

# Gender impact in diabetic patients with acute myocardial infarction: A hospital-based study

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## Abstract

**Objective:** There are previous studies stating gender differences in clinical profile in diabetics who sustain acute myocardial infarction. This study was undertaken to observe such differences in a small cohort of population in a south Indian hospital. **Materials and methods:** Clinical data comprising of presenting complaints, additional risk factors, type of myocardial infarction and in hospital outcome was collected from 100 diabetic patients admitted over a period of 6 months and the results were compared using chi-square test. **Results:** The mean [SD] age of females was 62.83 years [SD=5.8] and in men it was 58.92 years [SD=10.63]. Previous history of hypertension noted in 70% females vs. 40% male and obesity was observed in 24% of females and noted in 4% males. Chest pain as a predominant complaint was observed in 80% males and 48% females and fatigue as a presenting complaint was noted in 62% of females. ECG showed STEMI in 84% of males vs. 52% females and the overall mortality was 18% in females versus 8% in males. **Conclusion:** Female diabetics who presented with MI were more often obese hypertensives and presented with fatigue as a predominant complaint. Men had STEMI in majority of them and inhospital morbidity was almost equal across genders and mortality was slightly more among females.

**Key Word:** Coronary artery disease (CAD), Myocardial infarction, Non ST elevation MI (NSTEMI) ST elevation myocardial infarction (STEMI)

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## INTRODUCTION

Diabetes is known to increase the risk for CAD. Compared with non diabetics, it is been observed that diabetics have a two to four times increased rate of death from heart disease<sup>1</sup>. Indisputably diabetes has been called a CAD risk equivalent. Diabetes and its complications have some differences in manifestation among men and women<sup>2</sup>. There are reports to confirm that diabetic women are five times more prone to develop MI whereas in men it

is supposedly increase the risk by 3 times.<sup>3</sup> Few studies have observed increased mortality and morbidity post cardiac event in diabetic women. Various pathophysiological aspects contributing to this are the diffuse nature of the disease in the coronaries with accompanying common metabolic derangement leading to impaired compensatory mechanisms, increased infarct size and a disproportionately increased impairment of left ventricular function.<sup>4</sup> This study was taken up in a smaller cohort of patients in our set up to see the gender differences among the risk factors, symptomatology, inhospital complications among diabetics who presented with acute myocardial infarction.

## METHODS AND MATERIALS

**Type of study:** This study was an observational cross sectional study.

**Source of data:** Male and female diabetic patients admitted to JSS hospital with diagnosis of acute myocardial infarction during July 2007 to Jan 2008.

**Sample size:** 50 male and 50 female patients were

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included. Ethical clearance and consent for the study was taken from all the patients and the caregivers.

**Selection criteria:** Known diabetics of age less than 80 years with acute myocardial infarction diagnosed according to ACA criteria.

**METHODOLOGY**

Acute MI is suspected by typical clinical symptoms, ECG changes and enzyme elevation. Presence of any two of the three criteria is diagnostic of MI. Clinical symptoms suggestive of MI are substernal chest pain with radiation of pain to the neck, lower jaw, or left arm few less-typical symptoms such as shortness of breath, nausea/vomiting, fatigue, palpitations, or syncope are also considered. ECG changes include resting ST segment changes (depression  $\geq 0.5$  mm horizontal or down sloping in pseudo normalization of ST segment or dynamic changes) New pathological Q-waves ( $>0.4$  seconds) T wave inversion ( $\geq 2$  mm symmetrical) is considered with elevated as NSTEMI enzymes or unstable Angina with normal enzymes, and convex elevation  $> 1$ mm in  $\geq 2$  consecutive leads as STEMI. Cardiac enzymes like plasma troponin level in healthy subjects are hypothesized to be 0.1–0.2 ng/L. The enzyme changes considered are at least one value above the 99th percentile of the upper reference.<sup>5</sup> Cardiogenic shock was considered when the systolic BP was less than 90 with end diastolic pressure more than 18 mmhg. Arrhythmias included were ventricular, supraventricular and atrial fibrillation.

