Original Article

Comparative study of Cardiac Risk factors, Biomarkers, Angiographic Profiles and in Hospital outcome in male versus female Acute Coronary syndrome patients

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Abstract

Background: Coronary artery disease (CAD) is the most common cardiovascular disease and is estimated to cause fatalities of up to 23.3 million people by 2030. Some studies have shown gender difference in outcomes while others have concluded that gender was not an independent factor for outcome after acute coronary syndrome(ACS). In this cross sectional study, 70 male and 70 female adult ACS patients were evaluated for clinical presentation, cardiac biomarkers, angiographic profiles and in hospital outcome. This study demonstrated that women were less likely to have cardiovascular decompensation, presented with different biomarker profiles and had a different diagnostic spectrum. They also presented with 'nonspecific symptoms' as compared to men with ACS. In clinical practice, physicians need to take into account gender disparities, aiming at an improved selection of diagnostic and therapeutic strategies for both genders. In addition, further studies are needed to elucidate gender differences with regard to the pathophysiological mechanisms, risk stratification and treatment responses in patients with ACS. **Material and Methods:** In this cross sectional study, 70 male and 70 female adult ACS patients were evaluated for clinical presentation, cardiac biomarkers, angiographic profiles and in hospital outcome. This study demonstrated that women were less likely to have cardiovascular decompensation, presented with different biomarker profiles and had a different diagnostic spectrum. They also presented with 'nonspecific symptoms' as compared to men with ACS. **Results:** In this study, males and females showed similar biomarker profiles, angiographic patterns, and mortality, although females had a higher burden of diabetes, hypertension, CAD, and CKD while males had more smoking and COPD. STEMI was the most common presentation in both genders, and reduced EF (<40%) was significantly more frequent in males. **Conclusion:** Gender-based differences in ACS were mainly related to comorbidities and risk factors, with females presenting fewer classical symptoms but greater chronic disease burden. However, the overall severity, biomarker levels, angiographic patterns, and in-hospital outcomes were comparable across genders**.** In clinical practice, physicians need to take into account gender disparities, aiming at an improved selection of diagnostic and therapeutic strategies for both genders. In addition, further studies are needed to elucidate gender differences with regard to the pathophysiological mechanisms, risk stratification and treatment responses in patients with ACS.

Keywords: Coronary artery disease; acute coronary syndrome; biomarkers; angiographic profiles.

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Introduction

Coronary artery disease (CAD) is the most common cardiovascular disease occurring due to coronary stenosis, spasm or occlusion. It is estimated that up to 23.3 million people will die of CAD by 2030. Some researchers have shown gender difference in outcomes after adjusting multivariate factors, while other studies have demonstrated that gender was not an independent factor for outcome after acute coronary syndrome.[1] CAD has been reported to present a delayed onset by 10 years in women attributed to varied hormonal profile but with increased mortality and morbidity rates after acute coronary events have occurred when compared to men. In addition, studies have identified an age–sex correlation, where older age women have a particularly high risk of mortality after ACS even after adjusting for other risk factors.[2] Recently, studies have witnessed an increase in coronary death rates among young adults of both genders, but the increase is substantially more prominent among young women.[3] This increase in coronary deaths among young adults has closely correlated with the steady increases in unfavorable coronary risk factors, predominantly diabetes, hypertension (HTN), and metabolic syndrome.[4,5]

Most studies reporting the gender issue were conducted in

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western world, and data from Asian countries is scarce.[6] Therefore, this study was performed with the aim to study cardiac risk factors, biomarkers, angiographic Profiles and in Hospital outcome in both genders of acute coronary syndrome patients.

Materials and Methods

In this cross sectional study, 70 male and 70 female adult ACS patients admitted to cardiology and medicine indoors were included. Patients diagnosed to have noncardiac chest pain, stable angina; mortality within 24 hours of hospitalization and those allergic to dye were excluded. After obtaining informed consent from patients and institutional ethics committee history regarding current and past illnesses, addictions and co-morbidities was obtained. Vitals and BMI were assessed and cardiac biomarkers – Troponin-I, CPK-MB and serum LDH were recorded at the time of admission along with relevant hematological and biochemical investigations.

