

## Demographic Profile, Risk Factors and Management of Coronary Artery Disease: A Prospective, Cross-Sectional Study

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Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 28-04-2024

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Conflict of interest: Nil

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### Abstract:

**Background:** Coronary artery disease (CAD) is a prevalent cardiovascular condition characterised by the narrowing or blockage of the coronary arteries leading to significant morbidity and mortality. Early assessment of risk factors, prompt diagnosis and treatment may have an important role in reducing the cardiovascular complications. The aim of this study is to determine the factors contributing to the development of coronary artery disease, its diagnosis and management.

**Material and Methods:** A prospective cross sectional study was conducted in the cardiology ward of Geetanjali Medical College and Hospital, Udaipur. The study included patients of both genders, aged 18 years or above, admitted to the cardiac care unit (CCU) with coronary artery disease. The sample size was 342.

**Results:** The results indicate a significant burden of coronary artery disease in the examined patient population. The majority of patients fall within the 51-60 age range, with a higher prevalence among males. Chest pain is the most common symptom reported, and smoking is prevalent among male patients. Comorbidities such as hypertension and type 2 diabetes mellitus are frequently observed. Diagnostic tests, including angiography and ECG, are commonly performed for accurate diagnosis. Medications such as anticoagulants,  $\beta$  blockers, and statins are frequently prescribed to manage the disease.

**Conclusion:** The findings indicate toward target population being more affected by burden of disease and require the need for targeted interventions, including smoking cessation programs and lifestyle modifications, to reduce the risk and burden of coronary artery disease in this population. These insights provide valuable information for healthcare professionals in tailoring personalized approaches for coronary artery disease management.

**Keywords:** coronary artery, chest pain, angiography.

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### Introduction

Coronary artery disease (CAD), often referred to as coronary heart disease (CHD), ischemic heart disease (IHD), myocardial ischemia, or simply heart disease, is the largest cause of death globally. It is growing more common in developing nations as well owing to a significant increase in global obesity and diabetes mellitus.[1] CAD is caused by an atherosclerotic plaque obstructing the coronary arteries in majority of the patients.[2] This vascular occlusion results in myocardial hypoperfusion and hypoxia leading to irreversible myocardial damage. Hence, it must be quickly diagnosed and treated in order to reduce the substantial morbidity and mortality related to this disorder. This highlights the role of the healthcare team in evaluating and treating individuals with coronary artery disease and illustrates the evaluation, diagnosis, and management of the condition.[3]

Over 7 million people died as a result of CAD by 2010, making it the world's greatest cause with each decade of life. Males are more frequently affected than females.[4] Even though South Asia only makes up 20% of the global population, it is predicted that this region would carry 60% of the burden of cardiovascular disease worldwide. This can be a result of a combination of genetic and environmental variables. Chest pain or discomfort, which can move to the shoulder, arm, back, neck, or jaw, is a common sign. Typically, symptoms are triggered by physical activity or emotional stress, last for a short period of time, and are relieved with rest. Breathlessness can also occur, and occasionally there are no symptoms at all. A heart attack may be the first symptom which may be followed by heart failure or arrhythmias.[5] The most prevalent symptom reported by women of all races is short-

ness of breath. Women's symptoms can vary from men's symptoms. Severe dizziness, sleep difficulties, dyspepsia, and restlessness are additional symptoms that women report more frequently than males. However, some women do experience nausea, rapid heartbeats and sweating. Women typically show symptoms 10 years later than men.[6]

The commonly associated risk factors are high blood pressure, smoking, diabetes, lack of physical activity, obesity, depression, elevated serum cholesterol, unhealthy lifestyle and excessive alcohol intake. Additionally, incidence of coronary artery disease increases with positive family history.

Numerous tests, such as an electrocardiogram (ECG), echocardiography, coronary computed tomographic (CT) angiography, and coronary angiogram can be helpful in making a diagnosis.[7] Obstructive coronary artery disease can be diagnosed in symptomatic patients using stress echocardiography. It is not advised to perform advanced non-invasive imaging, or stress cardiac imaging on people who have no symptoms and are otherwise at minimal risk of developing coronary disease. The type of symptoms that are present has a significant role in the diagnosis of coronary disease. An ECG is the initial diagnostic test for both "stable" angina and acute coronary syndrome. Blood tests and a chest X-ray may be conducted.[8] Further tests for diagnosing coronary artery disease include exercise stress test, coronary angiography, intravascular ultrasound, magnetic resonance imaging (MRI) and CT scan.

