ORIGINAL RESEARCH

CORONARY ARTERY DISEASE AMONG YOUNG INDIAN ADULTS WITH SPECIAL REFERENCE TO CORONARY ANGIOGRAPHY PROFILE: REPORT FROM A TERTIARY CARE HOSPITAL OF BIHAR, INDIA

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Abstract

Coronary artery disease (CAD) is responsible for the highest mortality globally. Acute coronary syndrome (ACS) represents the most common mode of presentation of CAD. The present study is aimed to identify the clinical, risk factor and coronary angiographic characteristics in very young adults less than 30 years of age presenting with first STEMI as literature regarding this is very limited and exceptionally scarcer in Indian population.

Materials and Methods: The present study was a cross-sectional hospital-based conducted among 50 patients aged less than 30 years of age, admitted in the Department of Cardiology, Heart Hospital, Patna, Bihar, India during June 2020 to May 2021, who gave written informed consent. Inclusion criteria were based on the diagnosis of STEMI according to the guidelines given by the Joint European Society of Cardiology (ESC)/American College of Cardiology Foundation (ACCF)/American Heart Association (AHA)/World Heart Federation (WHF) Task Force.[6] The patients with a history of prior myocardial infarction or revascularization were excluded from the study. The study was approved by the institutional ethical committee.

Results: During the study period, 50 young patients aged less than 30 years of age suffering from acute STEMI were included in the study according to the predefined study protocol. The age of the patients ranged from 19 to 30 years with a mean age of 26.8 ± 3.7 years. The majority of the patients were within the age range of 25–30 years. There was a male preponderance with 94% of the patients being male. Apart from the male gender, the most common risk factor was dyslipidemia. A family history of premature CAD in first-degree relatives was present in less than 10% cases.

Conclusion: AWMI is the most common presentation of STEMI among the very young adults in the Indian population. Early diagnosis and treatment of CAD and its modifiable risk factors can have a huge impact on survival in this productive age group.
Key Words: Coronary Artery Disease, coronary angiography profile

Introduction

Coronary artery disease (CAD) is responsible for the highest mortality globally. [1] Acute coronary syndrome (ACS) represents the most common mode of presentation of CAD. [2] Data indicate that Asian Indians are more prone to develop CAD with symptoms occurring a decade earlier than the western population. [3] It has been estimated that there could be around 30 million patients suffering from CAD in India. [4] Acute myocardial infarction (AMI) in very young adults has been poorly studied but is estimated to be less than 2%. [5] In spite of limited data, it has been observed that the clinical and coronary angiographic profile is quite different in young patients as compared to those who develop CAD at an older age. [4] Apart from conventional risk factors, ST-segment elevation myocardial infarction (STEMI) in the very young (≤30 years) patients has been linked to substance abuse and nontraditional risk factors. Coronary angiographic data from various studies indicate preponderance of single-vessel disease or non-obstructive CAD in very young patients suffering from AMI. [5]

The present study is aimed to identify the clinical, risk factor and coronary angiographic characteristics in very young adults less than 30 years of age presenting with first STEMI as literature regarding this is very limited and exceptionally scarcer in Indian population.

Materials and Methods

The present study was a cross-sectional hospital-based conducted among 50 patients aged less than 30 years of age, admitted in the Department of Cardiology, Heart Hospital, Patna, Bihar, India during June 2020 to May 2021, who gave written informed consent. Inclusion criteria were based on the diagnosis of STEMI according to the guidelines given by the Joint European Society of Cardiology (ESC)/American College of Cardiology Foundation (ACCF)/American Heart Association (AHA)/World Heart Federation (WHF) Task Force.[6] The patients with a history of prior myocardial infarction or revascularization were excluded from the study. The study was approved by the institutional ethical committee.

All patients were subjected to Coronary Angiography after detailed clinical evaluation. Information on age, sex, history of type-2 diabetes mellitus, hypertension, substance abuse, and family history of premature coronary artery disease (CAD) were obtained through self-report. Patients were classified as obese with BMI $>25 \, kg/m^2$. All patients underwent complete hematological and biochemical investigations and electrocardiograms. Dyslipidemia was defined as serum total cholesterol level (TC) of ≥200 mg/dl, triglyceride (TG) > 150 mg/dl, low-density lipoprotein (LDL) > 130 mg/dl, high-density lipoprotein (HDL) < 50 mg/dl in women and <40 mg/dl in men and/or participants on lipid-lowering treatment.

Left ventricular ejection fraction (LVEF), regional wall motion abnormality (RWMA) and diastolic dysfunction were documented by echocardiography.