Transthoracic 2D echocardiography and ECG findings were documented. Angiographic profiles of patients were recorded and major adverse cardiac event (MACE) in the form of stroke (CVA), re-infarction or mortality during hospital stay were also noted. SPSS latest available version was used for statistical analysis. Continuous variables were expressed as mean ± standard deviation, those not conforming to normal distribution expressed as median and inter-quartile range. The Chi square test was used to compare the proportions. A p value< 0.05 was considered to be statistically significant.

Results

In this cross sectional study of equal number of patients of acute coronary syndrome presenting to tertiary care center, mean age for males and females was 56.07+11.39 and 57.46+9.45 years respectively. Major presenting symptoms were chest pain (angina) and breathlessness mean duration being 5 days and 1 day in both genders. 5 females also presented with atypical symptoms of jaw pain and back pain which was later diagnosed to be MI.

Table 1: Clinical and Biochemical profile of Male and female ACS Patients

Gender	Male		Female		p value
	Mean	SD	Mean	SD	
Age (years)	56.07	11.39	57.46	9.45	0.072
Chest Pain (days)	4.79	4.73	3.89	3.89	0.689
Breathlessness (days)	0.94	2.76	1.38	3.25	0.632
T2DM(years)	7.97	6.61	9.42	5.28	0.0001
HTN (years)	6.47	6.94	9.14	6.40	0.004
Dyslipidemia(years)	3.72	5.69	2.21	3.30	0.853
Smoking (years)	21.78	9.49	0.00	NA	0.014
Pulse (bpm)	83.28	14.54	95.63	17.86	0.706
RR (per min)	21.03	4.08	23.34	4.35	0.921
Temp (Degree F)	98.47	0.59	98.30	0.54	0.640
SpO2 (%)	97.63	1.80	97.47	2.01	0.251
BMI (Kg/m2)	25.43	3.33	27.90	2.51	0.325
Hb (gm%)	13.33	1.40	11.97	1.15	0.607
TLC(cu mm)	10114.69	3301.13	9641.69	2817.72	0.071
Urea(mg/dl)	34.97	11.41	32.51	11.93	0.064
Creatinine(mg/dl)	0.99	0.47	0.82	0.29	0.09
Bilirubin(mg/dl)	1.56	4.06	0.71	0.32	0.946
SGPT	44.65	24.51	33.33	10.58	0.012
SGOT	62.47	52.39	55.53	76.69	0.247
ALP	120.48	53.92	135.04	41.11	0.685
Total Cholesterol(mg/dl)	174.55	41.00	188.26	35.41	0.495
HDL	40.98	5.03	44.34	10.50	0.498
LDL	84.36	20.90	91.57	76.33	0.322
TG	162.70	45.83	157.52	44.39	0.984
RBS (in diabetics) (mg/dl)	200.14	93.57	240.63	111.52	0.393
HBA1C(% in diabetics)	7.76	0.95	7.74	0.75	0.894
LVEF (%)	48.31	9.64	51.43	8.17	0.341

Table 2: Age wise distribution of study participants (Male and female ACS patients)

Age (years)	Male		Female	
	No.	%	No.	%
26 - 35	2	2.9%	0	0.0%
36 - 45	15	22.1%	6	8.6%
46 - 55	17	25.0%	28	40.0%
56 - 65	20	29.4%	20	28.6%
66 - 75	11	16.2%	15	21.4%
> 75	3	4.4%	1	1.4%

Table 3: Comorbidities in Male and female ACS patients

Comorbidity	Male		Female		
	n	%	n	%	p value

T2DM	No	32	47.1%	19	27.1%	
	Yes	36	52.9%	51	72.9%	0.015
Hypertension	No	31	45.6%	15	21.4%	
	Yes	37	54.4%	55	78.6%	0.003
Dyslipidemia	No	57	83.8%	62	88.6%	
	Yes	11	16.2%	8	11.4%	0.418
Hypothyroidism	No	65	95.6%	64	91.4%	
	Yes	3	4.4%	6	8.6%	0.322
Known CAD	No	58	85.3%	70	100.0%	
	Yes	10	14.7%	0	0.0%	0.001
Arthritis	No	68	100.0%	69	98.6%	
	Yes	0	0.0%	1	1.4%	0.323
Chronic kidney disease	No	65	95.6%	50	71.4%	
	Yes	3	4.4%	20	28.6%	0.001
COPD	No	67	98.5%	44	62.9%	
	Yes	26	37.1%	1	1.4 %	0.001

