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Original Research Article

ASSOCIATION OF GENDER WITH IN-HOSPITAL OUTCOMES OF ST-ELEVATION MYOCARDIAL INFARCTION

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ABSTRACT

Background: *ST-elevation myocardial infarction (STEMI) remains a leading cause of morbidity and mortality worldwide. Gender-based differences in in-hospital outcomes following STEMI have been reported, but data from local populations are limited.* ***Objective:*** *To determine the frequency of in-hospital outcomes of STEMI and compare them between male and female patients.* ***Study Design:*** *Descriptive study.* ***Setting:*** *Department of Cardiology, Khyber Teaching Hospital, Peshawar, Pakistan.* ***Duration of Study:*** *06-February-2025 to 06-June-2025.* ***Methods:*** *A total of 251 patients (aged 30–75 years) of either gender, diagnosed with STEMI confirmed by ECG and elevated cardiac troponin levels, were included in this study. In-hospital outcomes assessed were tricuspid regurgitation, mitral regurgitation, arrhythmia, and heart failure. Data were analysed using SPSS version 21; the chi-square test was applied to compare categorical variables, with $p < 0.05$ considered statistically significant.* ***Results:*** *The mean age of patients was 58.00 ± 13.23 years, with 133 (53.0%) males and 118 (47.0%) females. Overall in-hospital outcomes included tricuspid regurgitation (31.9%), mitral regurgitation (20.3%), arrhythmia (19.1%), and heart failure (12.0%). Heart failure was significantly more frequent in females compared to males (18.6% vs. 6.0%; $p = 0.002$), while mitral regurgitation was also more common among females (26.3% vs. 15.0%; $p = 0.02$).* ***Conclusion:*** *Tricuspid regurgitation was the most frequent in-hospital outcome of STEMI, followed by mitral regurgitation and arrhythmia. Heart failure and mitral regurgitation occurred significantly more often in females, highlighting the need for gender-specific management strategies in STEMI patients.*

Keywords: ST-Elevation Myocardial Infarction, Gender, In-Hospital Outcomes, Heart Failure, Mitral Regurgitation

INTRODUCTION

The main reason for ST-elevation myocardial infarction (STEMI) is abrupt obstruction of a coronary artery caused by the development of a blood clot at the location of a ruptured plaque within the artery. While vulnerable deposits which have ruptured could appear mild or moderate, they are, in fact, far more severe (1, 2). This occurrence is likely attributed to positive remodelling, characterised by the expansion of blood vessels as a consequence of plaque enlargement, as well as the subsequent narrowing of the lumen. STEMI results from obstruction of one or multiple of the coronary arteries (3, 4). The sudden interruption of blood flow usually comes as a result of the rupture, fissuring, or dissection of the coronary arteries, which subsequently leads to the development of an obstructive blood clot. Four. In 2013, there were 116,793 fatalities due to MI, with 57% of cases occurring in males and 43% in females (5).

Numerous studies have investigated the risk factors associated with mortality, complications, and prognostic indicators following STEMI. Several studies have indicated that being a woman may adversely affect the clinical outcomes of STEMI, leading to higher mortality rates as well as increased complications (6, 7). The structure of the left ventricle exhibits variations between males and females. The study examined in-hospital outcomes for male and female cases with STEMI. Women are more likely to experience heart failure as a result of concentric remodelling, yet their left ventricular ejection fractions remain maintained. Female patients with STEMI generally exhibited an older age as well as a greater number of comorbidities, including hypertension and diabetes, in comparison to the male population (8, 9). The health status of female participants influences the outcomes of MI at the time of the event (10).

Research indicates that women tend to face less favourable outcomes than men after experiencing STEMI, which may be linked to variations in biological factors, existing health conditions, and the treatment administered. This study aims to compare the in-hospital outcomes of male and female patients with ST-elevation myocardial infarction at our health facility, addressing the limited local literature on this subject. The results of this study will contribute to a deeper understanding of the disparities, which is essential for creating targeted interventions aimed at enhancing clinical outcomes for all patients. Insights into current treatment protocols will be beneficial in identifying equitable practices and highlighting areas for improvement in clinical practice to mitigate gender-based disparities in STEMI outcomes.

