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CLINICAL AND ANGIOGRAPHIC PROFILE OF CORONARY ARTERY DISEASE IN WOMEN

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Abstract.

Introduction: Coronary artery disease is the major cause of mortality in women in both the developed and developing countries. Limited data exist regarding the risk factors and angiographic profile of coronary artery disease in Indian women. There is an urgent need to better understand the presentation of cardiac symptoms in women, in order to facilitate diagnosis and treatment, to initiate aggressive risk factor intervention and to improve the quality of life. This will aid in better identification of the disease in population and formulating an efficient management protocol.

Aim: To study the clinical and angiographic profile of women admitted with CAD in the cardiology department in a tertiary care hospital in south Kerala**.**

Methodology: This study includes 104 consecutive female patients who were evaluated for coronary artery disease in Cardiology department of a tertiary care hospital. Detailed history, clinical examination, ECG and echocardiography were done. The risk factors which were studied included hypertension, dyslipidemia, diabetes mellitus, obesity, sedentary life style, family history. Invasive coronary angiography was performed in all patients after taking informed consent. Patients were followed up in hospital till discharge. Data was coded and entered in Microsoft Excel and analyzed using IBM SPSS 23 software.

Results: Mean age of the study population was 55.7+/-10.6. Out of the 104 patients 47% patients were diabetic. There was statistically significant association between obstructive CAD with diabetes mellitus (p=0.000), hypertension (p= 0.000), dyslipidemia (p= 0.016), obesity (p= 0.020) and post-menopausal status (p= 0.001). We could identify Triple vessel disease as the most common angiographic pattern, observed in 35.1% of study population. 70% of the

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patients with triple vessel disease had intermediate or high SYNTAX score, suggesting presence of complex anatomy of lesions in this subset.

A large subset of patients with atypical symptoms and TMT positivity had normal coronary angiogram which highlights the importance of critically analyzing each patient with atypical symptoms before an invasive diagnostic investigation like coronary angiogram is performed. Comorbidities and presence of obstructive CAD increased with age in this study population.

Conclusion: Study establishes direct relationship of diabetes, hypertension, dyslipidemia, post-menopausal status, sedentary lifestyle and obesity with obstructive coronary artery disease. Many young patients with atypical symptoms and positive TMT demonstrated normal coronaries in Coronary angiogram indicating a higher prevalence of false positive TMT in younger women with atypical symptoms. Most common angiographic profile identified was triple vessel disease in this study, with high SYNTAX score suggestive of complex coronary anatomy.

Key words: Coronary Artery Disease, TMT, Obstructive CAD, Coronary Angiogram

INTRODUCTION

Almost 12million deaths are accounted by cardiovascular diseases in India.[1,2] Its about 26% of the total deaths happening in the country.[3,4] Coronary Artery Disease (CAD) is the leading cause of death in both men and women worldwide.[5] Cardiovascular diseases contribute to significant morbidity and mortality in India.[6] Many studies have proved beyond doubt that young myocardial infarction is more prevalent in Indian population.[7] 33% of women die of cardiovascular diseases all over the world.[8] Compared to males, CAD in women portend a bad prognosis.[9] They have higher mortality after myocardial infarction (MI), percutaneous intervention(PCI) and coronary artery bypass grafting (CABG).[10,11] They are more prone for death after a first MI. It is also noted that they have higher chances of recurrent MI, heart failure or death.[12] Framingham heart study states that one year mortality following an MI was 44% in women compared to a 27% in men.[13] There is 40% higher mortality in CAD of women adjusted for age and other risk factors.[14-19]. Objective of the present study is to analyse the clinical and angiographic pattern of coronary artery disease in women. This is useful for better understanding about the presentation of cardiac symptoms in women, in order to facilitate

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diagnosis and treatment, to initiate aggressive risk factor intervention and to improve the quality of life.

OBJECTIVE

To study the clinical as well as angiographic profile of women admitted with CAD to cardiology department in a tertiary care hospital of south Kerala.

