Original Article

Myocardial Infarction in young adult patients - Various Patterns of CAD and Different Risk Factors : A Tertiary Care Centre Experience

Milind Shrivastava*, Narendra Kumar Bairwa**, Nitin Kansal***

*Consultant Cardiologist and Head, **Assistant Consultant Cardiologist, ***Consultant Cardiologist
Dept of Cardiology, Santokba Durlabhji Memorial Hospital , Jaipur , India

Abstract

Background:Acute myocardial infarction is potentially life-threatening disease which is more prevalent in elderly, however young population is not totally immune from it. The aim of this study to determine risk factors, clinical profile, angiographic patterns and outcome in young patients (<40 years) presented with acute coronary syndrome.

Methods:We included a total of 172 patients, aging less than 40 years and presented with acute coronary syndrome to our hospital from January 2017 to December 2020.

Results: The mean age of study was 34.2 years, with male preponderance (74.4%). Diabetes (55.8%), chewing tobacco or substance abuse (54%), dyslipidemia with low HDL (56.3%), hypertension (36.6) and family history of CAD (15.1%) were prevalent risk factors. Chest pain (75%) and sweating (81.3%) were main symptoms and 66.2% patients had single vessel CAD on coronary angiography. There were two deaths in the hospital.

Conclusion:ST elevation MI was the most common presentation and smoking, chewing tobacco or other substance abuse was the most common risk factor. Mostly patients had single vessel CAD and good outcome, with low mortality. (Indian J Cardiol 2022;25 (1-2):11-16)

Introduction

Acute MI in young adults is an uncommon phenomenon, but in recent years, its incidence is increasing and it has become an important issue for healthcare because it has different risk factors, clinical presentation and wide spectrum of prognosis.

Overall, incidence of acute myocardial infarction (AMI) in patients with is less than 40 years of age is 4-8%[1]. Different clinical picture and ignorance of symptoms usually prevent young adults from seeking medical advice. Early recognition of myocardial infarction and risk factor modification in this population is very important[2].

However, AMI carries a significant morbidity, psychological impacts, and huge economic burden for the patient (who is usually only earning one) and the family when it occurs at a young age. Apart from diabetes mellitus and hypertension, smoking, obesity, dyslipidemia, substance abuse, stress and lack of physical activity play a significant role of risk factors in this population[3].

Due to changing lifestyle and risk factors,

Address for Correspondence :
Dr Milind Shrivastava, Consultant Cardiologist and Head, Santokba Durlabhji Memorial Hospital, Jaipur, India
E mail - milindshrivastava@yahoo.co.in

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prevalence of coronary artery disease is increasing in young population[4]. Atherosclerosis is most common etiology (80%) for coronary artery disease in young adults[5].

The purpose of this study is to classify various risk factors, clinical presentation, angiographic pattern and prognosis of AMI young adult patients (≤ 40 years of age).

Material and Methods

This was a prospective cross-sectional study which enrolled the study population consecutively for4years [from January 2017 to December 2020], who were eligible for the inclusion criteria. This study was conducted at Santokba Durlabhji Memorial Hospital, Jaipur, India. Study included 172 patients who were below 40 years. We used age less than 40 years to define young patients with coronary artery disease[6].

The diagnosis of Acute myocardial infarction was done as per standard definition of acute myocardial infarction by WHO criteria, which required at least 2 of the 3 criteria given below[7].

1. Chest pain characteristic of AMI,
2. Electrocardiographic changes with evolution of Q waves,
3. Rise in Cardiac Bio-markers levels.

Incusion criteria

1. Patient of AMI as per definition given by WHO (at least two out of three criteria) presented to our Centre with window period of 24 hrs.(thrombolysed / not thrombolysed)
2. Patient's age ≤ 40 years

Exclusion criteria

1. Patient not fulfilling WHO criteria (less than two criteria out of 3)
2. Patients > 40 years
3. Known case of CAD
4. Co morbidity not allowing for coronary intervention - CKD patients not on dialysis
5. Stress induced cardiomyopathy

A standard protocol was set and patients were included according to inclusion and exclusion criteria. In all the participants, details of the age, sex and occupation were recorded with the details of history of diabetes mellitus and hypertension, history of smoking, alcohol use or any substance abuse and a significant family history of ischemic heart disease. Height, weight and waist and hip circumference were measured for each person. Fasting blood glucose, lipid profile, serial ECGs, cardiac enzymes including CPK MB, Troponin I, Brain natriuretic peptide and serum homocysteine levels were also measured in this study.

