

An Observational Study To Compare Males And Females Undergoing Thrombolysis For Acute Myocardial Infarction At A Referral Centre Of Bihar

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Abstract

Introduction: Cardiovascular diseases (CVDs) are among the major causes of morbidity and mortality globally. According to a report, ischemic heart disease caused 1.3 million deaths in adults aged 15 to 59 years. With this background, this study was planned to compare effects of gender on outcome of patients presenting with acute myocardial infarction. To remove the effect of age as confounding factors, this study included postmenopausal women and age matched males as the study population. **Methodology:** An observational follow-up study with 100 postmenopausal women as a study group and 100 age-matched men as a control group (in 1:1 ratio) was undertaken on patients of ACS admitted in the Department of Internal Medicine of Nalanda Medical College and Hospital, Patna, Bihar, India. The study duration was 1 year from January 2021 to December 2021. Postmenopausal women above 45 years of age and men more than 45 years of age diagnosed with ACS (as per European society of cardiology guidelines), [29] were included in the study. The diagnosis considered for inclusion was ST elevated acute myocardial infarction presenting to the hospital within 12 hours of onset of pain. Collected data was entered and analyzed using Statistical Package for Social Sciences (SPSS, IBM Chicago) ver. 21.0. **Results:** The mean age of postmenopausal women in the study was 62.7 ± 7.1 years and of men was 61.9 ± 8.2 years. Chest pain was the predominant symptom among both women and men. Previous myocardial infarction (MI), smoking and heavy alcohol consumption, and obesity were significant risk factors among men compared to postmenopausal women, while hypertension was the most common risk factor among women. Both hypertension and diabetes were seen more among women compared to men, however not statistically significant. **Conclusions:** Public awareness on identification of such symptoms can reduce the pre-hospital delay which is an important determinant of morbidity and mortality in ACS.

Key Words: Thrombolysis, Acute Myocardial Infarction

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Introduction

Cardiovascular diseases (CVDs) are among the major causes of morbidity and mortality globally. According to a report, ischemic heart disease caused 1.3 million deaths in adults aged 15 to 59 years[1]. CVDs are the leading global cause of death, accounting for 17.3 million deaths per year, a number that is expected to increase more than 23.6 million by 2030[2], and hence CVD is estimated to be the major health concern all around the world[3]. Globally, CVDs (ischemic heart disease and stroke) were among the top 10 contributors of disability-adjusted life years—a commonly used measure of premature death and disability[4]. This scenario stands similar for South-East Asian countries[5].

According to the Global Burden of Disease study age-standardized estimates (from 2010), nearly one-quarter (24.8%) of all deaths in India are attributable to CVD[1]. The age standardized cardiovascular death rate of 272 per 1,00,000 population in India is slightly higher than the global average of 235[6]; adding further details, the age-adjusted CVD mortality rates in men is 349 per 100,000 and 265 per 100,000 in women, which is 2 to 3 times higher than in United States[7]. There has been a considerable rise in mortality due to CVD over past few decades[8]. Also, a significant leap has been observed in the death rate associated with ischemic heart diseases. These results clearly state a shift toward non-communicable diseases[9]. In developing countries, nearly one-half of the total deaths are reported

to be CVD-related deaths and occur in people less than 70 years old, whereas in the West, it is only 22%. There is a vast difference in deaths occurring due to stroke in developing and developed countries with reports stating 94% and 6%, respectively[6,10]. At present, it is the number one cause of mortality in the Indian population (irrespective of sex, socioeconomic background, and age) with a higher inclination in the Indian urban populations[11]. South Asian populations have an increased risk and 5- to 10-year earlier onset for acute myocardial infarction (AMI) as compared to Western populations[12].

Acute myocardial infarction or Acute Coronary Syndrome (ACS) in women is different from men with respect to risk factors, clinical presentation, complications, and outcome. ACS in women compared to men presents at a later age, has more atypical presentation, longer time to hospital presentation after symptom onset, increased morbidity and mortality[13, 14]. The greater age in women compared to men is presumably due to premenopausal exposure to endogenous estrogen[13]. In females, CAD is found more around the time of menopause when the estrogen in plasma begins to decline[14].

Comparative studies on ACS between women and men have been reported from the Western world[15-24]. Studies on ACS in women in India have also been reported[25-28] but recent evidence in the topic is still lacking and studies comparing the differences between women and men have a major of age being a confounding factor. Furthermore, in most studies, men outweigh women by a significant number and also women are older compared to men; thus again making age a significant confounding factor. Studies comparing the profile of ACS in postmenopausal women and age-matched men

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among patients of Indian ethnicity, to the best of our knowledge, are lacking. With this background, this study was planned to compare effects of gender on outcome of patients presenting with acute myocardial infarction. To remove the effect of age as confounding factors, this study included postmenopausal women and age matched males as the study population.

