Original Research Article

Clinical and coronary angiographic profiling in young patient with acute ST-elevation myocardial infarction admitted in cardiac critical care unit of tertiary care centre at south Tamil Nadu

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ABSTRACT

Background: Premature coronary artery disease (PCAD) is associated with a high rate of ischemic recurrence and mortality, causing a significant impact on public health. The present study focuses on the assessment of the risk factors, clinical presentation, angiographic profiling considering severity, and management of extremely young adults (aged ≤45 years) affected with first ST elevation acute myocardial infarction (STEMI).
Methods: The current study (cross-section) was carried out among 94 consecutive patients with STEMI. The study on patients was carried out between January 2022 and June 2022 at Tirunelveli Medical College Hospital, department of cardiology.
Results: This study involved 94 patients with a mean age of 37.80 years, 8.5% <25, and 84.9% male patients. Risk factors included smoking, being overweight, diabetes, hypertension, chest pain, syncope, and obstructive coronary artery disease (CAD). The most common symptom was chest pain (98.9%). Left anterior descending (LAD) was the most common culprit artery (26.1%), and ostial LAD was (3.2%). Percutaneous coronary intervention (PCI) was done in 53.2% of patients, elective PCI was 26.6%, pharma co-invasive PCI was 24.5%, and primary PCI was 2.1%. The patient was referred to coronary artery bypass grafting was 10.6%. 23.4% of patients had recanalized and normal coronaries, and 36% received medical management. No mortality occurred in this study.
Conclusions: Most commonly, AMI is found in very young male adults, and smoking is the commonly associated risk factor. LAD artery involvement was the leading cause of AWMI and the most common presentation observed.

Keywords: STEMI, Angiography, Percutaneous coronary intervention

INTRODUCTION

Coronary artery disease (CAD) is a common heart disease resulting from plaque formation in the coronary arteries.[1] The onset of this disease may occur in childhood and progresses over the lifespan. Based on a current report from the American Heart Association, the estimated mean age for the occurrence of the first acute myocardial infarction (AMI) in the United States is 65.6 years and 72 years for men and women, respectively.[2] Early-stage CAD possesses a high rate of ischemic recurrence and mortality, causing a significant effect on public health.[1,2] Thus, the study of CAD in young people is the need of the hour for early diagnosis and therapeutics.

Young CAD can be defined as 45 or 55 years old. However, the universal definition of "Young CAD" is not determined yet. Based on the older reports, the age group associated with Young CAD was 65. Lately, premature CAD for men has been reported as 49 years. In young Indians, the prevalence of CAD is about 12-16%, and this data is higher than any of the ethnic groups.[3,4]

Several reports suggest that 4-10% of AMIs cases arise before 45 years of age, although the frequency decreases

with a lower age limit. Lately, young individuals have shown a higher risk of ST elevation acute myocardial infarction (STEMI).[5]

Non-obstructive coronary arteries associated with myocardial infarction are a comparatively common clinical entity (10-20%) among AMI-affected young patients. Intravascular and cardiac magnetic resonance imaging is popular as a key diagnosis and potential treatment.[6-8] Myocardial infarction with non-obstructive coronary arteries (MINOCA), and spontaneous coronary artery dissection (SCAD), is especially seen in pregnant and peripartum women. Further, vasospastic (prinzmetal) angina is more often found in young patients having a record of variable prognosis and treatment when compared with obstructive CAD.[6,7,9]

The existing literature lacks the clinical angiography of young males suffering from STEMI in South Tamil Nadu. Therefore, a study on clinical and angiography profiling young males (<45 years of age) suffering acute STEMI is desirable for better identification and preventive measures. The main objective is to study the risk factors using an angiographic profile, clinical presentation, and management of very young adults (aged ≤45 years) having their first AMI.

METHODS

The observational data collection study was conducted on 94 patients consecutively suffering from STEMI. The patients were studied between January 2022 and June 2022 for six months at the department of cardiology, Tirunelveli Medical College Hospital.

Inclusion criteria

Age ≤45 years, in the absence of the left bundle branch block, electrocardiography (ECG)-based detection of STEMI is defined by the European Society of Cardiology (ESC), the new ST segment elevation at the J point is ≥2 mm, with a contiguous lead of ≥2 mm in men or ≥1.5 mm in women with leads V2–V3 and 1 mm in the contiguous chest or limb leads were included.