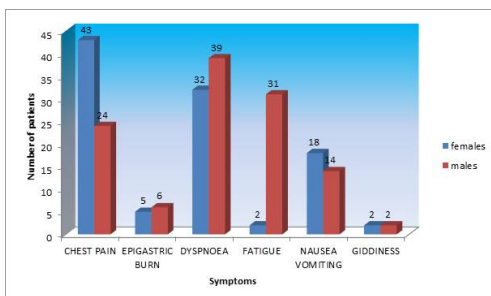
Acute myocardial infarction in Diabetic patients with co morbid conditions like sepsis, vasculitis, and severe respiratory disorder are excluded from the study. Investigations like FBS, PPBS, HBA1c, Lipid profile, complete hemogram, B. Urea, S. Creat. S. electrolytes, Troponin T, CK-MB, Chest X ray, Blood gases, Serial ECG and Echocardiogram were done in all patients.

**Data analysis:** The obtained data was coded and entered in Microsoft Excel worksheet. SPSS statistics software version 22.0 was used to analyze the data. The categorical data was expressed in terms of percentages. The difference

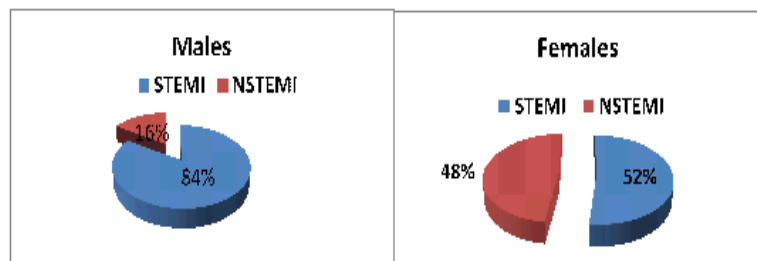
in proportion between male female groups was analysed using chisquare test and a p value of  $<0.05$  was considered significant.

**OBSERVATION AND RESULTS**

Patient’s age ranged from 33-82 years. The youngest in males was aged 33 yrs and youngest among females was 50 yrs. The oldest among males was aged 82 and that of females was 80 yrs. Females were maximum in the age group of 65-75 yrs [58%] Males were maximum in the  $<65$  age group [66%]. Statistically significant proportion of females were above 65 years of age [p = 0.009]. Among additional risk factors for CAD, the most common in both the groups was history of hypertension. In females it was 70% and in males it was 54%. Proportion of obese females was significantly higher than obese males. [24% vs 4% p value 0.004] Only two females and fifteen males had HbA1C below 8%. HbA1C more than 10% was seen in 24% of females and 4% of males. This was also significantly high in females with p value of 0.004. Patient’s presentation to hospital from onset of symptoms varied significantly. It was seen that only two percent of females and six percent of males could reach hospital within the golden period of three hours. Most of the patients in both the groups presented with in 9hrs. 16% of females were admitted after 24 hrs of symptoms and 6% of males were admitted after 24 hrs. There was no significant difference among men and women when the timing of presentation was concerned. Most of them presented between the 3-9 hours of symptom onset with males slightly out numbering females but was not statistically significant. Chest pain as a presenting symptom was noticed only in 48% of females and 86% of males [p value 0.005]. Dyspnoea was complained by 78% of females and 64% of males. Fatigue as a predominant complaint was largely noticed in female patients accounting to 62% but this symptom was very less in males 4% [p value 0.000]. Statistically insignificant patients complained of other anginal equivalents like giddiness or epigastric burning. [Fig 1]



**Figure 1**



**Figure 2**

**Figure 1:** Comparison of proportion of patients with their predominant presenting complaint

**Figure 2:** Pie diagram showing the distribution of the type of acute myocardial infarction in male and female diabetics

In the ECG, it was observed that STEMI was more common in both the groups. It was recorded in 52% of females and 84% of males [p =0.001] NSTEMI was noticed in 48% of females and 16% of males. [p=0.006] [Fig 2]

Post myocardial infarction complications were noticed in both the groups. Cardiogenic shock was present in 22% of females and 18% of males. CCF was observed in 30% of females and 26% of males. Recurrent angina was complained by 12% females but was absent in males. Arrhythmias were seen in 26% of females and 15% of males. It was noticed recurrent angina was complained more in females but cardiogenic shock CCF and arrhythmias were almost present equally in either of the genders. Table 1 describes the gender wise comparison of clinical profile complications and mortality in patients of acute MI.

