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# CLINICAL PROFILE OF CORONARY ARTERY DISEASE IN WOMEN

**Pal Singh Yadav[1], Ajay Kumar Meena[2], Heera Lal Verma[3], Rishi Ram Meena[3]**

[1]Assistant Professor, Department of Cardiology, RBM Hospital, SJPMC, Bharatpur, Rajasthan, India
[2]Assistant Professor, Department of Medicine, MMU Medical College, Solan, Himachal Pradesh, India
[3]Assistant Professor, Department of Medicine, RBM Hospital, SJPMC, Bharatpur, Rajasthan, India

## Abstract

**Background:** CAD [Coronary artery disease] is a condition in which there is an inadequate supply of blood and oxygen to a portion of the myocardium; it typically occurs when there is an imbalance between myocardial oxygen supply and demand. The most common cause of myocardial ischemia is atherosclerotic disease of an epicardial coronary artery (or arteries) sufficient to cause a regional reduction in myocardial blood flow and inadequate perfusion of the myocardium supplied by the involved coronary artery. **Materials and Methods:** This study was conducted in Department of Medicine…. Medical college. In this study we included total 100 female. The duration of study over a period of two year. Blood was collected in each visit and the samples were sent to the central pathology laboratory for routine hemogram & biochemical studies. On follow up visits, each patients detailed history was taken regarding recurrence in symptoms, vitals were recorded, blood biochemistry for sugar and lipid profile were taken. ECG, and 2D ECHO were also taken. **Result:** Total of 103 female patients with coronary artery disease (CAD) were included. The majority of the study population fell within the 41-80 age range. A significant proportion of the patients, 94 individuals (91.26%), were postmenopausal. **Conclusion:** We can conclude that coronary artery disease (CAD) predominantly affects postmenopausal women (91.26%) compared to premenopausal women.

## INTRODUCTION

The perception that coronary artery disease (CAD) was mainly a condition affecting men was widely held. However, as awareness grows regarding the leading cause of death in women being CAD, this belief is gradually diminishing.[1] Coronary artery disease (CAD) is a prevalent cause of death or disability in both men and women; however, it presents differently in women. Cardiovascular diseases (CVDs) are the leading cause of global mortality, surpassing all other causes. These diseases disproportionately affect low and middle-income countries and occur almost equally among men and women. In 2008, approximately 17.3 million individuals succumbed to CVDs, accounting for 30% of all worldwide deaths.[2] Out of the total number of deaths, an estimated 7.3 million were attributed to coronary artery disease, while 6.2 million were caused by strokes.[3] By the year 2030, it is projected that the number of individuals who will succumb to cardiovascular diseases (CVDs),

primarily heart disease and stroke, will rise to 23.3 million. CVDs are expected to continue being the primary cause of death, maintaining their position as the leading contributor to global mortality.[4] The number of women who have lost their lives to coronary artery disease (CAD) surpasses the combined fatalities caused by cancer, chronic lower respiratory disease, Alzheimer's disease, and accidents.[5] In terms of mortality, women have a higher rate of coronary artery disease (CAD) compared to men. The incidence of CAD in women tends to occur approximately 10 years later than in men, and there is an even greater delay of around 20 years for more severe clinical events such as sudden death and myocardial infarction (MI).[6] Among individuals who experience a premature myocardial infarction (MI) at the age of 50 or younger, women have a mortality rate that is two times higher compared to men following an acute MI.[7] Among older individuals aged 65 and above, women are more prone to experiencing a higher mortality rate within the first year following a myocardial

