Original Research Article

Study of coronary artery disease in young population of Central India

Vikas A. Mishra[1], Amit B. Kinare[1]*, Jayanta Pal[2], Vishwa Deepak Tripathi[3], Ravi Shankar Sharma[1], Pradeep Kumar Jain[1]

[1]Department of Cardiology, Superspeciality Hospital, NSCB Medical College, Jabalpur, Madhya Pradesh, India
[2]IQ City Medical College, Durgapur, West Bengal, India
[3]Department of Cardiology, Superspeciality Hospital, SS Medical College, Rewa, Madhya Pradesh, India

*Correspondence:
Dr. Amit B. Kinare,
E-mail: abkinare@gmail.com

ABSTRACT

Background: Coronary heart disease is the most common indication among cardiovascular diseases (CVD) and a major cause of mortality and morbidity. According to global burden of disease study estimates, nearly 24.8% of all deaths in India are attributable to CVD. Objectives of the current research study were to establish a correlation between varied risk factors and coronary artery disease (CAD), to determine angiographic characteristics individually in patients with multiple risk factors and to evaluate number of vessels involved in CAD.
Methods: Present study was a prospective study conducted on 50 patients with acute coronary syndrome below 40 yrs of age admitted at the department of cardiology, Superspeciality hospital, NSCB medical college, Jabalpur. All patients included in the study were subjected to coronary angiography. The angiographic characteristics such as extent of CAD (characterized by the number of vessels with angiographic lesions) were determined.
Results: Current study findings depicted that most of CAD patients were in age group of 36-40 years. Proportion of males was higher than females. One-fifth of patients were diabetics and 34.0% were hypertensive. It was observed that 54.0% CAD patients had history of smoking and 32.0% had history of premature CAD. Most of patients exhibited single vessel disease in CAG and left anterior descending (LAD) was the most commonly involved artery.
Conclusions: Smoking was concluded as one of the major risk factor associated with CAD and most of patients exhibited single vessel disease, LAD being the most commonly involved artery. Significant number of patients with family history depicted high risk for CAD. Males were concluded to be more prone to CAD at younger age.

Keywords: Coronary artery disease, Indian population, Obstructive and non-obstructive coronary artery disease, Coronary microvascular disease

INTRODUCTION

Coronary heart disease (CHD) is a type of cardiac ailment that develops when the arteries cannot deliver enough oxygenated blood to the heart.[1] Coronary heart disease is one amongst the most common indications of cardiovascular diseases (CVDs). CHD is a major cause of mortality and morbidity and represents almost 50% of the CVD events. CHD is reported to be more prevalent in the middle and low income countries.[1,2] Coronary heart disease is often caused due to buildup of plaque that partially or totally block blood flow in the arteries of heart. Since coronary artery disease develops gradually, symptoms are rarely noticed and may vary from person to person until there is a significant blockage in coronary artery leading to chest pain, heart attack or sudden cardiac arrest.[2]

Coronary heart disease can be categorized in to three main subtypes; obstructive coronary artery disease,

nonobstructive coronary artery disease, and coronary microvascular disease.[3] Sometimes both obstructive and nonobstructive forms of this disease are observed in patients. Coronary microvascular disease mainly affects tiny arteries in the heart muscle. Leading causative factors that may result into CHD are: age; changes in the small blood vessels of the heart upon aging increases the risk for coronary microvascular disease, environment and occupation; air pollution may worsen conditions like atherosclerosis and high blood pressure moreover contact with toxins, radiation, or other hazards and stress at workplace can increase the risk of coronary heart disease, family history and genetics; research depicts that some genes are linked with a higher risk for coronary heart disease, lifestyle; being physically inactive, not getting good quality sleep, smoking tobacco or long-term exposure to secondary smoking, stress, unhealthy eating patterns can trigger the chances of CHD, race or ethnicity; coronary heart disease is reported to be the leading cause of death for people of most racial and ethnic groups in the United States, including African Americans, Hispanics, and whites, sex; obstructive coronary artery disease is more prevalent in men as per reports, However, nonobstructive coronary artery disease is more common in women.[3-8]