The patients with a past history of diabetes and/ or with a fasting blood sugar value of >126mg% or HbA1C of > 6.5 were considered to be diabetic. Hypertension was defined as diagnosed case of hypertension treated with medication, diet, and/or exercise, blood pressure greater than 140 mmHg systolic or 90 mmHg diastolic on at least two occasions. Currently smoking patients and patients who quitted smoking within last one year were considered as smoker and others were considered as non-smokers. MI of ≥ 25 kg/m2 were considered as overweight and BMI of ≥ 30 kg/m2and the waist to hip ratio > 0.91 was considered as obese. Dyslipidemia was defined using serum cholesterol of ≥ 200mg%, serum triglyceride levels ≥ 200 mg/dl, serum LDL level ≥ 130 mg/dl, serum HDL level ≤ 50 mg/dl in females and< 40mg/dl in males. Hyperhomocysteinemia was said when serum levels ≥ 15 micromole/L.

Overall, the risk factors which were studied in present study were diabetes mellitus, hypertension, smoking, alcohol or any other substance habits, overweight /obesity, dyslipidemia, hyper homo cysteinemia, a past history of IHD (ischemic heart disease), and a family history of ischemic heart disease.

2D echocardiography was done in all the patients classifying them between normal (LVEF ≥ 50%), mild (LVEF 40- 49 %), moderate (LVEF 30-39 %) and severe left ventricular dysfunction (LVEF< 30%). 2D echocardiography was done on Philips IE33 machine and ejection fraction calculated by using modified Simpson method. Coronary angiogram was done in all patients which was performed by the standard Judkin's technique and all angiograms were assessed for the number of vessels which were involved and the type of the vessels which were involved. Significant stenosis was defined as > 50% of luminal occlusion of left main and > 70% luminal occlusion of left anterior descending artery, left circumflex artery or right coronary artery.

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Results

A total of 172 patients were studied who were eligible as per defined inclusion criteria. Mean age of presentation was 34.2 years. Total male patients were 128 and, female patients were 44. Out of total 172 patients, 96 (55.8%) patients were diabetic, 63 (36.6%) patients were hypertensive, 83 (48.2%) patients were smoker and 61(35.4%) were alcoholic.91 (54%) patients had history of tobacco chewing or other substance abuse.

26 (15.1%) patients were having family history of CAD. 33 (19.1%) patients were overweight and 14 (8.1%) patients were obese. Dyslipidemia as risk factor in form of high total cholesterol was found in 63 (36.6%) patients, high triglycerides were present in 72 (41.8%) patients, high LDL in 97 (56.3%) and low HDL in 97 (56.3 %) patients.

Out of total 172 patients, 117 patients were presented as ST elevation MI (STEMI) and 55 (31.9%) patients were having non-ST elevation MI (NSTEMI). Out of all 117 STEMI patients, 84 patients were having anterior wall MI, 28 patients inferior wall MI and 5 patients were having lateral wall MI. 25 (1.5%) patients were thrombolysed outside.

2D echo revealed 28 patients (16.2%) to have normal LV systolic function, and 144 (83.7%) patients were having LV systolic dysfunction. 75% (43.5%) patients having mild LV systolic dysfunction, 48 (27.9%) patients moderate LV systolic dysfunction and 21 (12.2%) patients were having severe LV systolic dysfunction. After 3 months of PCI follow up were done to look for improved ejection fraction if any in patients of LV systolic dysfunction, which revealed that out of 144 patients who developed various grades of systolic dysfunction,53 (36.%) patients got normalized LV systolic functions.