Methodology

An observational follow-up study with 100 postmenopausal women as a study group and 100 age-matched men as a control group (in 1:1 ratio) was undertaken on patients of ACS admitted in the Department of Internal Medicine of Nalanda Medical College and Hospital, Patna, Bihar, India. The study duration was 1 year from January 2021 to December 2021. It was an in-hospital follow-up study; hence the patients were followed up for their entire hospital stay that ranged from 2 to 15 days with an average of 7.3 days.

Postmenopausal women above 45 years of age and men more than 45 years of age diagnosed with ACS (as per European society of cardiology guidelines)[29], were included in the study. The diagnosis considered for inclusion was ST elevated acute myocardial infarction presenting to the hospital within 12 hours of onset of pain. Patients with chronic coronary syndrome, premenopausal women with ACS, postmenopausal women on hormone replacement therapy, postmenopausal women <45 years of age and men <45 years of age were excluded from the study. Informed consent was obtained from all the subjects included in the study. Ethical clearance was obtained from the institute ethical committee. Age matching was done, and groups of patients with age 45–54 years, 55–64 years, 65–74 years, and more than 75 years were created.

At the time of admission, a complete history was taken, and a meticulous physical examination was done. In the emergency department, a 12-lead electrocardiogram was done within 10 min of arrival and repeated if necessary. Cardiac enzymes such as creatinine kinase myocardial band isoform (CK-MB) and troponin T were done

at the time of admission and repeated if required. Echocardiogram was done during the stay in the hospital. Routine investigations such as complete blood count, urine microscopy, fasting, and postprandial blood sugar, blood urea, serum creatinine, fasting lipid profile were done during the admission. Reperfusion therapy with streptokinase was done. Hemodynamically compromised patients were treated with normal saline or inotropes as indicated. Mechanical ventilation was used in patients with left ventricular (LV) failure with pulmonary edema if required. The two groups were compared based on the presenting complaints, time to hospital presentation after symptom onset, risk factors for CAD, and clinical features on presentation, lipid profile, echo parameters, cardiac biomarkers, complications, and outcome.

Collected data was entered and analyzed using Statistical Package for Social Sciences (SPSS, IBM Chicago) ver. 21.0. For data comparison, Chi-square test and Fisher's exact test were used for categorical data and Student's *t*-test for continuous variables. Differences were considered statistically significant when $P < 0.05$.

Results

The mean age of postmenopausal women in the study was 62.7 ± 7.1 years and of men was 61.9 ± 8.2 years. When the symptoms on presentation between the two groups were compared, chest pain was the predominant symptom among both women and men. But radiation of chest pain and sweating associated with chest pain were significantly present in men. Previous myocardial infarction (MI), smoking and heavy alcohol consumption, and obesity were significant risk factors among men compared to postmenopausal women, while hypertension was the most common risk factor among women. Both hypertension and diabetes were seen more among women compared to men, however not statistically significant. All the demographic and baseline characteristics including time of presentation to hospital and risk factors of CAD had been encompassed in Table 1.

Table 1: Comparison of baseline characteristics of the study population

Characteristics	Females (N = 100)	Males (N = 100)	P-value
Mean age in years (SD)	62.7 ± 7.1	61.9 ± 8.2	-
Mean BMI kg/m ² (SD)	28.3 ± 5.5	29.1 ± 4.2	> 0.05
Time to reach hospital			
< 30 minutes	11	13	> 0.05
30 minutes - 1 hour	2	7	> 0.05
1 - 2 hours	8	14	> 0.05
2 - 12 hours	24	49	< 0.05
12 - 24 hours	2	19	< 0.05
> 24 hours	43	8	< 0.05
Risk factors			
Hypertension	29	33	> 0.05
Diabetes	24	21	> 0.05
Previous MI	4	12	< 0.05
Smoking	2	47	< 0.05
Alcoholism	0	35	< 0.05
Positive family history	11	16	> 0.05
Overweight	21	28	> 0.05
Obesity	16	15	> 0.05

Breathlessness, an atypical symptom of ACS was significantly present in women compared to men. Other atypical symptoms such as fatigue, giddiness, nausea, abdominal discomfort and diarrhoea were more common among women than men. Postmenopausal women were found to have a higher respiratory rate compared to men and more crepitations on auscultation compared to men. Although women also had a higher pulse rate and systolic blood pressure, statistical significance was not achieved. Similarly, men had a higher diastolic blood pressure compared to women, but not statistically significant. [Table 2]

Table 2: Comparison of clinical signs and symptoms at the time of presentation among males and females