**Table 1: Gender wise comparison of clinical profile in patients of AMI**

VARIABLES	MALES	FEMALES	P VALUE	
<b>Age (&gt;65 years)</b>	<b>17[34%]</b>	<b>30[60%]</b>	<b>0.009</b>	
Risk factors	Obesity(bmi>30)	2[4%]	12[24%]	0.004
	Hypertension	27[54%]	35[70%]	0.099
	HBA1C (>10)	2[4%]	18[36%]	0.003
Duration of symptoms 3-9hr		33[66%]	29[58%]	0.227
	Chest pain	43(86%)	24(48%)	0.000
	Epigastric burn	5[10%]	6[12%]	0.749
Symptoms	Dyspnoea	32[64%]	39[78%]	0.123
	Fatigue	2[4%]	31[62%]	0.000
	Nausea vomiting	18[36%]	14[28%]	0.429
	Giddiness	2[4%]	2[4%]	1.00
Type of MI	NSTEMI	8[16%]	24[48%]	0.006
	STEMI	42[84%]	26[52%]	0.001
	Recurrent angina	0[0%]	12[24%]	0.012
Post MI complications	Cardiogenic shock	9[18%]	11[22%]	0.617
	CCF	13[26%]	15[30%]	0.656
	Arrhythmias	15[30%]	13[26%]	0.656
Mortality	5[10%]	9[18%]	0.249	

## DISCUSSION

Diabetes by itself can be risk equivalent to a prior cardiac event. Presence of additional risk factors in a diabetic will certainly augment the peril. Nevertheless obesity is considered an independent risk factor for macro vascular disease across sexes<sup>6</sup>. Research evaluating the association with BMI and risk of death among patients with diabetes has shown inconsistent results with many studies showing a U-shaped association with BMI and all-cause mortality<sup>7</sup>. Even though in our study more females had a higher BMI, central obesity was not measured which has more relevance to metabolic syndrome. In observational studies, people with both diabetes and hypertension have approximately twice the risk of cardiovascular disease as nondiabetic people with hypertension<sup>8</sup>. It is observed that diabetic women tend to have a higher likelihood of associated hypertension than do their male counterparts which again is a significant risk factor for CAD.<sup>9</sup> In our study we observed that more than men, women diabetics were more often hypertensives on treatment. Other important factor which predicts a greater percentage of CAD among women diabetics was that women may not have their diabetes under control which can be substantiated with the evidence from a study where in a cohort that included 15,120 women found that in the first year after their diabetes diagnosis, women were less likely

than men to be taking cardio-protective medications.<sup>10</sup> Kautzky-Willer *et al.* observed that women with T2DM had a worse diabetic profile and could achieve therapeutic goals less frequently compared to males with T2DM and suggested more aggressive treatments in women<sup>11</sup>. Like the studies elsewhere we did have a significant number of female diabetics who had a very poor control of diabetes. This was substantiated by the fact that more number of females than males in our study had HBA1C more than 10%. In our study we also found that less than 10% of both men and women diabetics presented with in 3 hrs and the time lapse didn't differ much between both sexes. There were more men presenting between 3-9 hrs and very late presentation of more than 24 hours of symptom onset was recorded more in females. Western studies showcased that median prehospital delays were found to range from 1.8 to 7.2 hours for women versus 1.4 to 3.5 hours for men<sup>12</sup>. Factors associated with delay in women included advanced age, unmarried women having a previous history of MI, being alone during symptom onset, and the patient not wanting to bother anyone. Significant numbers of our patients were from very low socio economic groups and from villages with poor connectivity which was a very common reason for late presentation. And the symptom of fatigue as a predominant complaint among females was another drawback as many of them did not consider it to