Table 4: CAD Risk factors in Male and female ACS patients

Risk factor for CAD		Male		Female		
		n	%	n	%	P value
Family H/O CAD	No	43	63.2%	43	61.4%	
	Yes	25	36.8%	27	38.6%	0.780
PhysicalActivity	Heavy	18	26.5%	0	0.0%	
	Moderate	41	60.3%	39	55.7%	
	Sedentary	9	13.2%	31	44.3%	0.0034
Menopausal status	No	0	0.0%	7	10.0%	
	Yes	0	0.0%	63	90.0%	0.001
Sleep	Normal	61	89.7%	58	82.9%	
	Disturbed	7	10.3%	12	17.1%	0.065
Diet	Veg	1	1.5%	5	7.1%	
	Mixed	67	98.5%	65	92.9%	0.075
Active Smoking	No	23	33.8%	69	98.6%	
	Yes	45	66.2%	1	1.4%	0.014

Table 5: Biomarkers in male and female ACS patients on admission

Biomarker	Male	SD	Female	SD	p value
Troponin I (0-0.04 ng/ml)	2.31	2.71	2.21	2.50	0.471
CPK-MB (5-25 IU/L)	231.06	90.85	116.73	162.68	0.371
Serum LDH (140-280 U/L)	473.97	238.76	392.26	576.85	0.832

Table 6: ECG Findings at admission in male and female ACS patients

ECG Findings on Presentation		Male		Female	
		n	%	n	%
ECG findings	Normal	1	1.5%	3	4.3%
	STEMI	31	45.6%	15	21.4%
	NSTEMI	32	47.1%	43	61.4%
	T wave inversion	0	0.0%	4	5.7%
	Q waves	1	1.5%	1	1.4%
	LBBB	0	0.0%	2	2.9%
	AWMI	1	1.5%	0	0.0%
	RBBB	1	1.5%	0	0.0%
	Tachycardia	0	0.0%	1	1.4%
	Ventricular arrhythmia	0	0.0%	1	1.4%
	NSTEMI+ LBBB	1	1.5%	0	0.0%

Table 7: 2D Echocardiographic findings on admission in male and female ACS patients

Left ventricular Ejection Fraction (%)		Male		Female		
		n	%	n	%	p value
LVEF	Normal (>50)	36	52.9%	42	60.0%	0.025
	Moderately reduced (40-49)	11	16.2%	19	27.1%	
	Reduced (<40)	21	30.9%	9	12.9%	

Table 8: Angiographic findings in male and female ACS patients

Angiographic finding	Males (n)	%	Females (n)	%	P value
Normal	0	0.0%	4	5.7%	0.276
DVD	18	26.5%	18	25.7%	
SVD	18	26.5%	19	27.1%	
TVD	26	38.2%	25	35.7%	
Non critical CAD	5	7.4%	1	1.4%	

Myocardial Bridge in LAD	1	1.5%	1	1.4%	
LAD Subtotal occlusion	0	0.0%	1	1.4%	
Mild plaque in coronaries	0	0.0%	1	1.4%	

Female patients had significantly longer duration of diabetes, hypertension whereas none of females had history of active smoking. Among the biochemical markers there was no significant difference among both genders except SGPT which was significantlymore in males (p=0.012). Mean left ventricular ejection fraction in males was 48.31+9.64 where as in females it was 51.43+ 8.17, the difference of which was not significant [Table 1]. As far as age wise distribution of patients was concerned, maximum patients were in 56-65 years age group in males (29.4%) whereas 40% females belonged to age group of 46-55 years [Table 2]. If we compare comorbidities, females had significantly higher prevalence of diabetes, hypertension, known CAD and CKD whereas males significantly had higher prevalence of COPD [Table 3]. Among the risk factors for CAD, males had significantly higher levels of physical activity in daily life as compared to females but 66.2% of males were smokers as compared to only 1.4% of females. 90% of females were menopausal any other risk factors did not significantly vary among both genders [Table 4]. Mean levels of studied biomarkers (troponin-I, serum LDH and CPK-MB) in males versus females did not vary significantly although they were lower in females [Table 5]. ECG on presentation demonstrated a spectrum of findings correlating with ACS and most common presentation in both genders was STEMI followed by NSTEMI [Table 6]. Echocardiography was performed in both group of patient and males having significantly reduced EF (<40%) were significantly more (30.9%) as compared to females (12.9%) (p=0.025). Coronary angiography was performed for all patients of ACS and it was found that there was no significant difference in angiographic pattern among patients of either gender. TVD followed by DVD was the commonest finding among both subsets of patients. [Table 8]

Out of 140 patients admitted with ACS, one male and one female patient aged 78 and 65 years with diagnosis of STEMI and Non STEMI respectively did not survive. There was no case of in hospital re-infarction or stroke.