Characteristics	Females (N = 100)	Males (N = 100)	P-value
Clinical presentation, n			
Chest pain	87	93	> 0.05
Radiation	19	43	< 0.05
Sweating	29	76	< 0.05
Breathlessness	52	18	< 0.05
Fatigue	11	17	> 0.05
Vomiting	3	8	> 0.05
Giddiness	7	2	> 0.05
Clinical signs			
Mean pulse rate (per minute)	86.4 ± 12.4	91.3 ± 13.5	> 0.05
Mean SBP (mm/Hg)	153.2 ± 32.6	149.4 ± 41.7	> 0.05
Mean DBP (mm/Hg)	87.3 ± 17.2	89.6 ± 11.4	> 0.05
Mean RR (per minute)	26.4 ± 7.2	23.2 ± 8.3	< 0.05
Crepitations, n	42	31	< 0.05

When the lipid parameters were compared, we found that the mean total cholesterol, triglycerides and LDL were higher among postmenopausal women compared to men. Cardiac biomarkers such as CKMB and troponin T were increased above the normal range more among men compared to postmenopausal women. Echocardiographic parameters such as regional wall motion abnormality (RWMA) and LV systolic dysfunction (LVEF) were more commonly seen among men compared to postmenopausal women, though not statistically significant. [Table 3]

Table 3: Gender wise comparison of the findings of the study population

Characteristics	Females (N = 100)	Males (N = 100)	P-value
Investigations/diagnosis			
Mean total cholesterol	204.5 ± 32.6	199.3 ± 38.5	> 0.05
Mean triglycerides	173.4 ± 54.7	171.3 ± 63.7	> 0.05
Mean LDL	93.4 ± 16.8	88.7 ± 22.7	> 0.05
Mean HDL	42.6 ± 11.4	39.5 ± 16.5	> 0.05
Elevated CKMB, n	72	81	> 0.05
Elevated Troponin T, n	69	71	> 0.05
RWMA present, n	67	73	> 0.05
LVEF < 50%, n	39	43	> 0.05

Among complications, men had more ventricular tachycardia (17%) and intracerebral hemorrhage (8%) compared to women (6% and 1%, respectively). Left ventricular failure, cardiogenic shock, atrial fibrillation and complete heart block were all noted down. Women either had more than or same risk of developing any of these complications as men, but none of the values reached statistical significance. The in-hospital mortality was more among postmenopausal women (11 deaths) compared to men (6 deaths), but among patients who survived, men developed more LV systolic dysfunction.

Discussion

The current study presents the profile of ACS in postmenopausal women compared with age-matched men. Although chest pain was the predominant symptom of ACS in both women and men, the characteristics of the pain were different between the groups. The classical symptoms of angina such as sweating and radiation of chest pain to the left arm and neck were more common among men, while women presented with atypical symptoms such as breathlessness, fatigue, giddiness, nausea, and diarrhea. These findings were consistent with previous studies[16-18].

When the time to hospital presentation after symptom onset was evaluated, we found that postmenopausal women presented to hospital much later compared to men of the same age group. This finding was consistent with previous studies[30-31]. Thus, we could

find that delay in seeking treatment among women persisted even after menopause and age matching. This is explained by the frequency of more atypical symptoms among women.

Considering risk factors, our study showed that previous MI, smoking and alcoholism were less significant risk factors among women compared to men which was consistent with previous studies[22, 32]. Women had a higher prevalence of hypertension and diabetes mellitus which was consistent with previous studies by Tan et al.[33] Hochman et al.[22], and Gottlieb et al[20]. We found that women presented with a higher respiratory rate and more crepitations on examination. This was consistent with more dyspnea among women.

Study of lipid parameters showed that women had a higher LDL cholesterol and triglycerides, which was consistent with previous studies[33]. But contrary to previous studies[33], we found that postmenopausal women had a higher HDL cholesterol compared to age-matched men. This could be explained by age matching, as women in most studies are older than men.

Women overall had more complications than men, which was consistent with previous studies[22, 25]. The in-hospital mortality was also higher among women compared to men which was also consistent with previous studies[25, 34].

Conclusion

Postmenopausal women with ACS have more atypical presentation of symptoms, later presentation to hospital after symptom onset, more tachypnea, more crepitations, less likely to have past history of MI, less likely to be smokers and heavy alcohol consumers compared to men. Postmenopausal women were found to have more complications and higher in-hospital mortality compared to men of the same age group.

A high index of suspicion of ACS should be borne in mind by the treating physician while evaluating a potential atypical symptom in a postmenopausal woman, and timely diagnosis and management can decrease the morbidity and mortality. Public awareness on identification of such symptoms can reduce the pre-hospital delay which is an important determinant of morbidity and mortality in ACS. Aggressive management and proper monitoring of postmenopausal women with ACS can identify and decrease the complications.

Conflict of interest

None declared by any of the authors

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