Coronary angiography was performed using standard percutaneous techniques either via femoral or radial route after Allen's test. Angiographic severity was assessed in at least two orthogonal views using eye-balling. The obstructive CAD was defined as $\geq 70\%$ lesion in one of the major epicardial arteries [viz., left anterior descending (LAD), left circumflex (LCx), and right coronary artery (RCA)], or their major branches, or $\geq 50\%$ luminal narrowing of the left main coronary artery (LMCA). Accordingly, patients were further classified as suffering from single-vessel (SVD), double-vessel (DVD), or triple-vessel disease (TVD). All other lesions not amounting to the above-mentioned severity were grouped together as non-obstructive CAD.

Excel data analysis tool was employed for the descriptive statistical analysis. Continuous variables were presented as mean $\pm$ standard deviation, while categorical variables were expressed as frequency (percentage).

Results

During the study period, 50 young patients aged less than 30 years of age suffering from acute STEMI were included in the study according to the predefined study protocol.The age of the patients ranged from 19 to 30 years with a mean age of 26.8 ± 3.7 years. The majority of the patients were within the age range of 25–30 years.There was a male preponderance with 94% of the patients being male. Apart from the male gender, the most common risk factor was dyslipidemia. A family history of premature CAD in first-degree relatives was present in less than 10% cases. The frequency of hypertension and diabetes mellitus was also low. Table 1 describes the demographic and risk factor profile of the enrolled patients.

Table 1: Coronary risk factor profile of the patients

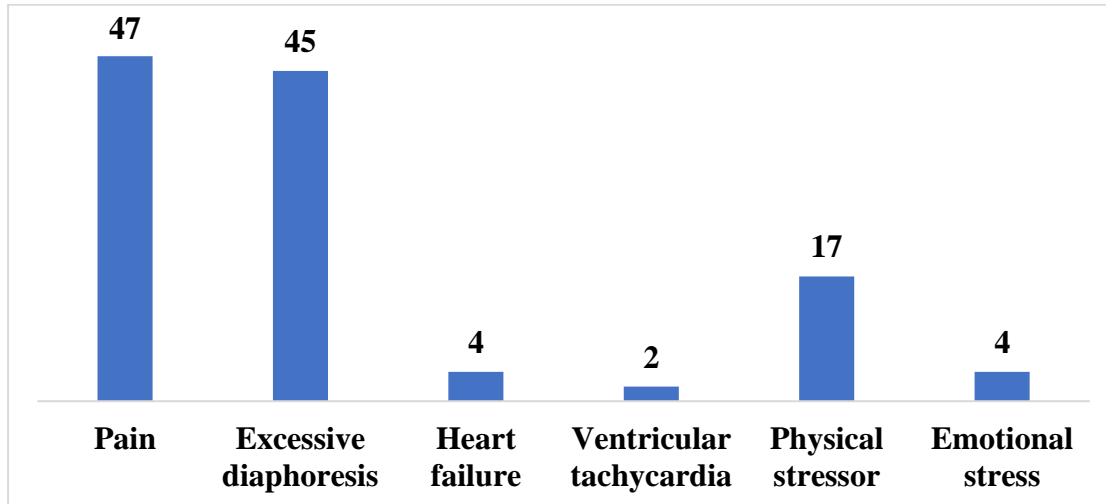| Coronary risk factor	Number (%)
Hypertension	7 (14%)
Diabetes mellitus	2 (4%)
Smoking	14 (28%)
Smokeless tobacco consumption	23 (46%)
Obesity	19 (38%)
Dyslipidemia	27 (54%)
Family history of premature CAD	3 (6%)

Figure 1: Presenting complaint and stress profile of the patients

Figure 2 depicts the clinical profile of the patients. Anterior wall myocardial infarction (AWMI) was the most common presentation resulting in mild to moderate left ventricular dysfunction. Regional wall motion abnormality (RWMA) was noted in majority of the cases with RWMA corresponding to LAD, RCA, and LCx territory being observed in 37 (74%), 7 (14%) and 1 (2%) cases, respectively. However, no RWMA was observed in 5 (10%) cases. Also, diastolic dysfunction was found in 95.1% cases, with maximum suffering from Grade - I diastolic dysfunction being observed in 38 (76%) cases followed by Grade - II and Grade - III diastolic dysfunction that was observed in 9 (18%) and 3 (6%) cases respectively. The mean left ventricular ejection fraction was 41.8 with SD of 11.1% among the study population. Notably, 32 (64%) patients underwent thrombolysis before undergoing coronary angiography.