METHODOLOGY

STUDY POPULATION:

All consecutive female patients with suspected CAD undergoing coronary angiography in a tertiary care hospital, over a period of 1 year were considered for participation in study. Patients with CKD, cardiomyopathy, congenital heart disease, valvular heart disease, myocarditis, pregnancy and serious medical illness were excluded from the study.

SAMPLE SIZE: According to a Kunal Mahajan[15], Nonobstructive CAD is present in coronary angiography in about 33.8% of patients presented with typical chronic stable angina who had undergone the procedure. Hence, taking the proportion of Non obstructive CAD as 33.8% and using the formula

$N=Z^2pq/d^2$

Z value taken as 1.96

p – proportion = 33.8%

q – 1-proportion= 66.2%

d – absolute level of precision = 10

Sample size is $(3.84 \times 33.8 \times 66.2) \div (10 \times 10) = 86$

So, the minimum sample size required for the study is 86

INCLUSION CRITERIA:

Female patients aged more than 18 years, presenting to Department of Cardiology in a tertiary care hospital in south Kerala, who are being evaluated for CAD and undergoing coronary angiography were included in the study.

EXCLUSION CRITERIA:

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Patients with Renal Failure/CKD, myocarditis, pre-existing valvular heart disease, congenital heart disease, cardiomyopathy, pulmonary artery hypertension, pregnancy and serious/morbid medical illness were excluded from the study.

STUDY PROCEDURE:

An informed consent was taken from all patients. A detailed history was taken from each patient with special emphasis on nature of chest pain (atypical /typical), duration of symptoms, angina equivalent symptoms and associated cardiovascular risk factors. Meticulous general and cardiovascular system examination was done in all patients who gave consent. Ethical committee approval was obtained from the Institutional Review Board (IRB number 81/2021).

Routine laboratory tests including total and differential WBC counts, renal function tests, blood sugar and fasting lipid profile were performed using standard protocol at the institutional laboratory.

Cardiac Troponin assay was done in all the patients with acute coronary syndrome (ACS) at least 4-6hrs after onset of index chest pain. Details of previously done TMT were recorded in patients who had undergone the test earlier. A detailed Echocardiography was performed in all patients.

Coronary angiogram (CAG) was performed with GE INNOVA IGS 520 cathlab machine. We considered radial artery approach as the default route and femoral artery access only if there was technical or anatomical difficulty with the radial approach. A minimum of 2 orthogonal views were obtained for each vessel. Angiographic pattern was described in accordance with the major vessels involved. It was called as single, double or triple vessel disease depending on the number of major epicardial coronary arteries involved.

Definitions:

1) Obstructive lesion was defined as greater than or equal to 50% stenosis.

2) Non obstructive lesion when luminal narrowing was less than 50% stenosis.

Data Management and Statistical Analysis

Data was coded and entered in Microsoft Excel and analysed using IBM SPSS 23 software. Continuous data were expressed as the mean value ± 2 standard deviations. Percentage analysis was used to describe distribution of demographic variables. Comparison of continuous variables between the groups was made with independent Student's t-test. The

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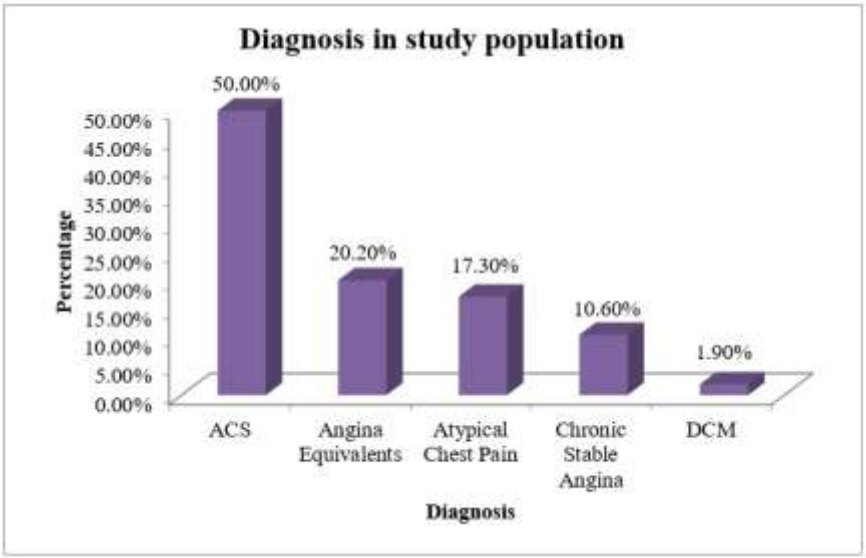
distribution of discrete variables between groups was assessed using a Chi-square test. p value of less than 0.05 was considered significant.