Cardiovascular diseases (CVDs) contribute as a major factor in public health problem and are a predominant cause of death globally.[9-11] An estimated 17.9 million of people lose their lives each year due to CVDs. Epidemiologic transition is being reported in India, whereby burden of communicable diseases is declining in comparison to communicable diseases. The National commission of macroeconomics and health estimated that number of CHD patients in India will increase from 38 million to 66 million in coming years. Four fold rise in CHD prevalence has been noticed over the last four decades.[10] According to the global burden of diseases 2016 nearly in India, 28.09% of total deaths are attributed to CVD, of which CHD itself constitute 17.8% of total death, i.e., around 61% of total CVD deaths. In age specific mortality rate (50-69 years), CHD constitutes 22% of total death. CHD which was the third-most common cause of premature death in 2005 was shifted to the most common cause in 2016.[10-12] The CVD death rate of 272 per 100 000 population in India is higher than the global average of 235 per 100 000 population.[13,14]

Coronary artery disease (CAD) is observed to be occurring in Indians that are usually <40 years of age and follows a malignant course. In India, mortality attributable to CVD was increased by 103% in men and by 90% in women from 1985 to 2015.[14-16] An angiographic study of 1066 consecutive male patients at CMC hospital, Vellore showed significant CAD among 877 patients. 55% of patients were <50 years of age, 34% were <45 years of age and 12% were <40 years of age. Reports from AIIMS, New Delhi have also confirmed the high prevalence of triple vessel CAD.[17,18]

Objectives

Objectives of the current research study were to establish a correlation between the risk factors and coronary artery disease, to determine angiographic characteristics individually in females, males, smokers, diabetics and patients with multiple risk factors and to evaluate number of vessels involved in CAD in different subgroups.

METHODS

Study type, place and duration

Current study was a single centre institution based prospective study conducted at the department of cardiology Superspeciality hospital, NSCB medical college Jabalpur from January 2020 to October 2020.

Sample size

50 patients (age 40 years and below) who underwent coronary angiogram were enrolled after detailed counseling and written consent.

Inclusion criteria

Inclusion criteria for the patients to be enrolled in current study were; males and females of 40 years and below, patients with angina/angina equivalent, unstable angina, acute STEMI (ST elevated myocardial infarction)/NSTEMI (non ST elevated myocardial infarction), patients with ischemic ECG changes, RWMA (regional wall motion abnormalities) in echocardiography and old MI (myocardial infarction).

Exclusion criteria

Exclusion criteria for the patients to be enrolled in current study were; cardiomyopathy, alternative diagnosis to chest pain, end stage renal disease (ESRD) and other comorbidities with poor prognosis

Procedure

Patients with typical or atypical clinical presentation and/or ECG changes together with positive troponin-T or CPK-MB levels above 2.5 times the upper limit of normal were considered as STEMI or NSTEMI. Risk factors for CAD and its co-morbidities like diabetes mellitus, smoking, family history of CAD, cerebrovascular accident (CVA), transient ischemic attack (TIA), chronic renal failure, dyslipidemia, coronary artery disease history were documented at the time of admission through a questionnaire. All patients included in the study were subjected to coronary angiography. The angiographic characteristics such as extent of CAD (characterized by the number of vessels with angiographic lesions over 50.0% one two or three arteries) were observed and documented.

Data analysis

Data analysis was done with different statistical tools like pie chart, bar diagram etc. Analysis was done with reference to male and female ratio included in the study and individual ratios of all major risk factors were observed. Type of lesion (single, double or triple vessel), focal vs. diffused were analyzed in different subgroups. Final treatment modality was noted and analysis was done to find out possible aetiology in young Indians and possibility of primary or secondary prevention.

Statistical analysis

Statistical analyses like basic cross-tabulation, inferences, associations, t test to compare the means were performed using Epi info 3.5.3 software. Percent values were calculated for different risk factors.

RESULTS

Results of the current study findings depicted that 30 patients (60.0%) were in the age group 36-40 years. 8 (16.0%) and 12 (24.0%) patients were in age groups of 25-30 years and 31-35 years respectively. Proportion of males 40 (80.0%) were higher than that of females 10 (20.0%) (Table 1).

Table 1: Age and sex distribution among patients.

Characteristics	Frequency	Percentage (%)
Age (years)		
25-30	8	16.0
31-35	12	24.0
36-40	30	60.0
Total	50	100.0
Sex		
Female	10	20.0
Male	40	80.0
Total	50	100.0

Approximately one-fifth; 9 (18.0%) of the patients were diabetics. In current study, 33 (66.0%) of patients had no hypertension and 17 (34.0%) were hypertensive. It was observed that 27 (54.0%) patients had history of smoking and 16 (32.0%) patients had history of premature CAD. 30 (60.0%) patients were non-obese where as 20 (40.0%) were obese (Table 2).

