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Research Article

Clinical, echocardiographic and angiographic correlation of acute coronary syndrome in women at a tertiary care centre

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ABSTRACT

Background: The evaluation of coronary artery disease (CAD) in women presents a unique and difficult challenge for clinicians, owing to the differences in symptoms, clinical features and mortality as compared to men. This study is to analyze the risk factors, clinical presentation, complications and outcome in women who presented with myocardial infarction.
Methods: The study was conducted among women admitted with acute myocardial infarction in coronary care unit of KIMS Hospital, Hubli from January 2013 to December 2013. After inclusion and exclusion criteria 100 women underwent detailed history, clinical examination and investigations.
Results: The mean age of the study group was 57.98 years. 49% of patients presented with atypical symptoms with majority being postmenopausal (87%). HDL cholesterol was the commonest risk factor followed by HsCRP, increased waist circumference and diabetes mellitus, with the least common risk factor being elevated homocysteine. Pump failure was the commonest complication. Double vessel disease was more common in diabetic population whereas single disease was common in non-diabetic population.
Conclusions: Women clinically present with atypical symptoms that resulted in significant delay to reach hospital. Novel risk factors like HsCRP and homocysteine may improve risk detection in women with CAD. Identifying and targetting lifestyle risk factors. Diabetes mellitus in particular is the key to reduction in CAD in women.

Keywords: Coronary artery disease, Diabetes mellitus, Gender-specific, HsCRP, Myocardial infarction, Women

INTRODUCTION

The twentieth century saw an unparalleled increase in life expectancy and a major shift in the cause of illness and death throughout the world. During this transition, Cardiovascular Disease (CVD) became the most common cause of death worldwide. A century ago CVD accounted for less than 10% of all deaths. Today it accounts for approximately 30% of deaths worldwide including nearly 40% in high income countries and 28% in low and middle-income countries.[1]

Based on data from the Framingham Heart Study, the lifetime risk of developing symptomatic coronary artery disease (CAD) after the age of forty is 49% for men and 32% for women. The World Health Organization (WHO) has estimated that by 2020, the global number of deaths from CAD would have risen from 7.2 million in 2002 to 11.1 million.[2] The evaluation of Ischemic Heart Disease (IHD) in women presents a unique and sometimes difficult challenge for clinicians, owing to the differences in symptoms, clinical features and mortality as compared to men. The diagnosis and treatment of CAD has been primarily based on research conducted in men, either excluding women entirely or including limited number of women.[3]

This societal burden of the disease is, in part, related to our poor understanding of gender- specific pathophysiologic differences in the presentation and

prognosis of IHD and the paucity of diagnostic and treatment guidelines tailored to phenotypic differences in women.[4]

This study is to analyze the clinical presentation, complications and outcome in those women who presented with myocardial infarction.

METHODS

The present study is a single centre cross sectional comparative study conducted on 100 women admitted with acute myocardial infarction in coronary care unit of KIMS Hospital, Hubli, Karnataka, India.

Inclusion criteria

Women diagnosed with acute MI as per Third Universal Definition of Myocardial infarction.

Exclusion criteria

- Age less than 15 years.
- Chronic stable angina.
- Cardiovascular diseases resembling acute coronary syndromes like pericarditis, aortic dissection or pulmonary embolism.
- Non- cardiac causes of chest pain.

After applying inclusion and exclusion criteria a randomly selected group of 100 women underwent detailed history, clinical examination and relevant investigations.

Coronary angiography was performed by the standard Judkin's technique after adequate preparation once patients were stabilized. Coronary artery narrowing of more than or equal to 50% was considered as significant stenosis. All the patients were followed up during their hospital stay and the outcome recorded.

Among 100 women, 50 were diagnosed to have Diabetes Mellitus according to the current ADA guidelines 84. Clinical, laboratory and angiographic parameters were compared between the diabetic and non-diabetic group with Chi-square test and t test using SPSS 25.0 software. A p value of less than 0.05 was considered for statistical significance.