Coronary artery disease can be prevented in up to 90% of patients by avoiding known risk factors. Adequate physical activity, managing obesity and high blood pressure, maintaining a balanced diet, lowering cholesterol levels, reduced psychological stress and quitting smoking are all part of prevention. Exercise and prescription drugs are almost equally effective. There is limited proof that very careful blood sugar control reduces the risk of developing heart disease in people with diabetes mellitus, although better sugar management seems to reduce other issues including renal failure and blindness. According to the World Health Organisation (WHO), "low to moderate alcohol intake" lowers the risk of coronary artery disease, whereas high intake raises the risk.[9]

Treatment strategies include medications such as calcium channel blockers, beta-blockers, antiplatelet drugs, nitroglycerin, and cholesterol-lowering medicines, coronary treatments like coronary angioplasty and coronary artery bypass grafting (CABG).[10] Revascularization reduces mortality in patients with acute coronary syndrome. For stable ischemic heart disease, percutaneous revascularization does not seem to be superior to medical therapy alone. Coronary artery bypass grafts

tend to be superior to percutaneous coronary procedures in patients who have disease in more than two arteries. Hybrid coronary revascularization has also proven to be a safe and practical therapy, even if it is more expensive than conventional CABG.[11]

The increase in the global burden of cardiovascular diseases may lead to poor quality of patient care, reduced therapeutic outcomes, and increase in inappropriate medical expenditures, leading to an increase in overall health care costs.

We aimed this prospective, observational study with primary objective to determine the prevalence pattern of factors contributing to the development of coronary artery disease in a tertiary care centre. Secondary objectives were assessment of demographic and clinical profile, cardiac evaluation, and diagnostic and management strategies in CAD patients.

The study will help us to understand managed health care systems, interpret, and improve the prescribing, administration, and use of medications.

#### Material and Methods

After obtaining Institutional Ethical Committee approval, this one-year prospective observational hospital based study was conducted in Department of Cardiology at our medical college hospital. Informed written consent from patients was obtained for data recording. The codes of the Helsinki Declaration were followed. Medical records of the outpatients and inpatients, maintained by the hospital, were used for data collection.

Patients of both gender with age  $\geq 18$  years, admitted in cardiac care unit (CCU) having diagnosis of coronary artery disease including acute coronary syndrome (ACS) and ischemic heart disease (IHD) were included in this study.

Patients having any type of medical emergency or life-threatening situations, pregnant and lactating mothers, patients who are facing any other acute illness during the course of study and patients under the age of 18 were excluded from this study.

Based on the hypothesis that prevalence of hypertension as contributing factor for CAD is estimated between 49.8% to 60.8%.

$$\text{Sample size} = \frac{[Z_{1-\alpha/2}]^2 [100-P] P}{d^2}$$

$$Z_{1-\alpha/2} = 1.96 \text{ (Two tailed and 5\% } \alpha \text{ error)}$$

P = Prevalence of hypertension as contributing factor for CAD is 55.3% in previous study by Barnett LA et al. [12]

$$d = \text{Relative precision} = 10\% \text{ of } 55.3\%$$

After placing values in above formula, we require 311 CAD patients for our study. Considering 10% drop out rate we require 342 CAD patients to conduct our study.

Sample size: 342

In this study, pre-designed patient data collection form was prepared for collection of data. The data of patient was collected in these forms. Information was collected from medical record department and inpatient department of our hospital. Demographic details (age, sex), history of smoking and alcohol consumption, dietary habits, any co-morbid conditions, presenting symptoms, cardiac evaluation (ejection fraction, number of coronary arteries affected by the disease, diagnostic tests performed) and management were recorded. Informed consent