Distribution of patients on the basis of number of vessels involved in coronary angiography (CAG), type of arteries involved in CAG and clinical presentation exhibited by patients is depicted in Table 3-4 and Figure 1. Mean BMI of the patients was 26.84±2.51 kg/m^2 and mean waist-hip ratio of the patients was 0.833±0.085 (Table 5), mean lipid profile and treatments given to the patients are shown in Figure 2-3. Correlation between different factors and type of vessels involved in CAG is shown in Figure 4 and 5.

Table 2: Distribution of risk factors among CAD patients.

Factors	Frequency	Percentage (%)
Disorders		
Diabetes	9	18.0
No diabetes	41	82.0
Hypertension	17	34.0
No hypertension	33	66.0
Smoking		
No smoking	23	46.0
Passive smoking	2	4.0
Smoking (<10/day)	13	26.0
Smoking (>10/day)	10	20.0
Tobacco chewing	2	4.0
Family history		
No history	34	68.0
One in family	13	26.0
>1 in Family	3	6.0
Obesity		
No	41	82.0
Yes	9	18.0

Table 3: Distribution on the basis of number of vessels involved in CAG.

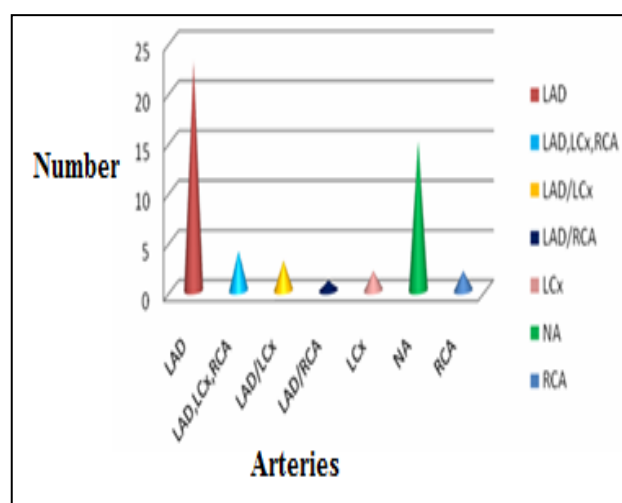| CAG	Frequency	Percentage (%)
All vessels normal (N)	9	18.0
Non-significant involvement (NS)	6	12.0
Single vessel disease (SVD)	27	54.0
Double vessel disease (DVD)	4	8.0
Triple vessel disease (TVD)	4	8.0
Total	50	100.0

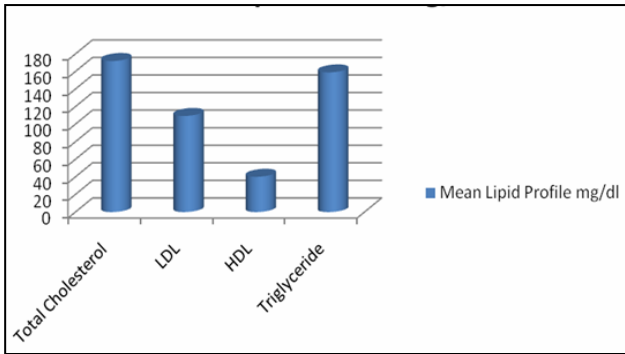**Figure 1: Distribution on the basis of type artery involved.**

Figure 2: Mean lipid profile in patients.

Table 4: Distribution on the basis of clinical presentation.

Clinical presentation	Frequency	Percentage (%)
RWMA in ECHO		
No	32	64.0
Yes	18	36.0
Angina		
No angina	4	8.0
Typical angina	37	74.0
Angina equivalent	9	18.0
Abnormal ECG		
No	11	22.0
Yes	39	78.0
LV dysfunction		
No	32	64.0
Yes	18	36.0

Table 5: Mean BMI and waist-hip ratio in patients.

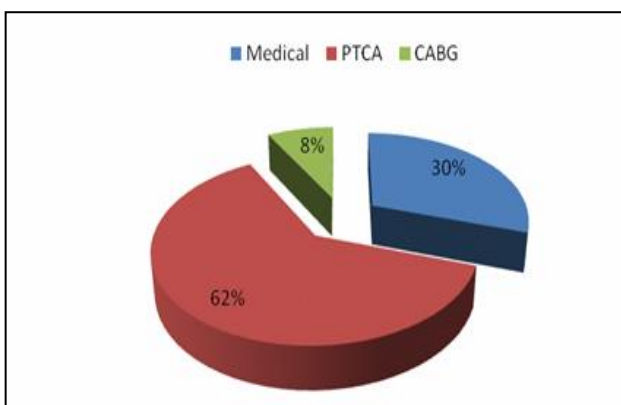| Parameters	Mean	SD
BMI (kg/m^2)	26.84	2.51
Waist-hip ratio	0.833	0.085