RESULTS

The incidence of Myocardial infarction was highest in age group of 50-59 (29%) followed by age group ≤49 years (21%), age group 60-69 (32%) and age group ≥70 (10%) in present study. In present study, mean age of study group was 57.98 years.

There was no statistically significant correlation between mortality and age. In the study, 30% of patients reached hospital within 6 hours whereas remaining patients 70% reached hospital after 6 hours after onset of symptoms. However comparison of outcome with time to reach hospital was not statistically significant (Figure 1). 51% patient presented with typical symptoms of myocardial infarction to the hospital whereas remaining 49% presented with atypical symptoms. Postmenopausal women (87%) constituted the largest group of patients who presented with myocardial infarction with premenopausal women (13%) being remaining group.

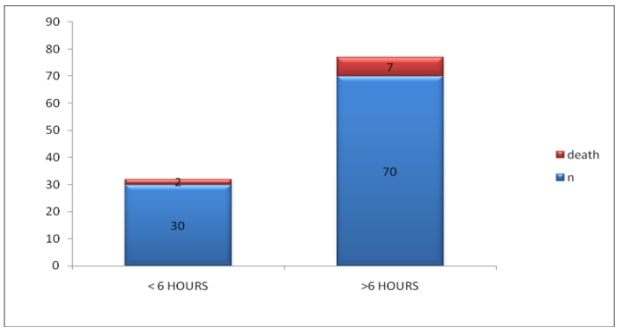

Figure 1: Time to reach hospital from the onset of symptoms.

When patient were classified according to killip scoring (Figure 2), the commonest class of presentation was killip class 1 (55%) followed by class 3 (17%), class 2 (17%) and class 4 (11%) with statistically significant correlation with short term outcome (p=0.0001*).

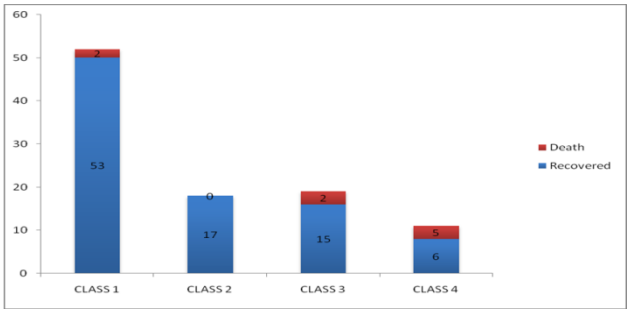

Figure 2: Status of killip class in outcome among study respondents.

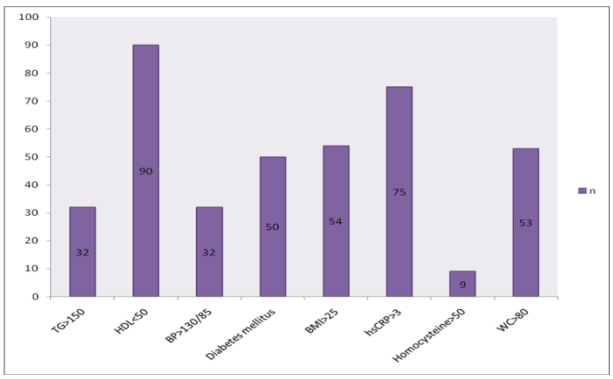

Figure 3: Prevalence of risk factors in the study population.

High density cholesterol (90%) was found to be commonest risk factor found in the study group (Figure 3) followed by elevated hsCRP (75%), Overweight (54%), Increased waist circumference (53%) and Diabetes mellitus (50%), with the least common risk factor being elevated homocysteine (9%).