RESULTS

A total of 104 females who were evaluated for coronary artery disease were included in the study. Age group of the samples ranged between 32-77 years with highest number of patients in the age group of 51-60 years (n=39, 37.5%). Body mass index was ≥23 kg/m^2 in 78 patients (75%), indicating a higher prevalence of overweight and obesity in the study population.

Clinical diagnosis:

Figure 1: Clinical presentation of patients:



ACS- Acute coronary syndrome, DCM- Dilated cardiomyopathy

Correlation between clinical presentation and obstructive CAD:

Out of the total 30 patients with non-obstructive CAD in CAG, 1 patient presented as ACS, 15 patients with angina equivalent symptoms, 13 patients as atypical chest pain and 1 patient as suspected ischemic DCM.

Among the 74 patients who presented as obstructive CAD, 51 presented as acute coronary syndrome, 21 patients with angina equivalent symptoms, 18 patients with atypical chest pain, 11 patients with chronic stable angina and 1 patient with ischemic DCM.

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Out of total 104 patients, TMT was performed in 51.90% patients. Among 30 patients with non-obstructive CAD, 27 patients had a positive TMT test while it was not performed in 3 patients. In the obstructive CAD group, TMT was positive in 23 patients while it was not performed in 51 patients.

Comorbid medical illness:

Out of the 104 patients 47% patients were diabetic. There was statistically significant association between obstructive CAD and diabetes mellitus (p=0.000). 53.8% patients were hypertensive. There was a statistically significant association between obstructive CAD and hypertension (p= 0.000).

45.2% patients had dyslipidemia. There was statistically significant association between Obstructive CAD and dyslipidemia (p= 0.016). 34.60% belonged to pre-menopausal age and 65.40% to post-menopausal age. Incidence of obstructive CAD was very rare in pre-menopausal age group. There is a statistically significant association between Obstructive CAD and post-menopausal age (p= 0.001).Prevalence of overweight and obesity was 75% in study population. There is a statistically significant association between Obstructive CAD and obesity (p= 0.020). Sedentary life style was very common in study population with a prevalence of 83.70%. There was statistically significant association between Obstructive CAD and sedentary lifestyle (p= 0.000).

Majority of the patients had good LV function and lesser fraction of patients had LV dysfunction varying from mild to severe. Majority of patients with LV dysfunction demonstrated significant obstructive CAD in CAG.

Table 1: Risk factors and association with obstructive CAD:

Risk factors	Obstructive/ Non obstructive	Status		Total	Significance
		No	Yes		
Diabetes mellitus	Non Obstructive	28	2	30	χ (1) = 27.685, p=0.000
	Obstructive	27	47	74	

