Original Study

Comparison of Clinical and Angiographic Profile between Men and Women with Coronary Artery Disease

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How to cite this article: Soumya Ranjan Mahapatra, Sandeep Bansal, Preeti Gupta. Comparison of Clinical and Angiographic Profile between Men and Women with Coronary Artery Disease. Indian Journal of Public Health Research and Development/Volume 15 No. 2, April - June 2024.

Abstract

Aim of the Study: To study the clinical and angiographic profile of coronary artery disease (CAD) among women & men to compare the difference in these profiles CAD.

Materials and Methods: 1000 consecutive patients undergoing coronary angiography (CAG) for coronary artery disease were taken for this study. Patients were divided into two groups on the basis of gender. The risk factors, clinical presentation, echo cardiographic features, angiographic profile and treatment modalities were analyzed and compared between both groups.

Results: 300 patients were female and 700 patients were male with a mean age group of 57.2 years & 53.2 years respectively. On comparing the angiographic data CAD was higher among men. Significantly men received greater thrombolytic therapy than women & any intervention in form of PCI/CABG at admission or within 3 months of follow up was significantly greater in men than in women.

Conclusion: There has been a shift with respect to onset of risk factors and clinical presentation for coronary artery disease in the women. It is necessary to identify atherosclerotic risk factors in women and treat them appropriately to prevent further cardiovascular events. Interventional options PCI & CABG are done more often in men as compared to women.

Keywords Coronary Artery Disease, Women, Risk Factors

Introduction

Coronary artery disease (CAD) is one of the leading cause of morbidity and mortality in both developed and developing nations. We believed that CAD was primarily seen in males. But with the fact that the leading cause of death in women is CAD, this belief is gradually changing among the physicians. Although women suffer 7-10 years later than men, Centres for Disease Control (CDC) states that 38% of mortality in females are attributed to coronary artery disease which is highest amongst all causes including cancer which attributes to 22% of all cause deaths. Notably, women with CAD are more adversely affected than men.[1].

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Submission date: Jun 8, 2023, **Revision date:** Jun 30, 2023, **Published date: Apr 4 2024**

Lack of self-awareness and poor identification of the cardiovascular risk factors, underrepresentation in clinical trials and different clinical presentations in women has led to improper diagnosis ,under treatment and inappropriate progression of the disease. A greater percentage of females (52%) than males (42%) with CAD die of cardiac arrest before reaching the hospital. The INTERHEART Study states that females have their first presentation of CAD nearly 10 years later than males, most commonly after menopause. However, in contrary, mortality from CAD is increasing more rapidly among females than males.[2].

Material and Methods

This was a prospective observational analytical study conducted in a tertiary care hospital in India. The patients who underwent coronary angiography for CAD, after obtaining written informed consent were included in the study. Data were collected using a standard questionnaire and answers were recorded. Any personal history of hypertension, dyslipidemia, diabetes mellitus and CAD were noted. Tobacco consumption in any form was asked about. Coronary risk factors, stroke & family history of premature CAD in first degree relatives (age <55 years in men and <65 years in women**),** were recorded. Questions related to history of documented prior myocardial infarction (MI), unstable angina, coronary artery bypass graft (CABG) surgery, non-invasive investigations for CAD, coronary angiography, coronary angioplasty, documented use of drugs for CAD and hospital admission for CAD. All patients underwent detailed evaluation including clinical, biochemical (including troponin levels), electrocardiography echocardiography evaluation and coronary angiography.

Inclusion Criteria

All patients who were admitted to undergo coronary angiography for Coronary Artery Disease after obtaining written informed consent were included in the study .

Exclusion Criteria

Patients with contraindications for angiography

- Patient's with renal dysfunction
- Patients who are too unstable to undergo coronary angiography

Result

1000 consecutive patients who fulfilled the inclusion criteria were included in the study. Out of 1000 patients 700 (70%) were males and 300 (30%) were females.

31.3% females and 30.3% males were in 51-60 years age group. 22.3% females and 21.3% males were in 61-70 years age group. 14% females and 5.7% males were in >70 years age group.28.4% males and 20.7% females were in 41-50 years age group, 12.1% males and 11.3% females were in 31-40 years, and 2.3% males and 0.3% female were < 30 years. Pattern of age distribution among females and males was statistically significant (Table 1).

Table 1. Age distribution in females & males

Age	MALE	FEMALE	p-value
<30 Yrs.	16(2.3%)	1 (0.3%)	<0.001
31-40 Yrs.	84(12.1%)	34 (11.3%)	
41-50 Yrs.	199(28.4%)	62 (20.7%)	
51-60 Yrs.	212(30.3%)	94 (31.3%)	
61-70 Yrs.	149(21.3%)	67 (22.3%)	
71-80 Yrs.	40(5.7%)	42 (14 %)	
Total	700(100%)	300 (100.00%)	

On comparing the risk factors 46.1% females were hypertensive and 38.3% females were diabetic. However only 27.3% males were hypertensive and 22.7% males were diabetic. Family history of premature CAD was 2.3% among females and 0.6% among males. These differences among both the groups were statistically significant.