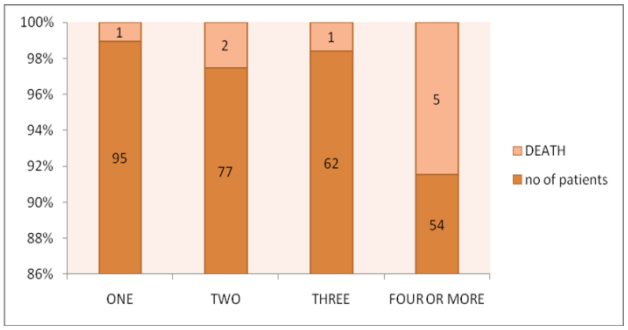

Figure 4: Comparison of number of risk factors with outcome.

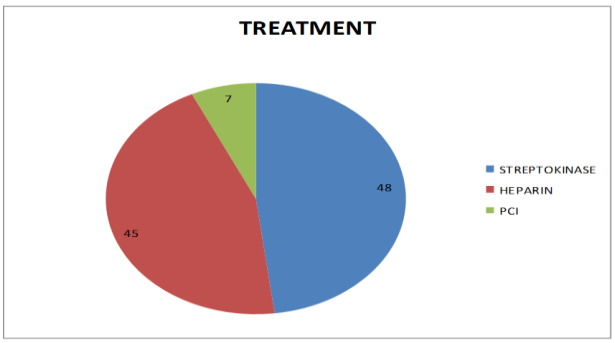

Figure 5: Management modality among study population.

In the present study, 91% of patients had at least one risk factor causing myocardial infarction and 50% patients had more than four of above mentioned risk factor causing myocardial infarction (Figure 4). The mortality rate was 9% in study with 5% of deaths occurring in patients with four or more risk factors.

Table 1: Distribution of angiographic findings in study population.

Type of CAD	Frequency	Outcome	
		Recovered	Death (%)
Single vessel disease	39	38	01
Double vessel disease	29	28	01
Triple vessel disease	12	10	02
Non-obstructing CAD	05	05	0
Normal	08	08	0
Not done	07	02	05

Isolated Inferior wall and Inferior wall with Posterior wall and Right Ventricular extension together constituted most common site of infarction (47%) followed by Anterior wall (37%) with most of the deaths occurring in Anterior wall MI. Mild LV Systolic dysfunction was found in 52% of patients with moderate LV Systolic dysfunction in 12% patients and severe LV Systolic dysfunction in 8% patients.

Single vessel involvement was the commonest angiographic finding in 39% of patients followed by Double vessel disease in 29% and triple vessel disease in 12%. In the present study, the severity of individual vessel involvement was compared and it was found that left anterior descending artery was common (57 %) followed by right coronary artery (51%) and left circumflex artery (40%) whereas severity of vessel involvement among the groups was not significant.

In our study, majority of the patients were managed with medical line of management with streptokinase and heparin with remaining patients undergoing percutaneous coronary intervention (Figure 5). Mechanical complication in the form of pump failure (23%) was the commonest complication out of which one third of patients died followed by arrhythmia (15%).

DISCUSSION

Cardiovascular disease is the leading cause of mortality in women. In fact CVD is responsible for a third of all deaths of women worldwide and half of all deaths of women over 50 years of age in developing countries. Retrospective analysis suggest that there are some clinically relevant differences between women and men in terms of prevalence, presentation, management and outcomes of the disease, but little is known about why CVD affects women differently.

This knowledge gap may also explain why cardiovascular health in women is not improving as fast as that of men. It is also becoming increasingly evident that gender differences in cultural, behavioral, psychosocial and socio economic status are responsible to various degrees, for

the observed differences in women. However the interaction between sex and gender related factors and CVD outcomes in women remains largely unknown.

This is a cross sectional observational study concentrating about the age of presentation, symptoms, delay in treatment, clinical profile, risk factors, complications and short term mortality. Hundred patients admitted to coronary care unit with evidence of acute MI features in ECG and cTropI positive were randomly selected and data collected with the follow up during the hospital stay of patients.

Table 2: Mean age of females in various studies.