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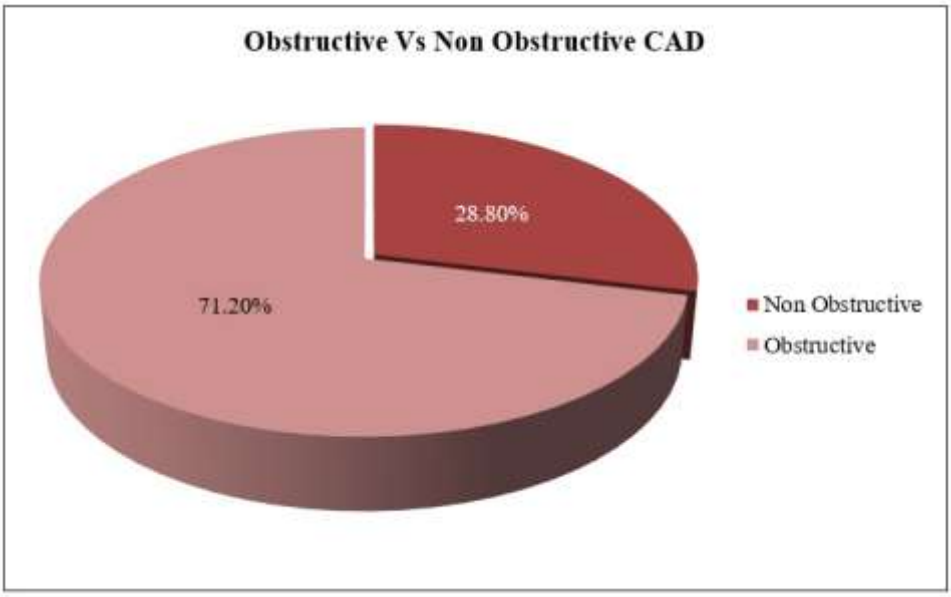
	Total	55	49	104	
Hypertension	**Non Obstructive**	22	8	30	χ (1) = 0.507, p= 0.000
	Obstructive	26	48	74	
	Total	48	56	104	
Dyslipidemia	**Non Obstructive**	22	8	30	χ (1) = 5.842, p= 0.016.
	Obstructive	35	39	74	
	Total	57	47	104	
Obesity	**Non Obstructive**	18	12	30	χ (1) = 5.407, p= 0.020
	Obstructive	26	48	74	
	Total	44	60	104	

Angiographic Profile:

Out of the total 104 patients evaluated for CAD, 71.20% (n=74) had obstructive CAD and 28.80% had non obstructive CAD (n=30).

Figure 2: Angiographic pattern:



Out of the total 74 patients with obstructive CAD, 21.6% (n=16) had double vessel disease, 12.1% (9/74) had left main with single vessel disease, 1.35% (n=1) had Left main involvement only, 1.35% (n=1) had single coronary artery with obstruction, 21.6% (n=16) had single vessel disease, 35.1% (n=26) had triple vessel disease, 6.75% (n=5) had left main with triple vessel disease.

Figure 3: Angiographic involvement of coronary arteries:

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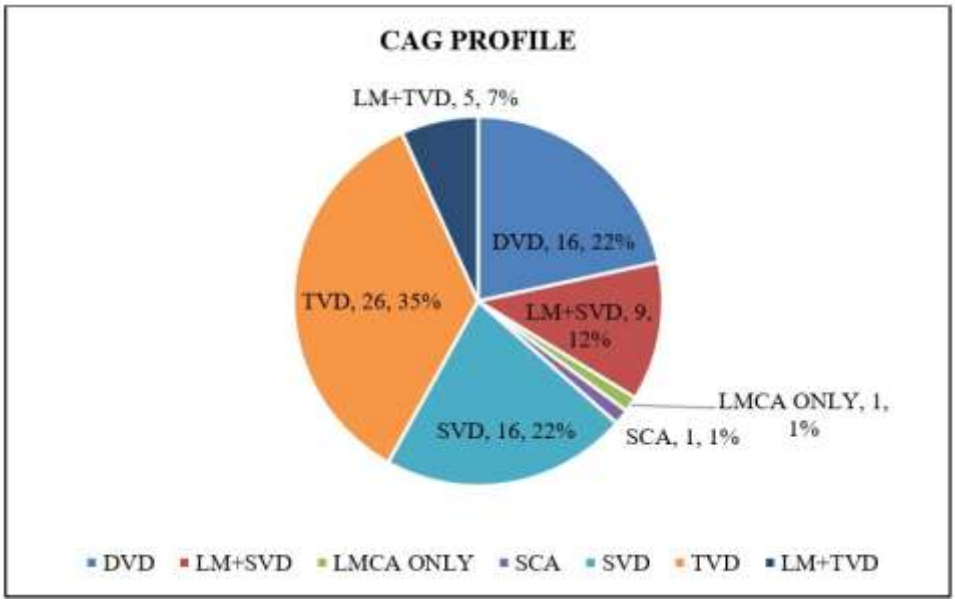