Smoking and obesity were found in 67.9% and 55.6% among males and 14.3% and 48.7% among females respectively. These differences among both the groups were statistically significant.

53% females and 51.1% males were dyslipidemic, 61.9% females and 65.9% males had sedentary lifestyle, 3.7% females and 5.6% males had a prior history of CAD and 16.4% males and none of the females were alcoholic. None of these differences among both the groups were statistically significant (Table 2).

Table 2. Risk factors in male and female patients

RISK FACTORS	FEMALE	MALE	p value
HYPERTENSION	138(46.1%)	191(27.3%)	<0.001
DIABETES	115(38.3%)	159(22.7%)	<0.001
SMOKING	43(14.3%)	475(67.9%)	<0.001
DYSLIPIDEMIA	159(53%)	358(51.1%)	0.59
ALCOHOL	0(0%)	115(16.4%)	
OBESITY	146(48.7%)	389(55.6%)	0.045
SEDENTARY LIFESTYLE	185(61.9%)	457(65.9%)	0.218
FAMILY HISTORY	7(2.3%)	4(0.6%)	0.014
PRIOR CAD	11(3.7%)	39(5.6%)	0.205

33.3% females and 21.6% males presented with chronic stable angina, 33.7% females and 52.6% males presented with STEMI, 26.3% females and 20.3% males presented with NSTEMI and 6.7% females and 5.6% males presented with unstable angina. These differences between both the groups were statistically significant. On comparing the angiographic profile, 69.4% women and 78.5% men had Obstructive CAD whereas 21.6% women and 8.6% men had Normal Coronaries. These differences between both the groups were statistically significant. Only 4.7% women and 5.8% men had Insignificant CAD and 4.3% women and 7.1% men had Intermediate CAD. However these differences between both the groups were not statistically significant (Table 3 and 4).

Table 3. Presentation in male and female patients

PRESENTATION	FEMALE	MALE	p value
STABLE ANGINA	100(33.3%)	151(21.6%)	<0.001
STEMI	101(33.7%)	368(52.6%)	
NSTEMI	79(26.3%)	142(20.3%)	
UNSTABLE ANGINA	20(6.7%)	39(5.6%)	
Total	300	700	

Table 4: Coronary Angiographic profile in male and female patients

PATTERN OF CAD	FEMALE(n =300)	MALE (n = 700)	p Value
OBSTRUCTIVE	208(69.4%)	550(78.5%)	<0.001
INTERMEDIATE	13(4.3%)	50(7.1%)	0.094
INSIGNIFICANT	14(4.7%)	40(5.8%)	0.307
NORMAL CORONARIES	65(21.6%)	60(8.6%)	<0.001

30.7% females and 45.1% males had Single Vessel Disease (SVD), 23.1% females and 17.3% males had Double Vessel Disease (DVD) and 15.7% females and 16,1% males had Triple Vessel Disease (TVD). These differences between both the groups were statistically significant (Table 5).

Table 5. Pattern of Obstructive CAD in male and Female patients

PATTERN OF VESSEL INVOLVEMENT	FEMALE N=300	MALE N=700	p value
SVD	92(30.7%)	316(45.1%)	< 0.001
DVD	69(23.1%)	121(17.3%)	
TVD	47(15.7%)	113(16.1%)	

49.7% females and 37.7% males had normal LV function. Mild LV dysfunction was found in 25.7% females and31.6% males. Moderate LV dysfunction was found in 24.3% females and 28% males. Severe LV dysfunction was found in 0.3% females and in 2.7% males. These differences between both the groups were statistically significant (Table 6 and 7).

Table 6. Left ventricular dysfunction in male and female patients

LV DYSFUNCTION	FEMALE	MALE	p Value
NONE	149(49.7%)	264(37.7%)	0.001
MILD	77(25.7%)	221(31.6%)	
MODERATE	73(24.3%)	196(28.0%)	
SEVERE	1(0.3%)	19(2.7%)	

Table 7: Thrombolytic therapy in males and females

	FEMALE	MALE	p Value
THROMBOLYTIC THERAPY ADMINISTERED	29(9.6%)	147(21%)	<0.001

Thrombolytic therapy was given in 21% males and 9.6% females and this difference was statistically significant.

Among females 71.7% received medical therapy alone and 28.3% received intervention in form of PCI/CABG at admission or within 3 months of follow up. However, among males 60% received medical therapy alone and 40% received intervention in form of PCI/CABG at admission or within 3 months of follow up. This difference between both the groups was statistically significant (Table 8).

Table 8. Coronary intervention in female and male

	INTERVENTION PLUS MEDICAL THERAPY			MEDICAL THERAPY ALONE	p Value
	CABG	PCI	TOTAL		
FEMALE	03	82	85(28.3%)	215(71.7%)	<0.001
MALE	26	254	280(40%)	420(60%)	

Discussion

1000 consecutive patients who underwent coronary angiography for CAD were included in our study. The risk factors, clinical presentation, echo cardiographic features and angiographic profile were analyzed and compared between various groups.