be a symptom of heart disease. When we discuss about the symptomatology in CAD women have a smaller diameter of the coronary arteries than men. It is said to be 10% less than that of men. The mechanisms like atherosclerotic plaque rupture, platelet-rich thrombus, and microembolisation may be operative more often in men, where as small-vessel disease and vascular inflammation may be operative more often in women. Postmortem studies and CT angiograms show clinically relevant sex differences in plaque morphology with women having fewer calcifications, less focal obstruction and a more diffuse pattern of atherosclerosis with soft plaques than men at all ages. Combined structural and functional disorders of the coronary (micro-) circulation are involved in the various manifestations of IHD<sup>13</sup>. It is seen that when recurrent angina is frequently provoked by exercise it suggests obstructive CAD. However, the presence of coronary micro vascular disease (CMD) is more likely if there is a variable threshold of physical activity that provokes angina, if the chest pain persists for several minutes after effort is interrupted and/or if there is a slow or poor response to short-acting nitrates<sup>14</sup>. It is known that CMD is a common finding in female diabetics. This could be a factor which probably leads to nonchest pain symptoms being more common in female patients which is a major contributory factor for the time delays in seeking help as observed in our study. The time delays from the onset of symptoms to admission and from admission to treatment have been reported to be responsible for the large discrepancy in the use of treatment strategies<sup>15</sup>. A substantial number of female patients presenting with NSTEMI is probably due to the differing pathophysiology of the ACS between men and women. Men more often had a complete occlusion of the coronaries in contrast to females. Various studies have shown that over one-third of women with MI have plaque rupture and ulceration when examined with intravascular ultrasound, despite having no angiographically demonstrable CAD<sup>16</sup>. Our study demonstrated that female patients had STEMI and NSTEMI almost in equal numbers. Men on the other hand had STEMI in more than 80% of them which probably favours the pathophysiology of complete occlusion of the arteries. The complications of MI happened in 2/3 of patients of either sex. They included recurrent angina, CCF, cardiogenic shock and Arrhythmias. One study found that women had increased pulmonary capillary wedge pressure than men during acute ST segment elevation MI (STEMI). This increased left ventricular filling pressure was independent of age, hypertension status, or infarct size, suggesting that it is largely gender dependent<sup>17</sup>. Increase in the left ventricular filling pressure may be one of the etiologies for patients to have cardiogenic shock and CCF. It is learnt that in women, an

area of ischemic injury may not be limited because the usual vasorelaxation which is essential for the collateral function is abnormal. This is the theory explaining why they tolerate acute coronary syndromes (ACS) poorly compared with men and why subsequent heart failure<sup>18</sup>. Our female patients had cardiogenic shock and CCF in significant numbers but the numbers were not statistically significant than male patients as observed in other studies<sup>17,18</sup>. We did notice a number of females complaining of recurrent anginal pain and dynamic ECG changes during the hospital stay which may be due to the fact that the pathology in the coronaries of female patients was often plaque rupture and ulceration which tends to behave like unstable angina rather than a complete block. In a Swiss trial it was observed that 90% of patients <65 years of age underwent primary PCI, this proportion decreased to less than two-thirds among patients ≥65 years of age especially when they were females. The reasons why patients were not referred for primary PCI was that in few cases it seemed futile, and in some avoidable delays had resulted in loss of the opportune treatment window. The observed age- and gender-related disparities and the deliberate waiver of treatment and unwitting discrimination in the provision of primary PCI for STEMI in a Swiss hospital where funds are abundant, remain poorly explained<sup>19</sup>. The primary reason for female patients not to have undergone PCI in our hospital was the unwillingness of the caregivers to take the financial burden. Most studies on outcomes following MI have found that women have higher mortality rates than men<sup>20</sup>. Our study demonstrated slight increase in mortality rates in females more than men. 7 out of 9 women who died were above the age of 65 years. In one study of young and middle-aged patients, women had higher baseline stress, mostly explained by their co morbidities, the state of their physical and mental health, intra-family conflicts, care giving demands, and financial hardship<sup>21</sup>. This higher stress was associated with worse female recovery at one month post AMI, specifically measured by angina, overall quality of life, and mental health. Female patients in our study were not evaluated for their mental status and baseline stress levels but we did find more mortality among women rather than men and the psychological aspects may have huge impact in recovery.

## CONCLUSION

Female diabetic patients who sustained acute myocardial infarction were older in age with hypertension obesity and uncontrolled sugars in significant numbers than male patients. Fatigue was the most predominant presenting complaint of AMI in many female patients whereas men had chest pain in majority of them. ECG showed ST elevation MI in greater number of men. Both sexes had

post MI in-hospital complications in comparable numbers where as higher mortality was observed among females.

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