a Microsoft Excel worksheet and all the categorical (qualitative) variables were coded numerically. Further data was transported in Statistical Package for the Social Sciences (SPSS) version 20.0 for windows for descriptive statistical analysis. Categorical variables were tabulated in frequency with percentage distribution and continuous variables were summarised in mean $\pm$ SD.

## RESULTS

Males were the dominant population in the current study. Females were older (42.15 $\pm$ 2.28; range 37-45 years) than males (38.28 $\pm$ 4.96; range 24-45 years). Smoking was the most common risk factor, followed by dyslipidemia. Traditional risk factors like diabetes mellitus, hypertension was less common. Majority of the patients presented with chest pain and were in Killip Class I [11] at presentation [Table/Fig-1].

Sex	N	%
Male	185	93.5
Female	13	6.5
Age group (years)		
21-25	3	1.5
26-30	17	8.5
31-35	29	14.6
36-40	78	39.4
41-45	71	36
Risk factors		
Hypertension	32	16
Diabetes mellitus	42	21
Tobacco chewing/Smoking	126	63.5

Dyslipidemia	56	28.5
History of coronary artery disease/Peripheral artery disease	11	5.5
Clinical presentation		
Chest pain	172	86.5
Sweating	100	50.5
Nausea/Vomiting	18	9
Arrhythmia	9	4.5
Giddiness	4	2
Pulmonary oedema	2	1
Killip's class		
I	183	92.5
II	4	2
III	5	2.5
IV	6	3

[Table/Fig-1]: Sex distribution, age distribution, risk factors, clinical presentation and Killip's Class among the study participants.

The AWWMI was the most common presenting diagnosis and majority of the patients presented with a window period of 6-12 hours [Table/Fig-2]. Majority of the patients did not had any complications and had mild LV systolic dysfunction (EF 40-50%) [Table/Fig-3]. Obstructive CAD was most commonly seen with SVD being most common one third had re-canalysed vessels. LAD was the most common artery involved [Table/Fig-4].

Type of MI	N	%
Antero Septal MI	68	34.3
Extensive Anterior Wall MI	52	26.7
Lateral Wall MI	11	5.5
Inferior Wall MI	40	20
Inferior Wall+Right Ventricular MI	20	10
Inferior Wall+Posterior Wall MI	7	3.5
Window period (hours)		
<3	10	5.0
3-6	33	16.5
>6-12	96	48.5
>12-24	35	18
>24	24	12

[Table/Fig-2]: Type of myocardial infarction and window period.

Complications	N	%
None	165	83.5
Ventricular tachycardia	5	2.5
Complete heart block	5	2.5
Atrial fibrillation	4	2
LV failure	10	5
Shock	4	2
Mitral regurgitation	3	1.5
LV clot	1	0.5
Intracranial bleed	1	0.5
LV function		
>50%	39	19.7
>40-50%	99	50
30-40%	60	30.3

[Table/Fig-3]: Complications and left ventricular function.

Type A lesion was most common and 60% patients underwent coronary angioplasty [Table/Fig-5].

Angiographic profile	N	%
Normal/Re-canalysed	68	34
Obstructive CAD	92	47
Total occlusion	38	19
Number of vessel involvement	N	%
Normal/Re-canalysed	68	34
Single Vessel Disease (SVD)	93	47
Double (DVD)	29	15
Triple (TVD)	5	2.5
Left main coronary artery	3	1.5
Artery involvement*	N	%
Left Anterior Descending (LAD)	90	45.5
Right Coronary Artery (RCA)	53	26.7
Left Circumflex Artery (LCX)	30	15

[Table/Fig-4]: Angiographic profile and vessel involvement.

CAD: Coronary artery disease; \*Since some vessels were normal on angiogram ie; did not show involvement of either LAD/RCA/LCX, the total could not reach 198

Type of lesion (ACC/AHA)	N	%
A	120	61
B	38	19
C	40	20
Revascularisation	N	%
Optimal medical treatment	72	36.5
Percutaneous transluminal coronary angioplasty	119	60
Coronary artery bypass grafting	7	3.5

[Table/Fig-5]: Type of lesion and management.