Coronary angiogram done in every patient included in this study. Out of 172 patients, 163 (94.7%) patients had significant CAD. 13 (7.5 %) patients found to have left main disease. 114 (66.2%) patients were having single vessel disease, 26 (15.0%) patients double vessel disease and 19 (11.0%) triple vessel disease. 8 (4.6%) patients had coronary dissection, 3 (1.7%) patients had coronary aneurysm and 21 patient were having (12.2 %) high coronary thrombus burden. Most of the patients (123 (71.5) were having lesion in LAD artery. two of our patients were died as presented late to us and were not thromboysed. Both presented with cardiogenic shock.

Clinical Parametres and Risk Factors	Results
Total patients	172
Clinical presentation	
• Chest Pain	129(75.0%)
• Sweating	140(81.3%)
• Palpitations	34(19.7%)
• Dyspnea	47 (27.3%)
Mean age	34.2 years
Male	128 (74.4%)
Female	44 (25.6%)
Diabetes mellitus	96 (55.8%)
• diet controlled	8
• on antidiabetics	88
Hypertensives	63(36.6%)
• diet controlled	16
• on antihypertensives	47
Smoker	83 (48.2%)
• male	70
• female	13
Family history of CAD	26 (15.1%)
Overweight	33 (19.1%)
Obese	14 (8.1%)
Alcohol	61(35.4%)
Tobacco chewing or other substance abuse	93(54%)
Dyslipidemia	
• High total cholesterol	63 (36.6%)
• High triglycerides	72 (41.8%)
• High LDL	59 (34.3%)
• Low HDL	97 (56.3%)
Hyperhomocysteinemia	16 (9.3%)
STEMI	117 (68.0%)
ANTERIOR WALL MI	84 (48.8%)
INFERIOR WALL MI	28 (16.27%)
LATERAL WALL MI	5 (2.9%)
Thrombolysed outside	25 (14.5%)
NSTEMI	55 (31.9%)

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2D ECHO for LV dysfunction

LV systolic function	Patients	Improved to normal LV systolic function after 3 months follow up
Normal	28 (16.2%)	-
Mild LV Dysfunction	75 (43.5%)	41 (54.6%)
Moderate LV Dysfunction	48 (27.9%)	12 (25%)
Severe LV Dysfunction	21 (12.2%)	0 (0%)

Angiography parametres

TOTAL PATIENTS	172
• Significant CAD	163 (94.7%)
• Non-Significant CAD	9 (5.3%)
Left main disease	13 (7.5%)
• LM+ Single vessel disease	8 (4.6%)
• LM + Double vessel disease	3 (1.7%)
• LM + Triple vessel disease	2 (1.15%)
Single vessel disease	114 (66.2%)
Double vessel disease	26 (15.0%)
Triple vessel disease	19 (11.0%)
Lesion in	
• LAD	123 (71.5%)
• RCA	43 (25.0%)
• LCX	20 (11.6%)
Coronary dissection	8 (4.6%)
Coronary aneurysm	3 (1.7%)
Coronary thrombus	21 (12.2%)

Discussion

Due to changing life style pattern and substance abuse, the prevalence of coronary artery disease is rapidly rising in young adults in India, which provoke us to conduct this study. In our study, we included 172 patients of less than 40 years of age presented with acute coronary syndrome. In young patients with acute coronary syndrome, there is difference in clinical presentation, risk factor profile, pattern of coronary artery involvement and prognosis, when compared with elderly patients[5,8]. Younger patients of acute coronary syndrome usually has single vessel involvement and has better prognosis and commonly associated risk factors are smoking, dyslipidemia and family history of premature coronary artery disease[9]. Indians are at higher risk of developing coronary artery disease at young age, when compared to other communities.[5-10%v/s 1-2%][10] Although prevalence of coronary artery disease is rising rampantly in young adults, details of risk factors analysis is limited, even though, most of them can be modified to improve outcome. Incidence of CAD in young was reported around 3% in earlier studies,[11] but recently, in YOUNG-MI registry, it has reported around 20%[12]. Also, prevalence of young CAD was reported 6.3% in GRACE registry,[13] it was 7% in Spanish registry,[14] and 5.8% in Thai ACS registry[15].

