Original Research Article

Risk factors and coronary angiographic profile in young STEMI patients: results from a tertiary care centre in south-central India

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ABSTRACT

Background: Compared to older counterparts, a significant distinction has been found related to risk factors, clinical presentation, and prognosis of ST-segment elevation myocardial infarction (STEMI) in younger patients. To date, a lack of studies has been looked, specifically at-risk factors and angiographic profile of STEMI among younger patients; with this in mind, we conducted the present study.
Methods: This hospital-based, cross-sectional, open-label study was carried out at Deccan College of Medical Sciences between April 2018 and December 2019. Patients under 40 years with the presentation of STEMI were included. All patients were subjected to electrocardiography, 2D echocardiography, and coronary angiogram. Baseline demographics, risk factors, and procedural characteristics were recorded.
Results: Of 51 young STEMI patients, 41 (80.4%) were male and 10 (19.6%) were female. The most common risk factors associated with the development of STEMI in young patients were smoking (58.8%), followed by diabetes (45.1%), and dyslipidaemia (45.1%). Anterior wall MI was the most frequent presentation (84.3%). The left anterior descending artery was the most frequently (62.8%) involved vessel, followed by left circumflex artery (9.8%), and right coronary artery (5.9%).
Conclusions: Insights gained from the study can aid in identifying clinical characteristics of STEMI in young patients, which may be beneficial to achieve appropriate and timely management. Further, the young population should be educated as to control modifiable risk factors and smoking cessation to prevent coronary artery disease since they belong to the highly productive group in the community.

Keywords: Coronary angiography, Diabetes, Dyslipidaemia, Smoking, ST-elevation myocardial infarction, Young

INTRODUCTION

Coronary artery disease (CAD) is a leading cause of death and disability in western countries and India.[1] India has been passing through an epidemiologic transition; the burden of communicable diseases has been decreasing gradually, but that of non-communicable diseases has been developing expeditiously, hence facing a double burden. As a matter of concern, the prevalence of CAD has been rising at an alarming rate in the last two decades in India and other south Asian countries. Recent Indian epidemiological data reveals that the prevalence of CAD is 7%-13% in urban and 2%-7% in rural populations.[2,3]

Acute myocardial infarction (MI), the fatal manifestation of CAD, includes both non-ST-segment elevation

myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI). More importantly, acute MI presents as sudden death. Despite the fact that acute MI occurs mainly in patients over the age of 45 years, at present, a higher incidence has been observed in patients younger than 45 years.[4] The prevalence of acute MI among very young patients aged ≤40 years was estimated to be ranging from 2% to 6%.[5] When acute MI develops at a young age, it carries significant morbidity, psychological effects as well as financial constraints for the person and the family. Among Indians at a younger age, CAD with more extensive angiographic involvement mainly occurs due to genetic, metabolic, and traditional causes.[6] Important risk factors for the development of CAD include hypertriglyceridemia, low levels of high-density lipoprotein cholesterol (HDL-C), metabolic syndrome, high lipoprotein-a, dietary habits, and unplanned modernization linked to a sedentary but stressful lifestyle. Moreover, smoking, drug abuse and non-traditional risk factors like hyperhomocysteinemia also contribute to the progression of CAD at a very young age (≤ 30 years).[7,8] Young STEMI patients have significant diversity pertaining to risk factors, clinical presentation, and prognosis than the older ones. Further, a better prognosis can only be achieved when proper treatment is given based on the correct diagnosis. There is little published data on risk factors and patterns of coronary artery involvement in young STEMI patients. We, therefore, investigated risk factors and coronary angiography profiles in such patients.

METHODS

Study design

The present study was a hospital-based, cross-sectional, open-label study that comprised 51 patients with confirmed diagnosis of STEMI. The study was conducted at Deccan College of Medical Sciences, Telangana, India between April, 2018 and December, 2019. Patients with age below 40 years with the presentation of STEMI were the sole criterion for selection. Patients with stable angina, unstable angina, and NSTEMI were completely rejected from the study. Ethical approval has been taken from local institutional ethic committee of Deccan College of Medical Sciences. All enrolled patients gave written informed consent.

Data collection

Meticulous history regarding present complaints, the onset of disease, duration and type and radiation of chest pain as well as associated complaints like palpitations, breathlessness, and diaphoresis were reported. In addition, a history of smoking, diabetes, hypertension, and family history of CAD, metabolic syndrome, and dyslipidaemia were also noted in the proforma. All patients were subjected to electrocardiography, 2D echocardiography, and coronary angiogram. Biochemical estimation, including complete blood picture, haemoglobin A1c test, random blood sugar, lipid profile, serum urea, creatinine, electrolytes, and high sensitive troponin tests were performed in each patient. All statistical data are expressed as number and frequency. Data analysis was performed by Statistical package for social sciences (SPSS) (SPSS version 17.0, SPSS Inc., Chicago, IL).