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infarction (MI).[5] In the age group of 45 to 64 years, women are more susceptible than men to developing heart failure within five years after experiencing a myocardial infarction (MI). Additionally, women have higher rates of angina compared to men. The burden of coronary artery disease (CAD) is substantial among women, emphasizing the importance of addressing this issue. Indeed, there are differences in the pathophysiology of coronary artery disease (CAD) between women and men. Studies using cardiovascular computed tomography have revealed that women tend to have smaller coronary artery diameters compared to men. This anatomical difference may contribute to variations in the presentation and progression of CAD between the two genders.[8,9] It has been observed that women are less likely than men to have obstructive coronary artery disease (CAD) when undergoing coronary angiography. In cases where women exhibit CAD without significant obstruction, the term "female-specific ischemic heart disease" has been suggested to describe this condition affecting the coronary arteries in women. This term helps acknowledge and address the unique aspects of CAD in women that may differ from the traditional understanding of CAD in men.[10-12] Traditional risk factors, including age, family history of coronary artery disease (CAD), hypertension, diabetes, dyslipidemia, smoking, and physical inactivity, play crucial roles as predictors of risk in women. However, the relationship between age and CAD differs between men and women. While CAD tends to increase linearly with age in men, women experience a more exponential increase in CAD risk after the age of 60. This highlights the importance of considering age-specific risk assessment and management strategies for CAD in women.[13] Hypertension is more prevalent in women, especially among older women. Furthermore, women with hypertension have a higher risk of developing congestive heart failure compared to men. The presence of diabetes is a relatively stronger risk factor for coronary artery disease (CAD) in women compared to men. In women, diabetes increases the risk of CAD by 3 to 7 times, whereas in diabetic men, the increase in risk is only 2 to 3 times. This highlights the importance of addressing and managing hypertension and diabetes in women to mitigate their risk of developing CAD.[14-16] In addition to the aforementioned risks, women with diabetes face a more than 3-fold increase in the risk of coronary artery disease (CAD) compared to women without diabetes. Moreover, elevated levels of triglycerides pose a greater risk to women than to men. This highlights the significance of monitoring and managing diabetes and triglyceride levels in women to mitigate their risk of developing CAD.[17-19] Truncal obesity and an increased body mass index (BMI) have been suggested as potential independent risk factors for coronary artery disease (CAD), especially in young women. In the St. James

Women Take Heart Project, it was found that asymptomatic women who were unable to achieve 5 metabolic equivalents (MET) on a Bruce protocol had a 3-fold higher risk of death compared to women who achieved more than 8 MET, even after considering traditional risk factors. This highlights the importance of maintaining a healthy weight and physical fitness level in reducing the risk of CAD in women, independent of other known risk factors.[20]

**CAD in Indian women.**

In Indian women, the risk of coronary artery disease (CAD) is significantly higher compared to other ethnic groups. Indians have a 3-4 times higher risk of CAD compared to White-Americans, a 6 times higher risk than Chinese individuals, and a striking 20 times higher risk than Japanese individuals. The incidence of CAD in young individuals is also notably higher in the Indian population. While in Western populations, the incidence of CAD in the young is around 5%, in Indians it can range from 12-16%. Additionally, several studies conducted in India have reported a high percentage, ranging from 25-40%, of patients below the age of 45 years suffering from Acute Myocardial Infarction (AMI). These findings emphasize the heightened burden of CAD in Indian women and the need for targeted preventive measures and early interventions. (21-26). The prevalence of coronary artery disease (CAD) is significantly higher in urban areas compared to rural areas in India, with urban areas experiencing a prevalence rate of 10% compared to a lower rate in rural areas. Among the different regions of India, South Indians have a higher prevalence of CAD, with rates of 7% in rural areas and 14% in urban areas. While there are numerous studies available on the risk factors and clinical profile of CAD, there is a limited number of studies focusing on the angiographic profile and outcome specifically in female patients. This particular study stands out as it analyzes the complete spectrum of CAD, including chronic CAD and asymptomatic CAD, exclusively in females aged 18 years and above. The study examines risk factors, coronary anatomy, vessels involved, and outcomes following interventions, providing valuable insights into CAD among women.

## MATERIALS AND METHODS

**Study area:** This study was conducted in Department of Medicine ….Medical college
**Study population:** In this study we included total 100 female.
**Duration of study:** The duration of study over a period of two year.
**Primary study population:** We recruited our study population (females) from emergency room, medical/cardiology OPD, intensive coronary care unit and medical wards, where patients were diagnosed to have CAD.