In India, although prevalence of young CAD is increasing, very limited registries are available to provide data on prevalence and risk factors. The largest series published was CADY registry,[16] which reported, that 9.7% of Asian males and 4.4% of Asian females experienced their first myocardial infarction at less than 40 years of age. In a retrospective study on premature CAD from south India, around 10% patients were less than 40 years of age[17]. As reported by different studies, young patients presenting with AMI are almost always males[16-19]. Interestingly, in our study 25.6% patients were females with different risk factor profile. Out of 44 female patients, 8 were smoker, 7 had low HDL cholesterol, 4 were tobacco chewer, 4 were diabetic with poor glycemic control, 3 were on anti-fertility treatment with no other risk factor, 2 patients were on tacrolimus therapy due to recent renal transplant and one patient had AMI during second trimester of pregnancy and later on

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found APLA positive with high homocysteine levels. In remaining 15 female patients only two had family history of premature CAD and in rest 13 female patients, we could not able to find any risk factor, except emotional stress. However, female patients presented in very sick stage, but they show better outcome after intervention.

Family history of premature CAD, is one of the important risk factors in young AMI, due to increased plaque burden in coronaries[20] and various studies shown wide variation in its prevalence, which varies from very low to high, up to 47%[17, 21, 22]. In our study[26] [15.1%] patients had family history of CAD and almost all were males, except two. Apart from diabetes (55.8%), we found smoking (48.2%) as major risk factor, as shown in other studies[18, 23]. Interestingly, we found increasing prevalence of smoking in female population. In few studies, an increasing trend of alcohol intake was observed in young CAD patients with prevalence of around 50%[24, 25]. However, in our study we found alarming rise of smoking [48.2%], alcohol intake [35.4%], tobacco chewing and other substance abuse [54%] in young patients with CAD, so cumulatively substance abusing has emerged as major risk factor for young CAD surpassing diabetes [55.8%] and hypertension [36.6%]. Some form of dyslipidemia was found in 56% of patients, majority of them [56.3%] had significantly low HDL cholesterol<30mg/dl and hypertriglyceridemia (41.8%). Raised total cholesterol and high LDL are well established risk factor for CAD[26] but hypertriglyceridemia significantly increases relative risk of CAD by 30% in men and 75% in women[27]. Low HDL levels are independent risk factor for CAD even if associated with normal total cholesterol and triglyceride levels[27,28,29]. Apart from dyslipidemia, we found significant elevation of serum homocysteine levels in 9.3% patients and all of them had low HDL levels, with no other risk factors. A recent study has shown strong correlation between hyper homocy steinemia and first MI in young[30]. In our study, 68% patients presented with STEMI and around 50% had anterior wall MI, chest pain and sweating were most common symptoms. Females had more severe symptoms and shown better outcome after revascularization, in terms of improvement in symptoms and ejection fraction. Coronary angiography revealed different pattern in young patients, when compared with elderly. Around 66% patients had single vessel involvement, mainly LAD as shown in other studies[29,31,32]. Patients who received thrombolysis outside presented in stable condition, shown better outcome and less LV dysfunction, none of them had bleeding complications. Patients presented early shown good improvement in ejection fraction in this study, 54.6% patients with mild LV dysfunction and 25% patients with moderate LV dysfunction shown normalization of LV functions within three months. In our study 12.2% patients had heavy coronary thrombus load, most of them were diabetics and current smokers and presented late to hospital. Patients presented with left main disease shown less improvement in LV ejection fraction and moderate to severe LV dysfunction persist in their follow up. In present 2 patients died, both were not thrombolysed and presented late (after 24 hours) with cardiogenic shock.

Limitations

Our study is single center study, with small sample size; larger studies are required before generalizing the results to the community. It was a cross sectional study without any control group, therefore statistical significance of risk factors could not be analyzed. Baseline lipid profile was not available in all patients and some patients with diabetes and hypertension were already on lipid lowering drugs, so exact prevalence dyslipidemia could not be traced. Intravascular imaging could have been more useful and accurate to demonstrate exact etiology of CAD.

Conclusion

Coronary artery disease in young adults is growing health issue worldwide. Apart from conventional risk factors, smoking, chewing tobacco and other substance abusing habbits emerging as new risk factors in young population. Recognition of symptoms early and timely treatment could save many lives in young adults, as most of them have single vessel involvement and shown good outcome with timely intervention.

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