Figure 2: Pie distribution of the type of MI among the study population
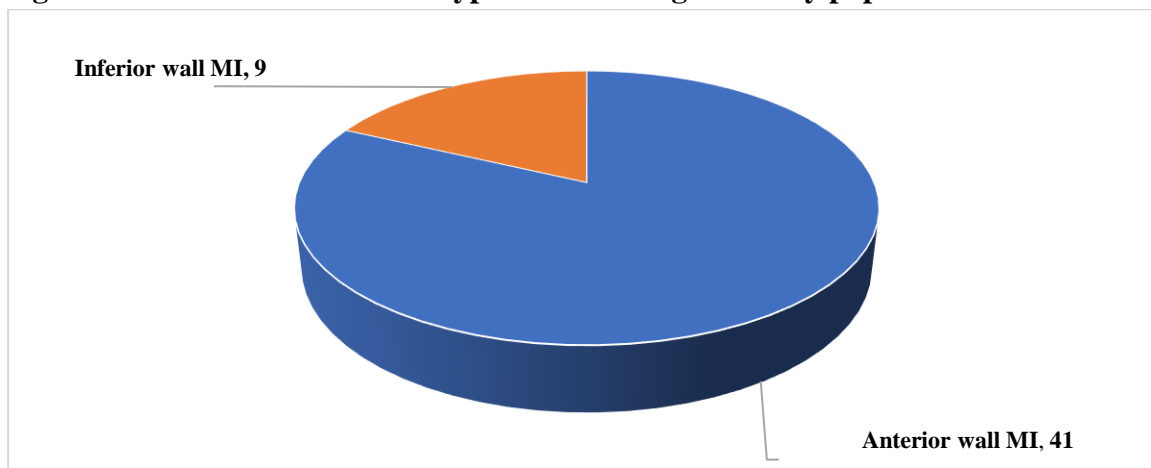
The pattern of coronary artery involvement are tabulated in table 2 and figure 3. Obstructive CAD with SVD was the most common angiographic diagnosis. LAD was the most common culprit vessel followed by RCA involvement. The proportion of DVD and TVD was very low. No case of LMCA disease was observed. Spontaneous coronary artery dissection was observed in only 3 (6%) patients, while non-culprit vessels were found to be diseased in 8 (16%) patients. Notably, more than a single lesion in the culprit vessel was observed in only 5 (10%) patients.

Figure 3: Pie distribution of clinical profile of the patients

■ **Obstructive CAD**   ■ **Non-obstructive CAD**   ■ **Normal coronary**
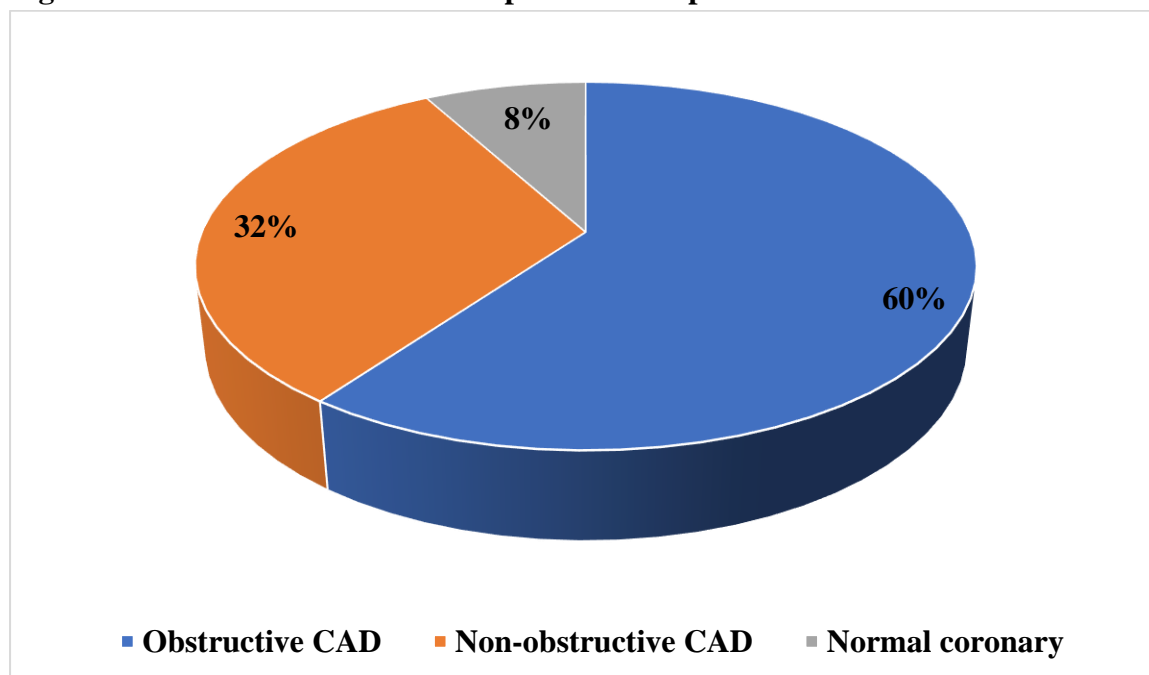
In all, 26 (58%) patients underwent percutaneous coronary intervention (PCI) with drug-eluting stent (DES) placement, 2(4%) patients with TVD underwent Coronary artery bypass grafting (CABG), and 22 (44%) patients were managed medically with guideline-directed optimum medical management. There was one death of the patient who underwent CABG. All the remaining patients were subsequently discharged in satisfactory condition.