**Subjects:** All symptomatic and asymptomatic patients who diagnosed CAD were included.

**Data Collection**

All subjects were given a general questionnaire, which includes thorough past and present medical history. They then underwent a physical examination and required to submit written informed consents prior to being included in the study. At the screening visit, 15 mL of blood from each subject to test, routine hemogram and biochemical investigations along with ECG and other relevant investigations. All subjects were started treatment depending on the diagnosis. If the patient initially managed elsewhere and referred to this hospital for the CAG then those details of initial treatment like thrombolysis details (Inj Streptokinase/ heparin/ recombinant tissue plasminogen activator etc) were noted. All the patients underwent CAG (details of CAG like primary or elective were noted). After the CAG, the details of angiogram, like vessels involved and management in terms of placement of drug eluting stent (DES) or bare metal stent(BMS) noted. Patients who underwent CABG are noted. All the patients underwent base line 2D ECHO to know the left ventricular ejection fraction at the time of discharge. Patients were followed up at the end of first month followed by at the end of 3 and 6 months.

Patients were examined thoroughly to detect markers of hypercholesterolemia. All the patient's general and physical characters including the anthropometry were noted. Each OPD visit they underwent routine haematological and biochemical investigations.

**Anthropometry**

All anthropometric parameters were obtained while the subject was standing erect and barefoot. Height and weight were determined using standardized conventional methods. Body mass index (BMI) was calculated using the formula: weight in kilograms (kg) divided by height in squared meters (m²). A standardized mercurial sphygmomanometer was used to take the blood pressure of each participant after complete rest

**Blood Collection**

Blood was collected in each visit and the samples were sent to the central pathology laboratory for routine hemogram & biochemical studies.

**Follow up:** On follow up visits, each patients detailed history was taken regarding recurrence in symptoms, vitals were recorded, blood biochemistry for sugar and lipid profile were taken. ECG, and 2D ECHO were also taken.

## RESULTS

During the study period, a total of 103 female patients with coronary artery disease (CAD) were included. The largest age group represented was the 61-70 age group, accounting for approximately 35% (35 out of 100) of the patients. The age group of 41-50 years constituted 25.24% of the patients, while the 51-60 age group accounted for 26.2%. The majority of the study population fell within the 41-80 age range. A significant proportion of the patients, 94 individuals (91.26%), were postmenopausal. Analyzing the presenting symptoms, 28 patients (27.18%) reported typical chest pain, while 52 patients (50.48%) had atypical chest pain. Among the 103 patients, 97 presented with chest pain (94.2%), 6 patients (5.8%) presented with asymptomatic ECG abnormalities, and 25.24% presented with non-anginal symptoms. Among the 75 patients with atypical/non-anginal chest pain and asymptomatic ECG abnormalities, 26 underwent a treadmill test (TMT), and 14 underwent stress myocardial perfusion imaging (MPI). TMT was performed on patients with a normal baseline ECG and non-anginal chest pain or atypical angina, while stress MPI was conducted on cases with baseline ECG abnormalities or those unable to exercise (pharmacological stress MPI). Analyzing the risk factors, 64 patients (62.13%) had a past history of hypertension, 48 patients (46.60%) were being treated for diabetes, and 5 patients (4.85%) had a history of dyslipidemia. Six patients (5.8%) were tobacco consumers. Among the fasting lipid profiles analyzed, 35 patients had total cholesterol levels above 250 mg/dL, and 48 patients had triglyceride levels higher than 150 mg/dL.

**Table 1: Age Wise Distribution of Cases**

| Sl No | Age | Patients |
|---|---|---|
| 1 | 21- 30 | 01 ( 0.97 %) |
| 2 | 31-40 | 02 (1.94 %) |
| 3 | 41-50 | 26 (25.24 %) |
| 4 | 51-60 | 27 (26.2 %) |
| 5 | 61-70 | 35 (33.98 %) |
| 6 | 71-80 | 12 (11.6 %) |
| Total | | 103 (100 %) |

**Table 2: Distribution of Presenting Symptoms**

| S.No | Symptoms | No of cases |
|---|---|---|
| 1 | Typical angina | 28 (27.13 %) |
| 2 | Atypical angina | 43 (41.74 %) |
| 3 | Non anginal pain | 26 (25.24 %) |
| 4 | Asymptomatic ECG abnormality | 06 (5.8 %) |
| | Total | 103 (100 %) |