## DISCUSSION

With rising prevalence of CAD in India, WHO estimates that India will soon be the cardio-diabetic capital of the world [12]. CVD tends to be more aggressive and starts manifesting at a younger age, which was also noted in present study. The mean age of presentation in male was 38.28±4.96 years and female 42.15±2.28 years. The maximum number of patients falling within 36-40 years age group (39.4%) which was comparable to Sricharan KN et al., Sharma R et al., Sinha SK and INTERHEART Study south Asian registry [13-16].

One of the most commonly reported risk factor for CAD is male gender. Present study consisted of 93.5% males and 6.5% of females. It may be attributed to the protective effects of oestrogens in preventing atherosclerosis and widespread presence of smoking in males that has been shown in various previous studies. The present study showed comparable results to studies done by Gallet B, (92.5% males and 7.5% females), Glover MU (92% males and 8% females) and Weinberger I et al., (86.6% males and 3.4% females) [17-19].

Following age, cigarette smoking is the most important and consistent risk factor for CAD with contribution ranging from 62-90% in various studies [19,20]. Like previous studies, smokers comprised 63.5% of the population. It negatively affects all phases of atherosclerosis by speeding up the thrombotic process, endothelial dysfunction, and coronary vasoconstriction, induces proinflammatory effects and ultimately creates a thrombotic setting [20]. Smoking termination programs should be started as primordial prevention [21]. Studies done by Kaul U et al., Glover MU, Zimmerman F, Colkesen AY and Siddique M et al., have also highlighted the increased risk associated with smoking and reduced prevalence of conventional risk factors as found in present study [18,22-25].

The prevalence of patients with BMI >25 kg/m<sup>2</sup> was 18.5% in present study which was similar to South Asian cohort of INTERHEART [12] study (20%). Lakka HM et al., have outlined that

abdominal obesity increases the predicament for ACS in middle-aged men and in association with smoking, the prospect of coronary events escalates by 5.5 times [26]. Central obesity which is a significant part of metabolic syndrome is more commonly seen in patients of Indian origin. Dyslipidemia was second most common risk factor present in 28.5% patients at the time of admission which was comparable to 36% in Sricharan KN et al., and Sinha SK study (21%) study [13,15]. Traditional risk factors like diabetes mellitus, hypertension were less common among patients ≤45 years of age.

Chest pain was the commonest presenting symptom followed by sweating. Present study was comparable to Sinha SK study in North India which showed chest pain and sweating were the presenting symptoms in 94% and 60% of the patients respectively [15] and Sricharan KN et al., study in which 90% of the patients presented with chest pain while 50% presented with sweating [13]. Most of the patients (92.5%) were in class I at the time of admission. Whereas 7.5% were in ≥II KILLIP class just like observed in Zimmerman F, (7%) [23]. AWMl was most common presentation in 61% patients, which was comparable to, Sinha SK (65%), Weinberger I et al., (57%) and Colkesen AY (60%) study [15,19,24]. IWMI was present in 33.5% patients in the current study which was similar to Sinha SK (35%), Weinberger I et al., (37%) and Colkesen AY (40%) study [15,19,24].

All patients underwent coronary angiogram and out of them 34% had normal or re-canalysed vessels, among the patients having obstructive CAD, 47% had SVD and 15% had Double Vessel Disease (DVD). LAD was the most common artery involved (45.5%) which was similar to the earlier studies by Zimmerman F, ColkesenAY and Badui E et al., [23,24,27]. Also, the present study showed comparable results to the study done by Sricharan KN et al., and the Sinha SK in the percentage involvement of vessels: normal/re-canalysed (34%), SVD (47%) and DVD (15%) [13,15]. Type A lesion was most common 61%, followed by Type C (20%) which were comparable to the findings reported by Sinha SK study [15]. So, the present study was comparable to other national and international studies in angiographic profile.

## Limitation(s)

The study took place at a single centre. Only regular risk factors like hypertension, diabetes mellitus, smoking, dyslipidemia were studied. Other risk factors like homocysteinemia, hereditary thrombophilia, anti-phospholipid antibody syndrome and genetic factors were not studied. Study of new risk factors and their relation to ACS in younger population needs to be addressed in larger randomised controlled trials.

## CONCLUSION(S)

Among young STEMI patients, males were more common, and smoking and dyslipidemia were found to be common risk factors, smoking being twice more common than dyslipidemia. Typical chest pain with Killip Class I and AWMl were seen in majority. Half of the patients had SVD and one third was found to be re-canalysed. Type A was the most common lesion and two thirds of the study population could undergo PTCA.

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