Exclusion criteria

Age >45 years, patients having a prior history of MI, percutaneous coronary intervention (PCI), or coronary artery bypass graft (CABG) surgery, electrolyte abnormality, bundle branch block or left ventricular hypertrophy was shown by ECG, certain conditions affecting the ST segment in ECG (e.g., suspected myocarditis, pericarditis, hypothermia, and receiving amiodarone treatment) were excluded.

Clinically, all patients were evaluated based on their detailed family history. Routine biochemistry was done, including a complete hemogram, urea, creatinine, and viral markers such as hepatitis B surface antigen (HBsAg),

hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Fasting lipid profile (FLP), postprandial blood sugar (PPBS), fasting blood sugar (FBS), ECG, and echocardiography were performed.

Multiple risk factors were studied, considering hypertension, diabetes mellitus, smoking habits, overweight, hyperlipidemia, physical inactivity, and a premature CAD (considering first-degree relatives <55 years in men and <65 years in women) associated with family history. Smokers are defined under two categories, one who is currently were either smoking (>four weeks) beedi, cigarette, and cigar or who have quit smoking (<1 year).

Anthropometric and clinical examinations considering blood pressure (BP) were measured for each subject. Body weight and height were measured with participants with light clothing and no shoes. Bodyweight measurements were done in kilograms to the nearest 0.1 kg by a calibrated digital scale, and height measurements were done to the nearest 5 mm by a height gauge. Furthermore, body mass index (BMI) was calculated using Quetelet's formula (given below), and overweight was defined as BMI >25 kg/m².

$$BMI = Mass(kg)/height(m^2)$$

Moreover, BP was recorded in the left arm using a supine position with an appropriately sized cuff using a sphygmomanometer. Hypertension is systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg. Diabetes mellitus (DM) is seen in patients with fasting plasma glucose (FPG) level ≥126 mg/dl, postprandial plasma glucose (PPPG) level ≥200 mg/dl, or a history of DM or taking medication for diabetes. Hyperlipidaemia is defined as serum cholesterol of ≥200 mg/dl, triglyceride (TG) >150 mg/dl, low-density lipoprotein >130 mg/dl, HDL-C <50 mg/dl for females and <40 mg/dl for males, dyslipidemia known cases and those who are on medication for dyslipidemia.

Most patients received fibrinolysis therapy using streptokinase 1.5 million units except for primary coronary angiogram. All patients underwent coronary angiography; Obstructive CAD is defined as ≥70% lesion in major epicardial arteries or ≥50% lesion in the left main coronary artery. The intermediate disease is major epicardial artery stenosis (50% to 69%). In contrast, the minimal disease is defined as ≤50% lesion, and collectively they were categorized as the case of non-obstructive disease.[8] The angiographic finding diagnoses the culprit artery. Based on coronary angiography, the eligible patients underwent PCI, medical management, and coronary artery bypass grafting (CABG).

RESULTS

In our study, 94 patients were included, with a mean age of 37.80 years, 8.5% of patients <25, and 84.9% of male

patients. Table 1 displays the associated factors of risk smoking (80.9%), diabetes (38.3%), hypertension (28.7%), overweight (18.1%), and family history of premature coronary artery disease (17.0%), and most common. Chest pain (98.9%) and syncope (12.8%) were the least common symptoms.

Furthermore, around 57.4% had anterior wall MI, 35.1% inferior wall MI, and 4.3% with Inferior wall MI in conjunction with RVMI. The least value was obtained for lateral wall MI which is 3.2% (Table 1).

Table 1: The data of 94 patients with STEMI to gender, risk factors, symptoms and clinical diagnosis.

Variables	Count	Column N %
Age group (years)		
<25	8	8.5
26-35	21	22.3
>36	65	69.1
Gender		
Female	10	10.6
Male	84	89.4
Risk factors		
Smoking	76	80.9
HTN	27	28.7
Diabetes	36	38.3
Family history	16	17.0
BMI		
Underweight	1	1.1
Normal weight	76	80.9
Overweight	17	18.1
Types of symptoms		
Chest pain	93	98.9
Sweating	63	67.0
Breathlessness	57	60.6
Nausea vomiting	46	48.9
Palpitation	36	38.3
Diarrhoea	17	18.1
Syncope	12	12.8
Clinical diagnosis of STEMI		
Anterior wall MI	54	57.4
Inferior wall MI	33	35.1
IWMI + RVMI	4	4.3
Lateral wall MI	3	3.2

Total cholesterol (TC) was 216.9±38.84, low-density lipoproteins (LDL) were 122.39±22.75, triglycerides (TGL) were found to be 202.49±50.20 and high-density lipoproteins (HDL) were 39.94±5.55. Figure 1 shows the graphical representation of the dyslipidemia pattern.