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**Table 3: Distribution of Selected Risk Factors**

| Sl No | Risk factor | | No of cases |
|---|---|---|---|
| 1 | Hypertension | | 64 (62.13%) |
| 2 | Type 2 DM | | 48 (46.6 %) |
| 3 | Dyslipidemia | | 64 (62.1 %) |
| 4 | Tobacco consumption in any form | | 06 (5.8%) |
| 5 | Obesity ( BMI ≥ 25 kg / m2 ) | | 54 ( 52.42% ) |
| 6 | Family h/o | Hypertension | 03 (2.9 %) |
| | | Type 2 DM | 06 (5.8 %) |
| | | CAD | 09 (8.7 %) |

**Table 4: Distribution of Cases According to Clinical Presentation of Coronary Artery Disease**

| Sl No | | No of cases | |
|---|---|---|---|
| 1 | MI | | 45(43.68 %) |
| | (a) STEMI | 30 (66.66%) | 29.12% |
| | (b) NSTEMI | 15 (33.33%) | 14.56% |
| 2 | UA | | 25 (24.27%) |
| 3 | CSA | | 27 (26.21%) |
| 4 | Asymptomatic ECG abnormality | | 06 (5.8%) |
| | Total | | 103(100%) |

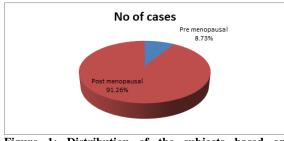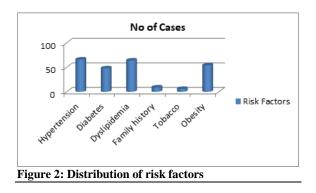Majority of the patients were post-menopausal 94 patients (91.26 %)



**Figure 1: Distribution of the subjects based on menstrual status**



**Figure 2: Distribution of risk factors**

## DISCUSSION

Cardiovascular disease (CVD) is globally considered as the leading cause of death with 80% of CVD related deaths being reported from low and middle income countries like India. Indian women are less likely to be referred for coronary angiogram or revascularization procedures. Even after underlying procedures like angioplasty or bypass grafts, the women have poorer outcome, when compared to their male counterparts.

**Analysis of Menstrual Status**

In our study, out of the 103 female patients, 94 patients (91.26%) were postmenopausal females with an average age of 60 ± 20 years. The remaining 9 patients (8.73%) were premenopausal and fell within the age range of 34-46 years. A similar study conducted by Rout S et al. (reference 27) also reported a majority of postmenopausal patients, accounting for 76% of the participants, with an average age of 55 ± 14 years. These findings suggest a higher representation of postmenopausal women in both studies, highlighting the importance of considering the impact of menopause on the development and progression of coronary artery disease.

In a study conducted by Lokesh S et al. (reference 28) on ischemic heart disease (IHD) among women in South India, it was found that the majority of female patients (74%) fell within the age group of 45-70 years. This age distribution is similar to the findings in our study, indicating that a significant proportion of women affected by IHD in South India belong to this particular age range. This similarity in age distribution further supports the need for targeted interventions and preventive measures in this population to address the burden of IHD in women.

**Analysis of Presenting Symptoms**

In our study of 103 patients, the presentation of typical angina was observed in 28 individuals (21.73%). A larger proportion, 43 individuals (41.74%), presented with atypical angina. Additionally, 26 patients (25.24%) presented with non-anginal chest pain, and 6 patients (5.8%) were asymptomatic but had abnormal ECG findings. A similar study conducted by Rout S et al. (reference 27) involving 106 patients reported that 28 cases (26.4%) had abnormal baseline resting ECG, manifested as non-specific ST changes and T-wave inversion. Another study by Milner et al. (reference 29), which included 127 men and 90 women, showed that symptoms such as dyspnea, nausea/vomiting, indigestion, fatigue, sweating, and arm or shoulder pain, in the absence of chest pain, were more frequent among women than men. In our study, we also found a majority of women presenting with atypical or non-anginal chest pain, which is consistent with the findings of the

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aforementioned study. These results highlight the importance of recognizing and considering atypical symptoms in women when diagnosing and managing coronary artery disease.