RESULTS

A total of 51 young patients with STEMI were included in this study. As demonstrated in Figure 1, the incidence of STEMI was the most common (54.9%) in patients with the age group of 36-40 years, followed by 31-35 years (35.2%) and 25-30 years (9.8%). The youngest patient included in the study was 29 years old. Regarding gender-wise distribution, 41 (80.4%) were male and 10 (19.6%) were female.
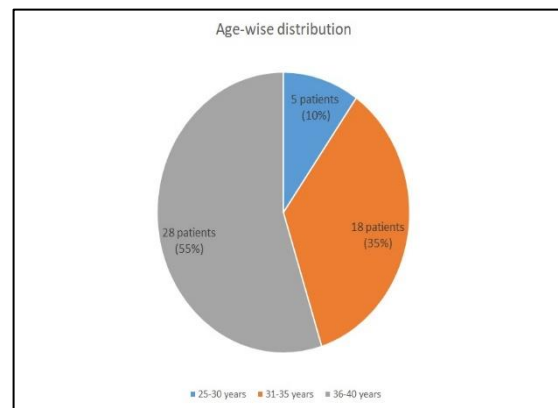
Figure 1: Age-wise distribution of STEMI patients.

Table 1: Risk factors for STEMI development in young patients.

Risk factor	Patients (N = 51)
Smoking, n (%)	30 (58.8)
Diabetes, n (%)	23 (45.1)
Hypertension, n (%)	13 (25.5)
Dyslipidaemia, n (%)	23 (45.1)
Metabolic syndrome, n (%)	7 (13.7)
Family history of CAD, n (%)	8 (15.7)

† CAD, Coronary artery diseases

Table 1 illustrates the most common risk factors associated with the development of STEMI in young patients. The majority of patients (58.8%) were smokers, of which, 3 patients (10%) had pack-years of smoking less than 5 years, 11 patients (36.6%) had 6-10 years, 12 patients (40%) had 11-15 years, and 4 patients (13.3%) had 16-20 years. Diabetes (45.1%) and dyslipidaemia (45.1%) were the second most common risk factors associated with the development of STEMI in young patients. Out of 23 diabetic patients, 16 patients (69.6%)

were identified with denovo diabetes mellitus. Moreover, hypertension, metabolic syndrome, and family history of CAD were present in 13 patients (25.5%), 7 patients (13.7%), and 8 patients (15.7%), respectively. Of 13 hypertensive patients, 10 patients (76.9%) had denovo hypertension.

Table 2: Clinical, angiographic and therapeutic profile in young STEMI patients.

Profile	Patients (N=51)
Distribution of MI	
AWMI, n (%)	43 (84.3)
IWMI	8 (15.7)
Ejection fraction	
<30	3 (5.9)
31-40	20 (39.2)
41-49	21 (41.2)
>50	7 (13.7)
Angiographic profile	
SVD	29 (56.9)
DVD	8 (15.7)
TVD	2 (3.9)
Others	12 (23.5)
Affected vessels	
LAD	32 (62.8)
RCA	3 (5.9)
LCX	5 (9.8)
Others	11 (21.6)
Treatment modality	
Thrombolysis alone	11 (21.6)
Thrombolysis and PTCA with single stent	31 (60.8)
Thrombolysis and PTCA with two stents	7 (13.7)
CABGs	2 (3.92)

† MI, Myocardial Infarction; AWMI, Anterior wall MI; IWMI, Inferior wall MI; SVD, Single vessel disease, DVD, vessel disease; TVD, Triple vessel disease; LAD, left anterior descending artery; RCA, right coronary artery; LCX, Left circumflex artery; PTCA, Percutaneous transluminal coronary angioplasty; CABGs, Coronary artery bypass grafting

As shown in Table 2, anterior wall MI (AWMI) was the most typical presentation (84.3%) of STEMI among our study population. Higher number of patients (41.2%) had an ejection fraction between 41-49%, followed by 31-40% (39.2%). On performing coronary angiography, single-vessel disease (SVD) (56.9%) was most commonly. Left anterior descending artery (LAD) was the most commonly involved infarct related vessel in our study population, which was observed in 32 patients. In addition, involvement of left circumflex artery (LCX) was observed in 5 patients, and right coronary artery (RCA) in 3 patients. Remaining 11 patients had significant coronary artery disease, of which, 3 patients had ectatic coronaries with slow flow, 5 patients had recanalised vessels with restrictions of less than 50%, 1

patient had thrombus in mid RCA, and 2 patients had spontaneous coronary artery dissection. Of the total 51 patients, 11 patients (21.6%) received thrombolysis therapy only, 31 patients (60.8%) underwent thrombolysis with single stent percutaneous transluminal coronary angioplasty (PTCA) treatment modality, 7 patients (13.7%) underwent thrombolysis with two stents PTCA, and 2 patients (3.92%) were treated with coronary artery bypass grafting (CABGs).