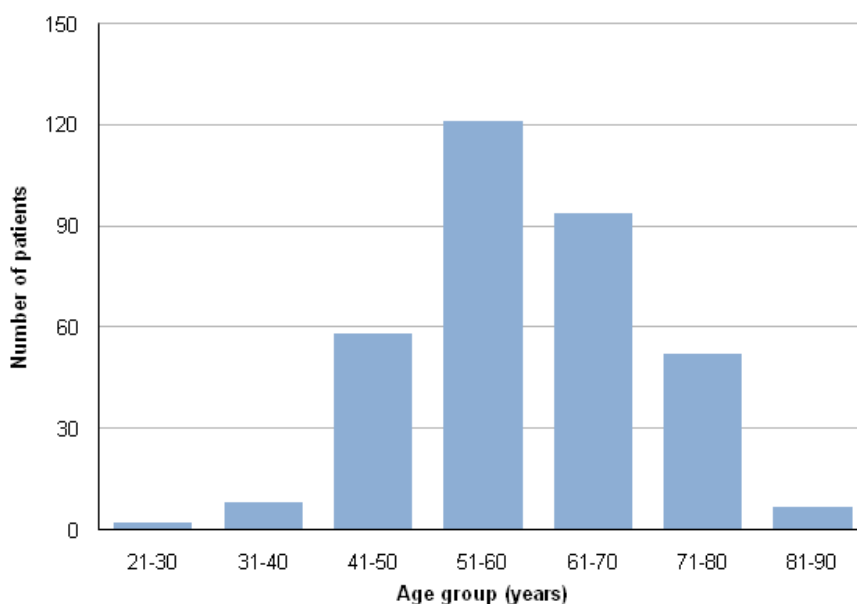
form was available both in english and hindi. The collected data of patients involved in the study was kept confidential.

**Statistical Analysis**

Data were entered in Microsoft Excel and analysed using statistical package for social science (SPSS version 20) by IBM.

Descriptive analysis was performed for demographic characteristics. Categorical variables were expressed as percentages and continuous variables as mean ± Standard Deviation (SD). Data was analyzed for normality before applying statistical test. P value less than 0.05 was considered statistically significant.

**Results**



**Figure 1: Age distribution of patients**

**Table 1: Patient predisposing factors and comorbidities**

Variable	Patient Type	Number (%)
Smoker	Male	165 (48.2%)
	Female	4 (1.2%)
	Total	169 (49.4%)
Alcoholic	Male	124 (36.2%)
	Female	10 (2.9%)
	Total	134 (39.2%)
Dietary habit	Vegetarian	185 (54.1%)
	Non vegetarian	157 (45.9%)
Comorbidites	Hypertension	254 (74.3%)
	Diabetes mellitus type 2	168 (49.1%)

**Table 2: Signs and symptoms**

Sign and symptoms	Number of patients (%)
Chest pain	280 (81.8%)
SOB	182 (53.2%)
Palpitation	112 (32.7%)
Uneasiness (Ghabrahat)	164(47.9%)
Nausea & vomiting	25 (7.3%)

**Table 3: Extent of Cardiac Disease**

Ejection fraction		Vessel Disease	
Range	No. of patients (%)	Type	No. of patients (%)
20 - 30 %	38 (11.1%)	SVD	107 (31.3%)
30 - 40%	95 (27.8%)	DVD	162 (47.3%)
40 - 50%	117 (34.2%)	TVD	73 (21.3%)
50 - 60%	82 (24%)		
60 - 70%	10 (2.9%)		

**Table 4: Diagnostic tests**

Diagnostic Tests	No. of patients (%)
ECG	342 (100%)
Echocardiography	342 (100%)
Angiography	342 (100%)
CBC	342 (100%)
RFT (Renal Function Test)	342 (100%)
LFT (Liver Function Test)	342 (100%)
Random Blood Sugar	342 (100%)
HBA1C	182 (53.2%)
Chest X-Ray	184 (53.8%)
Carotid Doppler	104 (30.4%)
MRI	5 (1.4%)
HRCT (chest)	24 (7.0%)

**Table 5: Medications advised to the patients**

Medication Class	No. of patients (%)
Anticoagulants	72 (21%)
β Blockers	271 (79.2%)
Antiplatelet drugs	342 (100%)
Calcium channel blockers	174 (50.8%)
Statins	342 (100%)
Insulin	25 (7.3%)
Cardioglycosides	34 (9.9%)
Nitrates	202 (59%)
Antiarrhythmics	72 (21%)
Oral Hypoglycemics	164 (47.9%)
Antibiotics	53 (15.5%)

Total 358 patients were assessed for eligibility, out of which 16 patients were excluded as they were not filling the inclusion criteria. Mean age of patients was  $60.58 \pm 10.37$  years with majority of patients in 51-70 years age group (Figure 1). 273 patients were males (79.8%) and 69 were females (20.2%).