Table 2 shows the data on obstructive CAD. About 65.9% of patients had obstructive CAD. This data includes CAD with single vessel disease (44.7%), double-vessel disease (7.4%), and trippel vessel disease (10.6%). The least value obtained for left main involvement is 3.2%. Left anterior

descending (LAD) was the most common culprit artery (26.1%), with ostial LAD (3.2%) followed by a right coronary artery at 13.9% and ostial RCA at 1.1%.
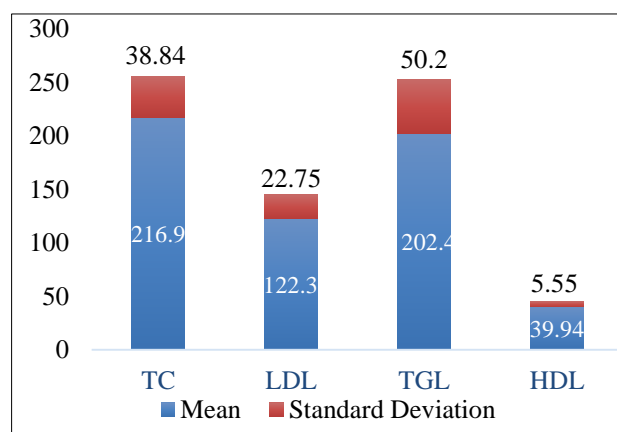
Figure 1: Cholesterol profile of patients with a standard deviation.

Table 2: Data of patients who have obstructive CAD.

Parameters	Count	Column N %
LAD	22	23.4
LCX	3	3.2
Ostial LAD	3	3.2
Ostial RCA	1	1.1
RCA	12	12.8
LAD and D1	1	1.1
LAD and LCX	1	1.1
RCA and LAD	2	2.1
RCA and LCX	3	3.2
TVD	10	10.6
LM disease	3	3.2

The coronary angiography of STEMI patients revealed the prevalence of type A (35.1%), B (10.6%) and C (9.6%) coronary lesions. Suggesting that most patients (type A) can have a high success rate after treatment. Further, Thrombus grades 0 to 5 indicated that almost 83% of patients had no thrombus characteristics. Furthermore, the coronary calcification data was also found to be mild (5.3%) to moderate (2.1%) (Table 3).

Based on these readings, the patients were treated by around 36% medical management and 64% with PCI. Among 53.2%, elective PCI was 26.6%, Pharmaco invasive PCI was 24.5%, and Primary PCI was 2.1%. The patient referred to coronary artery bypass grafting was 10.6% (Table 4).

About 11.7% of patients had non-obstructive CAD. LAD was observed to be the most common artery (6.4%), along with the right coronary artery (5.3%). Interestingly about 23.4% of patients had recanalized and normal coronaries, and about 36.2% received medical management. No in-hospital mortality in this study (Table 5).

Table 3: Coronary angiography of patients.

Parameters	Count	Column N %
Lesion		
Type A	33	35.1
Type B	10	10.6
Type C	9	9.6
Thrombus grade		
0	78	83.0
2	5	5.3
3	4	4.3
4	4	4.3
5	3	3.2
Calcification		
Mild	5	5.3
Moderate	2	2.1

Table 4: PCI data of 53.2% of patients and their presentations.

Parameters	Count	Column N %
Fibrinolysis	91	96.8
Primary PCI	2	2.1
Pharmaco invasive PCI	23	24.5
Elective PCI	25	26.6
CABG	10	10.6
Medical management	34	36.2

Table 5: PCI patient data.