Various studies	Mean age
Gupta et al[7]	57.5±6.6 years
Jenkins et al[8]	63. 1±1.9 years
Howard et al[9]	69 ± 11 years
Present study	57.98±11.69 years

The average age at first MI is 64.5 years for men and 70.3 years for women.[5] The incidence of CAD in women lags behind men by 10 years and by 20 years for more serious clinical events such as MI and sudden death[6]. The mean age of occurrence of acute MI in females in this study was 57.98 yrs with age ranging from 21 years to 82 years. This is comparable with the other studies (Table 2).

The incidence of MI was highest in age group of 50-59 (29%) followed by age group <49 years (21%), age group 60-69 (32%) and age group >70 (18%) in the present study. Total mortality is 9% and there was no significant correlation between mortality and age. Johanne Neil et al state that the excess mortality in women is due to older age at presentation in women.[4]

51% women presented with typical symptoms and 49% with atypical symptoms. 30% of patients reached hospital within 6 hours whereas remaining patients 70% reached hospital after 6 hours.

When patients were classified according to Killip scoring the commonest class of presentation was killip class 1 (55%) followed by class 3 (17%), class 2 (17%) and class 4 (11%). This study concludes that almost half the women classically present with atypical symptoms resulting in a delay of initiation of treatment or inadequate treatment leading to poor short term outcome. There is a significant delay in reaching the treatment care center.

Table 3: Clinical presentation comparision in various studies among females.

Symptoms	Bhat et al (%)[10]	Charles et al (%)[11]	Culic et al (%)[12]	Thuresson et al (%)[13]
Chest pain	73.8	86.7	79.9	82
Sweating	64.2	41.8	48.1	66
Vomiting	64.2	42.9	21	18
Breathlessness	23.8	52	48.4	33
Syncope	18	9.3	7.8	30
Pain abdomen	Nil	12.3	13.3	14
Palpitation	Nil	Nil	-	-

Table 4: Comparison of risk factors in females in different studies.

Risk factors	Yavagal et al (%)[18]	Chatterjee et al (%)[19]	Dave et al (%)[20]	Stone et al (%)[21]	Babu et al (%)[22]	Present study (%)
Post- menopausal	30	97.7	84	-	-	87
Diabetes	35	56	44	10	40.8	50
Overweight	45	4	58	-	8.8	54
Hypertension	30	25	53	54	48	32

Majority of patients were managed with medical line of management, that is, streptokinase (48%) and heparin (45%) with remaining patients undergoing percutaneous coronary intervention (7%). Sandra et al state that, women receive somewhat less aggressive treatment during the early management of acute MI.[14] Hani Jneid et al state that the underuse of evidence based treatments and delayed reperfusion among women represent potential opportunities for reducing poor outcomes after acute MI.[15] In the CRUSADE (Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes With Early Implementation of the American College of Cardiology/ American Heart Association Guidelines) initiative, women were less likely to receive heparin and glycoprotein(GP) IIb/IIIa inhibitors and less likely to undergo cardiac catheterization and revascularization than men were.

Women with ACS have also been shown to be less likely to receive early aspirin, beta-blockers, reperfusion, and timely reperfusion.[16] Focus on risk factors is important in the prevention of CAD in women, just as it is in men. When women with 2 or more risk factors were compared to women with no risk factors, those without risk factors had a substantially lower lifetime risk of CAD (8.2% vs. 50.2%).[17]

Table 5: Comparison of homocysteine in females in different studies.

Homocysteine mean	Khare et al [37]	Puri et al [38]	Present study
Homocysteine	23.49 ± 16.11	27.8 ± 13.11	22.15±19.15

Table 6: Different sites of infarction in various studies.

Site of infarction (%)	Yavagal et al (%)[39]	Babu et al (%)[40]	Bhat et al (%)	Howard et al (%)	Present study (%)
Anterior wall infarction	51	46.6	41.7	37	37
Inferior wall infarction	20	9.8	29.8	35	27

Unique to women are the hormonal changes that occur over their lifetimes and ultimately affect CAD risk. The incidence of acute MI increased in the postmenopausal women. In this study, 87% belonged to this group. Chatterjee et al observed 97% of their cases were post-menopausal. There were 13 patients in the pre-menopausal period in this study (13%).The discrepancy in cardiovascular disease between the sexes has been attributed to hormones and menopause.