**Analysis of Risk Factors**

The study conducted by Rout S et al,[27] of 106 female patients, hypertension was present in 58 (52.4%) of patients, diabetes in 27 (25.4%) patients and family history of premature CAD in 20 patients (18.8%). In our study, of 103 female patients, past history of hypertension was present in 64 (62.13 %), diabetes in 48 (46.6 %), family history of CAD in 12 patients (11.65 %). It has been observed that diabetes mellitus eliminates the advantage of being female with respect to prevalence of IHD.[30]

In the present study, obesity with BMI more than 25 kg/m2 was seen in 54 patients (52.44 %). Study done by Willett WC, Manson JE, Stampfer MJ et al showed that body mass index (25-29 kg/m2) had twice the risk of CHD compared with women of body mass index (<21 kg/m2).[31] Available evidence suggests that unrestrained weight gain worsens the atherogenic risk factor profile.

Dyslipidemia is an important risk factor for CAD. In our study, dyslipidemia was present in majority of cases. Total cholesterol was found raised in 35 (33.98%) patients, with an average value of 250 ± 50 mg%, raised LDL was seen in 23 (23.33 %) patients in the range of 125 ± 20 mg%, low HDL was found in 30 (29.12%) and raised TG in 48 patients (46.66 %) in the range of 200 ± 50 mg%. Study done by Rout Set al,[27] had shown that of 106 patients, dyslipidemia was present in 28 (24.5%) cases. Of all the patients withdyslipidemia raised TC was found in 12 (42%) patients,with an average value of 226±12mg%. raised LDL wasseen in 14 (50%) patients with an average of136±18.4mg%. low HDL was found in 22 (78.6%) raised TG in 18 patients (64.2%) in the range of 188±22mg%. Similar observations were noted in another study done by Lokesh S et al (165) on IHD among women in south india showed (40 %) of female patients had abnormal lipid profile. Evidence shows that in cases of CAD, low HDL and high triglyceride levels are an important risk factors in females in contrast to LDL and total cholesterol in males.[32-33]

Analysis of distribution of cases according to clinical presentation of CAD

In our study we have analysed the complete spectrum of CAD (STEMI, NSTEMI, UA, CSA, Asymptomatic CAD with ECG abnormalities). Among the 103 patients ,45 patients (43.68%) were diagnosed to be having MI. In the 45 patients of MI group, 30 patients (66.66 %) were suffering from STEMI and 15 patients (33.33%) were belonging to NSTEMI population. Approximately 25 patients (24.27 %) presented with UA, 27 patients (26.21 %) presented with CSA and 5.8 % patients (06) presented with asymptomatic ECG abnormality.

## CONCLUSION

Based on our study findings, we can conclude that coronary artery disease (CAD) predominantly affects postmenopausal women (91.26%) compared to premenopausal women (8.73%). Among postmenopausal women, the age group of 41-80 years is the most vulnerable to CAD, especially when accompanied by associated risk factors. Clustering of risk factors such as hypertension, dyslipidemia, obesity, and diabetes is commonly observed among women with CAD. Atypical angina is the most frequently reported presenting symptom in these patients. In terms of CAD characteristics, the anterior wall is the most commonly involved territory in ST-elevation myocardial infarction (STEMI). Single vessel disease is the most prevalent pattern of CAD, with the left anterior descending artery (LAD) being the most frequently affected artery, followed by the right coronary artery (RCA). Early and appropriate therapy plays a crucial role in minimizing complications, and early intervention, such as percutaneous coronary intervention (PCI) or primary angioplasty for myocardial infarction (PAMI), significantly reduces the risk of subsequent left ventricular dysfunction. Therefore, it is crucial to conduct detailed investigations in women presenting with chest pain, particularly if they are postmenopausal, in order to confirm or rule out CAD, as is recommended for men. Prompt diagnosis and appropriate management are essential for improving outcomes and reducing the burden of CAD in women.

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