Of these, 300 patients (30%) were females and 700 patients (70%) were males with a mean age group of 57.2 years & 53.2 years respectively. The INTERHEART study which was conducted in 52 countries, including India, had nearly 76% male patients amongst all the enrolled subjects [3]. On comparing the age distribution among females and males, the younger age group showed a significantly greater number of male patients. Although the peak incidence at around 51-60 years was found in both the groups, older age showed significant female preponderance. This observation is very similar to the previous studies. This difference in the age of presentation among males and females varies between 5-10 years in all the similar studies. The later age of presentation in women can be attributed to endogenous protection by estrogens before menopause. Estrogens promote HDL-C levels and reduce LDL-C levels, reduce endothelial dysfunction and up regulate the release of nitric oxide leading to vasodilatation & delay in the manifestation of atherosclerotic disease in premenopausal women.[4].

Hypertension & Diabetes were significantly more prevalent among women than men. 46.1% of female patients were hypertensive as compared to just 27.3% of male patients. Similarly, 38.3% of our female patients were found to be diabetic as compared to

22.7% of male patients. Studies conducted by Gupta and Anand respectively have reported similar distribution of risk factors among males and females [4]. However, our data shows higher prevalence of diabetes and hypertension in women which is similar to the from the WestS Bajaj et al. in a similar study in North India also found higher prevalence of diabetes and hypertension in women as compared to men.[5,6].

On comparing the BMI, Obesity was more prevalent in females. Similar to our findings, S Bajaj et al found higher BMI in males whereas Butala NM et alfound a higher BMI in females.[6,7].

Smoking was the most common risk factor among the males in our study and was significantly less in the female patients. This is consistent with various studies due to the social and cultural belief.[4,8].

2.3% of women and 0.6% of men had a family history of premature CAD (p=0.014). In a population based study by Sekhri et al., 6% of female patients & 4.4% of male patients had a first degree relative with a history of premature CAD (p<0.05), consistent with our result.[9].

On comparing females with males, the incidence of acute coronary syndrome was higher in males (77.4% vs 66.7%) and the incidence of angina pectoris was higher in females (33.3% vs 22.6%). STEMI and NSTEMI were commonest form of ACS in males and females respectively. Similar to our findings, in a 3-year follow-up study in Delhi by Chadha. S. L. et al.the proportions of all coronary events represented by myocardial infarction and angina pectoris were 21% and 79%, for men, and 11% and 89%, for women, respectively [9]. In a recent meta-analysis of 74 international studies, the prevalence of typical angina was 11–27% greater for women <65 years than men & women ≥75 years of age.[10].

On comparing the angiographic data of women and men, more women had normal coronary arteries (21.6% vs 8.6% p<0.001) whereas prevalence of obstructive CAD was higher among men (78.5% vs 69.4% p<0.001). Similar to our findings, in the CASS (Coronary Artery Surgery Study), normal coronaries were seen in 30% of women with typical angina and 64% with atypical angina, but in contrary was observed in only 7% of men with typical angina and 34% of men with atypical angina.[11]

In our study significantly greater subset of men received thrombolytic therapy than women (21% vs 9.6% p<0.001). Several studies have shown that women in compared to men with STEMI present at the hospital after the window period for thrombolysis [8]. This may explain women being less commonly treated with thrombolysis than men with STEMI as time from symptom to treatment is crucial for successful thrombolysis.

In addition, our study showed, any intervention in form of PCI or CABG at admission or within 3 months of follow up was significantly greater in men than in women (40% vs 28.3% p<0.001). Many studies show higher rates of coronary interventions for males in comparison to females suggesting more aggressive approach for males. However, others have reported no significant gender differences, thereby resulting in uncertainty if really a true gender bias exists in coronary intervention.[12].

Conclusions

Cardiovascular disease is under-recognized, undertreated & major cause of death in women. Our study highlights an alarming increase in the proportion of women diagnosed to have significant coronary artery disease. There has been a shift with respect to onset of risk factors and clinical presentation for coronary artery disease in the women. It is necessary to identify atherosclerotic risk factors in women and treat them appropriately to prevent further cardiovascular events. Gender related differences with regard to involvement of coronaries, clinical presentation and further treatment options prevail in our country. Interventional options PCI & CABG are done more often in men as compared to women.

Greater awareness of the gender based differences in risk factors, presentation of coronary artery & interpretation of diagnostic tests, is necessary for medical professionals to improve treatment strategies and overall outcomes in women. Cardiology guidelines should focus on gender-related differences wherever necessary. Further, women need to be more aware of their own risk factors and clinical signs of the disease. There is an increasing need to educate the general population that CAD is not only a disease of males & women can be affected as well.

Limitations of Our Study

The results presented involve a single centre. Hence, the results are a representation of a segment of population and not the country as a whole. Patients that were too unstable for coronary angiography were excluded. Hence our study could not comment accurately on in-hospital mortality. Our study didn't perform FFR (fractional flow reserve), IVUS (intravascular ultrasound) & OCT (optical coherence tomography). Hence we were not able to analyse further on the intermediate lesions seen on coronary angiography.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Ethical Clearance was obtained from the Institutional Ethics Committee prior to the commencement of the study

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