Discussion

In our study the maximum patients of ACS both males and female were in 5th and sixth decades. Symptom duration was similar between genders, a diurnal variation with regard to the time of presentation to the ED was observed, with women presenting mainly during late hours. Lower values of cardiac biomarkers was seen in women than in men, although it was not significant as also shown in other studies.[11]

Among baseline characteristics ,few differed significantly between genders, with older age, and a lower rate of current smoking in women. While most studies including patients with confirmed or suspected ACS report comparable gender-related differences with regard to known coronary artery disease, age and smoking history; variable results have been observed regarding other baseline cardiovascular risk factors.[11,12] Differences between studies may mainly be due to different inclusion criteria, in particular, whether patients with confirmed or suspected ACS were included, and also due to a lower-risk patient population in primary care. In this study, symptom duration was calculated as the time period from reported symptom onset to the beginning of treatment in the ED and was found to be similar in both genders. Most research in this field is based on chief complaints, mainly chest pain but this fact also known now that women are less likely to present with typical symptoms.[13] Our study included patients with suspected ACS irrespective of the leading complaint, aiming at an inclusion of a wider, less specific patient population. In our study there were comorbidities like diabetes, HTN, CKD in both genders but they were more prevalent in women patients and they were more likely to be drug naive. Echocardiographic parameters were significantly deranged in male patients while coronary angiographic findings did not differ much.

Several studies showed that women have a less plaque burden than men, even despite the presence of higher rates of cardiovascular risk factors which might be attributed to microvascular CAD in women.[14]

Although previous studies have shown that women tend to develop worse outcomes, the role of gender in mortality has been controversial.[15] In-hospital outcome for our subset of patients was not different as two patients of either gender who had STEMI did not survive.

In ACS patients, gender-related differences in clinical profiles and outcomes have previously been reported and besides observed disparities in baseline characteristics, associations between atypical symptoms including back pain, nausea and shortness of breath and female gender have been identified.[7] In their study Yongchen Hao et. al. they found that women hospitalized for ACS in China received acute treatments and strategies for secondary prevention less frequently than men. The observed sex differences in in-hospital mortality were mainly attributable to worse clinical profiles and fewer evidence-based acute treatments provided to females with ACS.[8] In a study conducted by Li ping Chau et.al. to compare the survival rate and the influencing factors between women and men following ST-elevation myocardial infarction (STEMI) treated with primary percutaneous coronary intervention (PCI) the results showed that although female patients with STEMI-treated primary PCI had higher in-hospital and 1-year mortality rates than those of males in Taiwan, there was no gender difference after adjusting for age and cardiovascular risk factors.[9]

A limitation of this study is its single center design.

Conclusion

This study demonstrates that in patients with suspected ACS, women were less likely to have cardiovascular decompensation, presented with different biomarker profiles and had a different diagnostic spectrum. Women also presented with ‘non specific symptoms’. In clinical practice, physicians need to take into

account gender disparities, aiming at an improved selection of diagnostic and therapeutic strategies for both women and men. In addition, further studies are needed to elucidate gender differences with regard to the pathophysiological mechanisms, risk stratification and treatment responses in patients with ACS.

Our study will shed some light on spectrum of variation in clinical presentation, risk factors, cardiac biomarkers, angiographic profiles and in hospital outcomes between male versus female patients of acute coronary syndrome. It is important to recognize differences in risk factors because this might result in a better understanding of gender-related mechanism of CAD, and improved therapeutic strategies and outcomes in both sexes. This will help in prognostication as well have therapeutic implications but more than that it is expected to guide on preventive aspects of CAD in both males and females.

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Conflicts of interest

There are no conflicts of interest.

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