Table 1 demonstrates the presence of predisposing factors in our patient population. It suggests that a larger proportion of male patients in this particular group have a history of smoking and alcoholism as compared to female patients. This data indicates that among the patients with coronary artery disease, 54% followed a vegetarian diet while 46% followed a non-vegetarian diet. It suggests that a larger proportion of patients in this specific group followed a vegetarian diet. This study was conducted in Rajasthan, India where non-vegetarian consumers are lesser as compared to vegetarian in their daily dietary habits. Our study indicates that among

the patients with coronary artery disease, 254 patients had hypertension (HTN), while 168 patients had type 2 diabetes mellitus (Type 2 DM) as a comorbidity.

Table 2 represents the distribution of patients with coronary artery disease based on the reported signs and symptoms. This data suggests that chest pain is the most common symptom reported by patients with coronary artery disease, with 81.8% of patients experiencing it.

Table 3 shows that the majority of patients fall into the range of 40%- 50% LVEF, followed by 30% - 40% LVEF and 50% - 60% LVEF. There are smaller numbers of patients in the lower and higher ejection fraction ranges (20% - 30% and 60% - 70%).

The tabular data also represents the distribution of patients with coronary artery disease based on the type of vessel disease diagnosed. It suggests that

among the patients in this specific group, the majority (47.3%) have been diagnosed with double vessel disease (DVD).

Table 4 provides insights into the diagnostic tests performed on patients with coronary artery disease and indicates that among the CAD patients, ECG, echocardiography, CBC, RFT, LFT, random blood sugar and coronary angiography are performed in nearly all patients followed by HbA1C and chest X-ray as required according to patient's condition. Table 5 shows the different types of medications used to manage various aspects of the condition.

### Discussion

We conducted this cross sectional, descriptive study to evaluate the prevalence pattern of various risk factors and diagnostic and management techniques in patients presenting with coronary artery disease at our hospital. Various aspects of coronary artery disease, including patient demographics, comorbidities, diagnostic tests, dietary habits, ejection fraction ranges, and medication classes data were collected.

Gender is one of the most important factor associated with coronary artery disease in the study. It has been observed that males have more chances of developing CAD as compared to females. Farshid et al. conducted a study to determine the impact of risk factors including gender on coronary artery disease. As per this study, there were 1012 patients diagnosed with CAD, among them 698 (69%) were men and 314 (31%), were women.[13] According to our study, we found that there were 273 (79.8%) male patients and 69 (20.2%) female patients. This indicates presence of a positive association between male gender and CAD.

The age distribution of patients indicates a higher prevalence of coronary artery disease in the middle to older age groups (mean age  $60.58 \pm 10.37$  years), with the highest number of patients falling within the 51-60 age range. This aligns with the well-known association between age and increased risk for coronary artery disease. In people around the age of 80 years, CAD is a significant source of morbidity and mortality. Improving outcomes in this high-risk population requires an understanding of the pathophysiology, epidemiology, and ideal methods of diagnosis and treatment of CAD in elderly persons. When caring for such patients, a patient centred approach that considers health state, functional capacity and frailty, cognitive skills, and patient preferences is imperative.[14] Sakuma et al. conducted similar study on 39 patients (30 males and 9 females) with CAD and found that the mean age of developing CAD was 63.9 years with a standard deviation of 15.6.[15] Smoking increases the chances of developing CAD and is known to affect its pattern and severity. It causes inflammation, which may lead to increased plaque accumula-

tion in the arteries, damages blood vessel walls, causing them to become rigid and less elastic. This leads to reduced caliber of blood vessels, disturbs regular heartbeats, increases heart rate and blood pressure, forcing the heart to work more than normal. Krishnan et al conducted a study to determine coronary artery disease prevalence and associated risk factors and observed that smoking was found in 28% males who were diagnosed with CAD. [15] In our study, 165 (48.2%) of male patients were smokers and 4 (1.2%) female patients were found smoking. This represent that smoking acts as a very important predisposing factor in developing CAD. (Table 2)

Alcohol has numerous effects on the heart and blood flow. Chronic alcohol use has been linked to a number of cardiovascular conditions, including hypertension, stroke, heart failure, and sudden death. At the same time, mild alcohol intake has been linked to a decreased risk of coronary artery disease, possibly as a result of its positive effects on lipoprotein levels. There have been conflicting reports on the acute effects of alcohol on coronary circulation, which may be very important in people who already have cardiac disease. However, clinical studies have shown that acute alcohol consumption even in low to moderate dosages have a negative impact on the relationship between coronary supply and demand in angina pectoris patients.[17] Our study showed that regular use of alcohol was done by 124 (36.2%) male patients and 10 (2.9%) female patients. Alcohol consumption is higher in males as compared to females. (Table 2)