DISCUSSION

Myocardial infarction is widely known as a disease of the older population, and occasionally present at a young age as well. Such young patients are atypical in comparison with the general population. In the young age group, MI with normal coronary arteries has been associated with diverse risk factors like polymorphisms, high levels of lipoprotein, thrombophilia or previous diseases such as Kawasaki.[9-12] This indicates different pathogenesis for the development of STEMI in young patients, as compared to those with atherosclerotic disease.

In this study, the majority of the patients were aged between 30 to 40 years. Yunyun et al reported that the mean age of genesis of STEMI was 40 years.[13] In addition, another study reported a 47 fold increase in the incidence of MI under the age of 40 years in the last two decades.[14] The findings obtained from the INTER HEART study revealed that first MI occurred in 4.4% of the Asian females and 9.7% of the males under the age of 40, which is roughly 2-2.5 times higher than that of the west European population.[15] In this study, the occurrence of STEMI was predominant in males as compared to females. This finding was consistent with data reported in the Jaipur Heart Watch (JHW) study in which the prevalence of STEMI was 80.4% in males.[16]

In this study, smoking had appeared as the most common risk factor for the development of STEMI in young patients. This fits well with the INTERHEART study , in which 92% of young CAD patients were smokers.[15] Mukherjee et al hold the view that the figures of smoker were higher in those under the age of 40 years than over 60 years (58.7 versus 43%), in patients who underwent PTCA.[17] Altogether, these results corroborate the findings of a great deal of the previous works that shed light on the association between smoking and young MI.[18-21] We found diabetes as the second most frequent risk factor present in about 45.1% of young STEMI patients. This contrasts with the study reported by Prabhakaran et al who found that the prevalence of diabetes was 15% in young STEMI patients.[22] According to the Chennai urban rural epidemiological study (CURES 38) diabetic risk score increased with raised events of glucose intolerance, and it also served as an efficient indicator of metabolic syndrome and cardiovascular risk. It further stated that 11.9% of the patients had diabetes and 24.4% of the patients were hypertensive in that study. Moreover, it has been reported

a 30% prevalence of hypertension, while our study demonstrated 25.5% prevalence. Despite the fact that hyperlipidaemia is the most prevalent risk factor present in about 50% of MI cases, still, there is huge disagreement in regards to the prevalence of hyperlipidaemia.[18,21] In their analysis, Mohon et al identified metabolic syndrome as the most prevalent risk factor of CAD among an industrial population of south India, accounting for 34% of patients.[23] Many scholars hold the view that the prevalence of a family history of CAD in young MI patients is higher than older counterparts.[20,24,25] The present study has been unable to demonstrate such a high prevalence; our findings revealed only 15.7% prevalence. Nonetheless, this much discrepancy in findings may be due to the smaller sample size in our study population. This finding is congruent with the work of Bhardwaj et al, which showed the family history of CAD present in 18% of the total study population.[26]

Calle et al have found that out of 80 patients with age <40 years, 35 patients had AWMI, 26 patients had an inferior wall, 9 patients had a lateral wall and 10 patients had non-Q acute MI.[27] However, our researchers have arrived at the conclusion that AWMI was the most common type of MI, representing 84.3% of the total young STEMI patients. From comprehensive cohort studies, it is well established that patients with acute coronary syndrome had a high incidence of normal coronaries or single-vessel disease than older ones. In one study, the incidence of SVD, double vessel disease (DVD), and triple vessel disease (TVD) was found to be 43%, 22%, and 16%, respectively.[27] On the other hand, we have found SVD in 56.9%, DVD in 15.7%, TVD in 3.9%, and others in 23.5% of STEMI cases. Chen et al advocated that younger patients are more likely to be associated with single-vessel disease and complex stenotic morphological features.[28] On the contrary, elderly patients had more extensive CAD.

In our study, out of the 11 patients who underwent thrombolysis followed by coronary angiogram showing non-stentable lesions, two patients had ecstatic coronaries with slow flow, five patients had re-canalized coronaries with residual stenosis of less than 50%, one patient had thrombus in mid-RCA, and two patients had a spontaneous dissection of the coronaries. Numerous scholars have provided empirical evidence, claiming that LAD being the most common culprit artery in patients with young STEMI. Similarly, this has been our finding as well.[29-31]

Several limitations of this study should be acknowledged. Firstly, the study comprised only a small group of participants, therefore obtained findings may not be an actual representation of the entire population. Secondly, this was not a comparative study; to draw a proper conclusion, identification of the most prevalent risk factors in older counterparts, and comparison of these factors among younger and older is of utmost importance.

CONCLUSION

The incidence of STEMI amongst young patients has been emerging as a critical issue in today's scenario. Summing up the results, we can conclude that the incidence of STEMI has been more pronounced in males as compared to females. Most of the patients were of 30-40 years of age. Smoking was the most common risk factor of STEMI, followed by diabetes and dyslipidaemia. AWMI was the most frequent typical manifestation of STEMI in young patients. SVD was commonly present in patients with STEMI, and the LAD was the main infarct-related artery.

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