Table 7: Incidence of various complications in different studies.

Complications	Yavagal et al (%)	Bhat et al (%)	Hochman et al M (%)	Hochman et al F (%)
Left ventricular failure	30	14.2	-	-
Cardiogenic shock	10	7.1	7.3	11.9
VPC's	10	25	-	-
Atrioventricular block	5	25	5.4	7.4
Ventricular tachycardia	5	25	4.3	4.2
Post infarct VSD	Nil	Nil	-	-
Left anterior hemiblock	Nil	25	-	-
Ventricular fibrillation	Nil	25	1.3	2.9
Pericarditis	Nil	3	-	-
Atrial fibrillation	-	-	8.6	11.0
Acute mitral regurgitation	-	-	0.6	1.6

Post-menopausal hormone replacement therapy has proved to reduce the relative risk of CAD to 0.3 -0.79 and improved survival in women.

Burke et al state that, in women, traditional risk factors have distinct effects on the mechanism of sudden coronary death, which vary by menopausal status. Effective risk factor modification may therefore differ between younger and older women and may targeting different mechanisms of plaque rupture.[23,24]

Diabetes mellitus is the next important risk factor. The incidence in various studies varied from 26 to 56%.[25-29] The presence of diabetes is a relatively greater risk factor for CAD in women versus men, increasing a woman's risk of CAD by 3- to 7-fold, with only a 2- to 3-fold increase in diabetic men.[30] Furthermore, women with diabetes have a greater than 3-fold increase in CAD risk than nondiabetic women do.[31] In the present study 50 (50%) females were diabetics according to the current ADA guidelines.

The incidence of hypertension in various studies varied between 30 to 54%.[32-36] The present study showed an incidence of 32%. Stone et al noted hypertension in 54% cases, 12 patients were both diabetic and hypertensive (40%). The incidence of overweight in this study was

54%. The incidence in various studies varied from 4-45%.

Hence, the incidence of overweight was comparable to other studies. In our study, Isolated Inferior wall constituted 27 % and Anterior wall 37% (Table 6). However, Inferior wall with posterior wall and right ventricular extension together constituted most common site of infarction (47%). This was similar to the incidence observed by Bhat et al, and Howard et al.

Table 8: Mortality among females in various studies.

Sex	Howard et al (%)	Stone et al (%)	Culic et al (%)	Present Study (%)
Female	17.5	9.3	21.4	9

Table 9: Comparison of the cause of the death among different studies.

Cause of death	Gupta et al (%)	Present study (F) (%)
Pump failure	39	66%
Arrythmia	6%	22%
Others	17.4	11%

Pump failure was the most common complication in this study accounting to 23%. Bhat et al observed left ventricular failure in 14.2% cases. The next common complication was arrhythmia (15%).

Hochman et al noticed atrio-ventricular block in 7.4% of females and 5.4% of males and the incidence of ventricular tachycardia in various studies varied between 4 to 25% of the cases. Among 100 female patients, 9 (9%) deaths occurred.

Among 9 deaths in females, pump failure was the most common cause of the death in 66% females whereas 39% of deaths in Gupta et.al occurred due to pump failure. Arrhythmia was the next common cause of mortality in 22% of cases.

CONCLUSION

To conclude, women clinically present with atypical symptoms that resulted in significant delay to reach the hospital. Postmenopausal state, Dyslipidemia and Diabetes Mellitus were the most common risk factors among women.

Diabetic women present with CAD at a younger age, with multivessel disease and are likely to have higher incidence of pump failure associated with poorer outcome.

Abdominal obesity, but not BMI was strongly associated with acute MI in diabetic women. Novel risk factors like HsCRP and homocysteine may improve risk detection in women with CAD.

Identifying, preventing and targetting lifestyle risk factors, diabetes mellitus in particular, are the key to reduction of CAD in women.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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