Diet plays a very important role in keeping our heart healthy. Consumption of low-fat food, green vegetables, whole grains and plant based proteins are good for our health. Consumption of rich fatty diet, meat etc. in excessive amounts can lead to heart problems. Kamran et al. conducted a case-control study to identify eating patterns in patients with CAD and indicated that consumption of poultry, eggs, fresh fruits, and vegetables was significantly correlated with a lower risk of CAD. Daily milk consumption, weekly fish consumption, and ghee consumption did not significantly increase the risk of coronary artery disease. [18] In our study, the dietary habits of the patients indicated that majority of them followed a vegetarian diet, while a significant portion followed a non-vegetarian diet. This may be due to areas wise dietary preferences in South Rajasthan. It's worth noting that a well-balanced and heart-healthy diet is crucial for managing coronary artery disease, regardless of the specific dietary preferences.

Hypertension (HTN) and type 2 diabetes mellitus (DM) are the most prevalent comorbidities among the CAD patients. These comorbid conditions have significant implications for managing coronary artery disease and require comprehensive treatment

strategies to address their impact on cardiovascular health.

When the heart doesn't receive enough oxygen-rich blood, coronary artery disease signs and symptoms appear. Chest pain (angina) and shortness of breath are two symptoms that might occur if you have coronary artery disease due to restricted blood supply to the heart. A heart attack can be brought on by a complete obstruction of blood flow. Lauren et. al. conducted a study to identify factors that are related to chest discomfort and shortness of breath (SOB) and observed SOB in 22% and chest pain in 91.3% patients.[12] As per our study, we also determined that chest pain and shortness of breath are the main presenting symptoms of CAD, which makes the diagnosis easier.

The ejection fraction is a measure of the heart's pumping efficiency, specifically the percentage of blood pumped out of the left ventricle with each contraction. It's important to note that a normal ejection fraction typically ranges between 50% and 70%. In our study data, patients are distributed across various ejection fraction ranges, and it may suggest a variation in the severity or stage of heart dysfunction among the patients presenting with coronary artery disease.

Coronary small vessel disease (SVD) is a condition in which the walls of the smaller branches of the larger coronary arteries in the heart, known as the small arteries, are harmed and do not expand normally. It is also known as small artery disease and coronary microvascular disease. In double vessel disease, two coronary arteries are significantly narrowed as a result of coronary heart disease which may be readily treated with coronary angioplasty.

An extreme case of CAD is triple vessel disease where coronary artery bypass grafting may be indicated. Ameen et al. performed a study for profile of coronary artery disease demographic, clinical, and angiographic data. Result of this study showed the presence of single vessel disease in 23.3% of patients, double vessel disease in 14.3% patients, and triple vessel disease in (21.3%) patients.[12] In our study, SVD and DVD were more prevalent which makes the treatment easier by coronary stenting.

It is important to note that the selection of diagnostic tests may vary depending on the clinical evaluation, individual patient cases, and healthcare provider preferences. The specific diagnostic tests chosen aim to provide information about the coronary arteries, heart function, renal function, liver function, blood parameters, and other relevant factors to assess and manage coronary artery disease patients. In our study, angiography was done in all (100%) patients which helps in accurate diagnosis of the underlying pathophysiology. Furthermore, the specific medication classes chosen and the number of patients receiving each class may de-

pend on factors such as individual patient needs, disease severity, associated comorbidities, and healthcare provider preferences. Antiplatelets,  $\beta$  blockers, calcium channel blockers, and statins are among the frequently prescribed medications.[19] These medications aim to manage blood clotting, blood pressure, cholesterol levels, and other relevant factors to improve patient outcomes.

Our study highlights that successful management of CAD patients should focus on overall assessment of risk factors and current cardiac condition of the patients. These data can be used to plan preventive strategies to reduce the presence of risk factors which may over all reduce the prevalence of CAD and future planning of resource allocation can be done to improve management of patients. Limitation of our study is the presence of small sample size, so the observations may not be generalisable to all the population.

### Conclusion

In our study, total 342 CAD patients were assessed. Out of them, majority of patients were males, in the age group of 51 - 70 years, with a history of smoking and alcoholism, presenting mainly with chest pain and SOB. Predominant presence of LVEF in the range of 30-50% and double vessel disease makes the management a bit difficult. Proper cardiac evaluation and optimisation, thorough understanding of pathophysiology of disease and multi-disciplinary team approach are keys to successful management of CAD patients.

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