SVD- single vessel disease, DVD- double vessel disease, TVD- triple vessel disease, LMCA-left main coronary artery.

Out of total 74 obstructive CAD cases, LAD involvement was 72.9% (n=54), LCX was 51.3% (n=38), and RCA was 58.1% (n=43).

Table 2: Angiographic pattern of coronary artery involvement:

Angiographic Pattern								Total
SVD	**DVD**	**TVD**	**LMCA**	**LM+SVD**	**LM+TVD**	**Single coronary artery**	**Non-obstructive**	
16	16	26	1	9	5	1	30	104

SVD- single vessel disease, DVD- double vessel disease, TVD- triple vessel disease, LMCA-left main coronary artery.

Out of total 11 cases of LM involvement, 4 cases had 50-60% stenosis,6 cases had 60-70% stenosis and 1 case had 70-80%.Out of the total 54 patients with LAD involvement 19 patients had 50-70% stenosis (37%), 21 patients had 70-90% stenosis (41%), 11 patients with 90-100% (22%).Out of the 38 patients with LCx involvement, 18 patients had stenosis in the range of 50-70%, 17 patients in the range of 70-90% (45%), 3 patients with 90-100% stenosis (8%). Out of the total 31 patients with RCA involvement, 12 patients (38.7%) had 50-70% stenosis, 18 patients(58%) had 70-90% stenosis and 1 patient(3%) had 90-100% stenosis.

SYNTAX score in TVD: 70% of the patients with triple vessel disease had intermediate or high SYNTAX score, suggesting presence of complex anatomy of lesions this subset.

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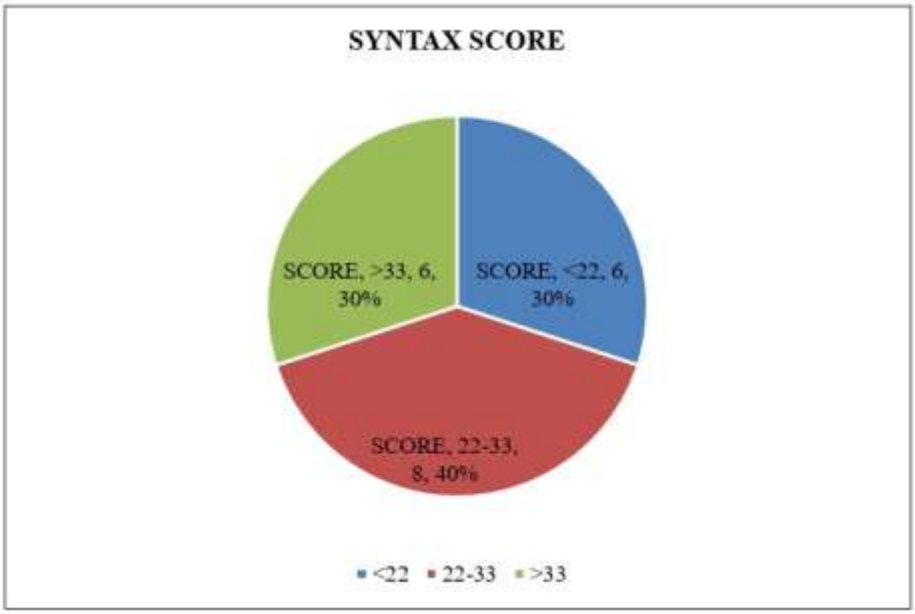
Figure 4: Syntax score in patients with multivessel involvement:



DISCUSSION

Clinical and angiographic profile of 104 female patients with CAD were evaluated in the cardiology department of a tertiary care hospital. Age group of the samples ranged between 32-77 years with highest number of samples belonging to age group of 51-60 years.