Discussion

The present study included 50 patients younger than 30 years of age presenting with first AMI. Male sex is one of the most consistently reported risk factors for CAD in many studies accounting for skewed gender distribution. [4, 5, 7] Protective effects of estrogens against atherosclerosis in females and high prevalence of smoking in males have been attributed for male preponderance. [5]

Dyslipidemia is a conventional risk factor for CAD with more than 50% prevalence in the present study. Various other studies conducted among young patients of AMI have reported dyslipidemia in their study cohort ranging from 20 to 80%. [4-9] Obesity at a younger age poses a significant threat to the development of early CAD. More than one-third of the patients were found to be obese in the present study. These findings are in line with the study done in North India. [5] However, obesity was reported as an infrequent cause in most of the other previous studies, with a prevalence of 11–15%. [4-7] Systemic hypertension and diabetes mellitus are well-established risk factors for CAD. There was a low frequency of hypertension and diabetes mellitus in the studied population. The prevalence of hypertension

ranged between 10 and 44% in other studies. [4-9] However, the prevalence of diabetes mellitus was reported to be less than 10% in many studies. [4, 8, 9]

A positive family history of premature CAD is associated with increased plaque content in the coronary arteries. Various Indian studies report a much lower prevalence rate of positive family history of premature CAD, which is quite consistent with the findings of the present study. [4- 9] However, few Indian studies contrastingly report a much higher prevalence ranging from 30 to 47%. [5, 7] Tobacco use is the most preventable cause of death worldwide that adversely affects all phases of atherosclerosis. [5] Smoking cessation substantially reduces the risk of CAD, and its cessation before the age of 40 years reduces the mortality risk by 90%. [10] Smokeless tobacco consumption is still not an established cardiovascular risk factor. However, it is widely prevalent in the South Asian population, thereby requiring systematic testing before any specific recommendations can be made in context with STEMI. Stressful life events can cause instability of the plaque leading to its rupture, thereby resulting in STEMI. This is evident in the present study too by the high prevalence of significant physical stressor before the event. [5]

LVEF is a commonly employed tool for risk stratification. The mean LVEF in the present study was found to be $41.8 \pm 11.1\%$. This finding is in close concordance with other studies reporting mild to moderate left ventricular dysfunction with mean LVEF ranging from 37 to 55% in young patients. [4, 5, 7] The left ventricular dysfunction can be attributed to the higher prevalence rate of AWMI and RWMA corresponding to LAD territory in the studied population with more than 80% being diagnosed as AWMI. [5, 8] Since diastolic dysfunction frequently accompanies systolic dysfunction and is often a first echocardiographic manifestation of AMI, more than 95% of cases suffered diastolic dysfunction in the present study, with a majority being diagnosed with Grade-I diastolic dysfunction. Majority of the patients had obstructive CAD. Available literature also supports the aforementioned findings, with many studies reporting similar rates of obstructive CAD. [4, 8, 11]However, many other studies have reported a much higher prevalence rate (>80%) of obstructive CAD. [5, 7, 9, 12].

Conclusion

AWMI is the most common presentation of STEMI among the very young adults in the Indian population. SVD is the most common angiographic diagnosis, with LAD being the most common culprit vessel. Smoking was found to be the most common preventable risk factor. Smokeless tobacco consumption needs further testing to be established as a cardiovascular risk factor. Early diagnosis and treatment of CAD and its modifiable risk factors can have a huge impact on survival in this productive age group.

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