Parameters	Count	Column N %
Non-obstructive CAD		
LAD	7	6.4
RCA	5	5.3
Anomalous coronary origin	1	1.1
Spontaneous coronary dissection	3	3.2
Recanalized coronaries/ normal coronaries	22	23.4

DISCUSSION

CAD is the most common heart disease and the primary cause of death in the US and worldwide. The disease must be appropriately studied regarding clinical and coronary angiographic profiling for early diagnosis and treatment to avoid the morbidity and mortality caused by this disease.[5,10,11] The current study demonstrates the clinical assessment and angiographic profiling of young STEMI patients from South Tamil Nadu. The patients chosen for the study belong to young CAD, defined as ≤45 years old. About 94 patients were included, with a mean age of 37.80 years, and 8.5% were <25. Among these, about 84.9% of the patient were male. The data obtained from risk factors associated with young CAD were smoking (80.9%), a history of premature CAD (17.0%), being overweight (18.1%), diabetes (38.3%), and hypertension (28.7%). The

dyslipidemia pattern showed Total cholesterol (TC) was 216.9±38.84, LDL were 122.39±22.75, triglycerides (TGL) were 202.49±50.20 and HDL were found to be 39.94±5.55. Here low HDL and high triglycerides are the characteristics of diabetic dyslipidemia.[12]

The study revealed that the most and the least common symptoms of CAD were chest pain (98.9%) and syncope (12.8%), respectively. Clinical diagnosis data showed maximum (57.4%) of patients had anterior wall MI, 35.1% had inferior wall MI, and 4.3% had Inferior wall MI with right ventricular MI (RVMI). The least value was of lateral wall MI (3.2%). The coronary angiographic and the evaluation of specific vessel involvement showed around 65.9% of patients were suffering from obstructive CAD having single vessel disease (44.7%), double-vessel disease (7.4%), and triple vessel disease (10.6%). They left the main contribution (3.2%). Left anterior descending (LAD) was the most common culprit artery (26.1%), and ostial LAD was (3.2%), followed by 13.9% of right coronary artery (RCA) and 1.1% of ostial RCA.

The coronary angiography of STEMI patients further suggested the prevalence of type A (35.1%), B (10.6%) and C (9.6%) coronary lesions. This indicates that a high number of patients with type A lesion means a high success rate after treatment. Further, thrombus grades 0 to 5 revealed that almost 83% of patients had no thrombus characteristics. Furthermore, the coronary calcification data was also found to be mild (5.3%) to moderate (2.1%). The treatment profiling showed that 53.2% of patients underwent PCI. Among 53.2% of PCI-treated patients, 26.6% were treated by elective PCI, 24.5% by PCI and 2.1% by primary PCI. Furthermore, 10.6% of patients were referred to coronary artery bypass grafting.

Another interesting finding of coronary angiography was 11.7% of patients had non-obstructive CAD. The LAD artery (6.4%) was the most commonly seen lesion, followed by RCA (5.3%). Furthermore, about 23.4% of patients had recanalized and normal coronaries, and 36% of patients received medical management. There was no mortality occurred in the present study. Several reports on clinical and coronary angiography CAD patients are available. Prakash et al reported the demographic and angiographic profiling of 117 young patients (<40 years) undergoing coronary angiography.[2] The study's findings suggested that most affected young patients were male, and SVD considering LAD, was the leading cause.

Similarly, Malakar et al reported the clinical and angiographic report of coronary artery disease in 143 young women.[4] The findings showed most of the patients were having stable enigma and STEMI. Further, the most common risk factors were hypertension and diabetes. Moreover, coronary angiography showed younger women were affected than older. The current study adds substantial data about the clinical and coronary angiography of patients suffering from acute STEMI from the South Tamil Nadu region. However, the report has

limitations, such as the small sample size compared to other reported studies.[10,13-15]

Moreover, the study included only a single centre. Thus, a large patient group from multiple centers needs to be studied better to understand the course of the disease and its management. Moreover, long-term clinical and angiography profiling of patients over the years is desirable to estimate the actual percent of mortality.

Limitations

The current study's limitations are a single centre for study and a small sample size.

CONCLUSION

AMI was found to be associated mostly with very young male adults. Smoking was observed as the most common risk factor. Further, LAD artery involvement was the most common presentation as the cause of AWMI. In contrast to the western population, AWMI is characterized by earlier onset, delayed presentation, more severity, diffuse disease, and high morbidity but with supporting in-hospital mortality.

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