In the study of Mahajan et al., sedentary life style was 60.4% while in our study it was 83.70%.[15] Both studies could establish direct relationship between sedentary lifestyle and coronary artery disease. In the study by Abed and Jamee reported 17% Palestinian women undergoing CAG to be overweight.[16] These striking differences across populations are probably the result of variations in ethnic and eating habits of these populations.

Prevalence of diabetes and hypertension in the study by Mahajan et al.[15] was 20.6% and 69.7% respectively, while in our study it was 52.9% and 53.8%, indicating higher prevalence of diabetes in study population.

The results of RATIO study indicate women with at least one parent who suffered from myocardial infarction are at 4 times higher risk of ACS.[17] However, our study could not establish a relationship between family history and obstructive CAD. A study with higher sample size may establish the relationship.

Prevalence of dyslipidemia was 54.80% in the present study. Other studies[15] also report similar prevalence of dysipidemia in female patients.

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Regarding the presentation patterns, young patients tend to present more with atypical symptoms and false positive TMT. This highlights the point that younger women with less clinical probability of CAD present more with atypical symptoms and non-obstructive CAD in CAG.

Out of the 104 patients 50% presented as ACS, 20.2% as angina equivalent symptoms, 17.3% with atypical chest pain, 10.6% as chronic stable angina, 1.9% with suspected ischemic DCM. Both studies showed a significant number of women with atypical chest pain, false positive TMT results and non-obstructive CAD in angiogram.

Prevalence of obstructive CAD and non-obstructive CAD was 67.7% and 32.2 % respectively in previous studies[15] while in our study it was 71.2% and 28.8% respectively. In the pilot phase data from the WISE study 43% had obstructive CAD.[18] In Abed and Jamee study showed 55.2% as prevalence of obstructive CAD.[16] Similarly Indian study by Ezhumalai and Jayaraman revealed 45.4% of patients had obstructive CAD.[19]

Profile of obstructive CAD in in another study was single vessel disease (41.4%), double vessel disease (27.6%), triple vessel disease (31%) and LMCA involvement (5.2%).[15] Involvement of left main coronary artery was 3.4% in the study by Ezhumalai and Jayaraman.[19]

Syntax score was calculated in Triple vessel disease and maximum number of patients were having intermediate or high SYNTAX score indicating complex anatomy of lesions in TVD. This may be attributed to multivessel disease in poorly controlled diabetic women. It highlights the importance of strict screening and management of diabetes and other comorbidities in this population.

Conclusion.

The novelty of the study is the focus on women with coronary artery disease and evaluation of both clinical and coronary angiography profile in the group. This will aid in better identification of the disease in female population and formulating an efficient management protocol.

This prospective, tertiary care hospital based observational study comprising 104 female patients establishes direct relationship with diabetes, hypertension, dyslipidemia, postmenopausal age, sedentary lifestyle and obesity with obstructive coronary artery disease. The present study also demonstrated that there is a progressive increase in CAD risk factors as well as the angiographic extent and severity of the disease with increasing age.

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Young patients with atypical symptoms and positive TMT demonstrated normal coronaries in Coronary angiogram indicating a higher prevalence of false positive TMT in this subset of patients. A higher prevalence of Triple vessel disease and high SYNTAX score were observed in patients with obstructive coronary artery disease.

Limitations of study.

The study didn't consider opposite gender as a control group; hence an effective comparison could not be made with male patients. It is a single centre study with relatively small sample size. Novel atherosclerotic risk factors were not considered in this study. Inherent limitations of observational study design with chances of potential residual confounders also prevail

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