Figure 3: Distribution according to treatments like percutaneous transluminal coronary angioplasty (PTCA) and coronary artery bypass grafting (CABG) given to patients.
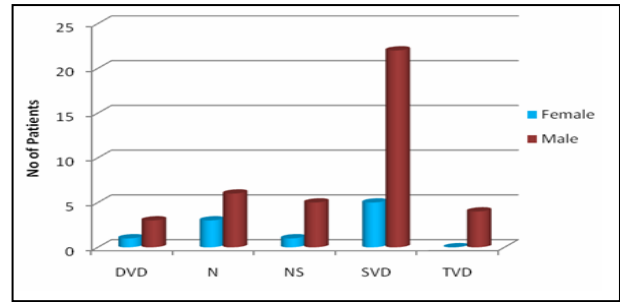

Figure 4: Distribution on the basis of correlation between sex of the patients and type of vessels involved in CAG.
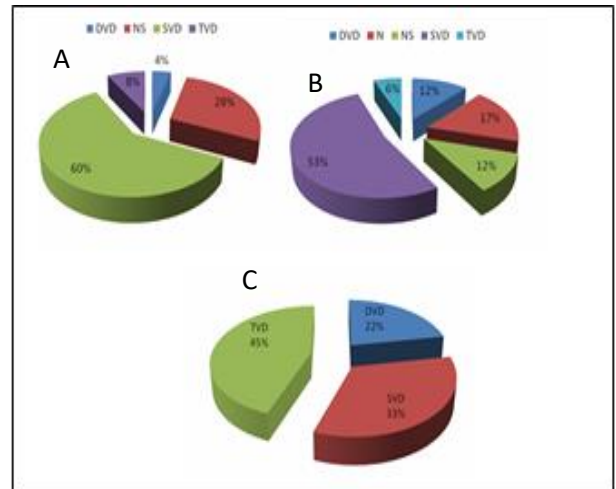

Figure 5: Distribution on the basis of correlation between type of vessels involved in CAG and A) smokers, B) hypertensive patients and C) diabetics.

DISCUSSION

Present study findings revealed that most of the patients of CAD were in the age group 35-40 years and proportion of males was higher than females. Female number was less; probably because of atypical presentation, denial of facts/suppression of symptoms, less access for medical evaluation and symptoms being considered as anxiety/functional etc. Approximately one-fifth of the patients included in the study were diabetics which is major issue in young Indians, due to lack of physical activity, high caloric food intake leading to obesity.[19-21] Diabetics exhibited tendency towards more than one vessel involvement in CVDs.[22-24]

In current study, it was observed that almost one third of the study population had hypertension, because of lifestyle habits like lack of exercise, smoking etc. leading to obesity. It was observed that almost half of the enrolled patients had history of smoking, even some females were victim of passive smoking, ACS was one of the common and important presentation in such patients with left anterior descending (LAD) as culprit artery. 16 (32.0%) patients had history of premature CAD which

was a remarkable and notable finding consistent with reported study of Zimmerman et al.[25] Strong family history of premature CAD was observed as an important risk factor of disease mostly in young patients. In coronary angiogram single vessel disease (SVD) was observed as the most common type of involvement followed by double vessel disease (DVD) and TVD. In majority of patients with SVD as the characteristic CAG finding, LAD was the most commonly involved artery.

Proximal and focal lesions were most commonly observed. Patients with MI usually had thrombotic occlusion. Echocardiography showed RWMA in 18 cases (36.0%). Echo report of all patients with RWMA exhibited ACS. ECG was found to be abnormal in 39 (78.0%) patients, in the form of ST-T changes, ST elevation and T wave changes. LV dysfunction was observed in 18 cases. Mode of treatment in current study for most of the patients was PTCA followed by medical treatment and CABG respectively.

CONCLUSION

From the current study findings it was concluded that smoking was one of the main risk factor associated with the incidence of CAD, most of patients with smoking exhibited SVD in CAG, thus avoiding smoking can help to reduce major burden of CAD in young Indians. LAD was the most commonly involved artery. Apart from thrombotic lesion observed in myocardial infarction, lesions were usually focal in nature. In diabetics tendency of diffuse diseases exist prominently. Significant number of patients with family history depicted high risk for CAD; males were concluded to be more prone to CAD at younger age.

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