METHODOLOGY

This descriptive study was conducted in the Department of Cardiology at Khyber Teaching Hospital, Peshawar. The study was initiated after ethical approval from both the institutional ethical review board. The study's duration was from February 6, 2025, to June 6, 2025.

Two hundred fifty-one sample was determined using the previous frequency of arrhythmia at 20.5% (11), a margin of error of 5% and a confidence level of 95%. Patients were selected using a consecutive non-probability sampling technique. The study included patients aged between 30 and 75 years, of both genders, who presented with STEMI. Patients with active infections, autoimmune conditions such as rheumatoid arthritis or lupus, pregnant women, or those who had been diagnosed with severe liver or end-stage renal disease were not included.

STEMI was diagnosed with typical chest pain greater than four on a visual analogue scale radiating to the left shoulder or jaw for a duration of more than 20 minutes. This clinical presentation was interpreted and confirmed by a consultant cardiologist. Electrocardiographic confirmation was obtained using a Fukuda me C110 machine set at paper speed of 25mm/sec and a voltage of 10 mm/mV, demonstrating STEMI at the J-point in at least two

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contiguous leads of 2 mm or more in men or 1.5 mm or more for females in the same V2-V3 leads in contiguous limb leads. Alternatively, a Diagnosis was confirmed by an elevated serum troponin level exceeding 0.6 ng/mL, as measured by a Roche analyser in the hospital laboratory at the time of admission.

The in-hospital outcomes included tricuspid regurgitation, which was identified in patients presenting with symptoms such as fatigue, peripheral oedema, shortness of breath, and palpitations. The Diagnosis was made via Doppler echocardiography, demonstrating a regurgitant jet area, a vena contracta width between 0.3 and 0.7 cm, and a PISA radius of 0.6 to 0.9 cm. Heart failure was diagnosed based on the presence of dyspnea, orthopnea, paroxysmal nocturnal dyspnea and fatigue. It was diagnosed by echocardiography, showing heart failure with reduced ejection fraction (HFrEF) for values ≤40%, preserved ejection fraction (HFpEF) for values ≥50% or mid-range ejection fraction (HFmrEF) for values between 41% and 49%. Mitral regurgitation was diagnosed in patients reporting fatigue, dyspnea, paroxysmal nocturnal dyspnea and palpitations. It was confirmed through echocardiography by the presence of a regurgitant jet from the left ventricle into the left atrium. Arrhythmia was assessed in patients experiencing palpitations, syncope, shortness of breath, chest pain, fatigue, and three or more of the following symptoms on a visual analogue scale. Diagnosis was confirmed by electrocardiography showing the presence of Atrial Fibrillation (Absence of distinct P waves, and irregular QRS complexes), Atrial Flutter (Sawtooth pattern of flutter waves), Supraventricular Tachycardia (P waves absence, inverted, or buried in the preceding T wave), Ventricular Tachycardia (Wide QRS complexes >0.12 seconds), Ventricular Fibrillation (No identifiable P waves, QRS complexes, or T waves) and Bradyarrhythmias (Prolonged PR interval >0.20 seconds).

Patients gave their consent. Demographic information, including age, gender, body mass index, socioeconomic status, place of residence, educational status and occupational status, was recorded, along with comorbid conditions such as diabetes, hypertension and smoking. Patients were monitored for their aforementioned in-hospital outcomes until their discharge. All assessments were performed under the supervision of an experienced cardiologist with a minimum of five years of post-fellowship experience.

SPSS 21 was used for data analysis. Age, height, weight and BMI were recorded as mean and standard deviation. Demographics and comorbidities, along with in-hospital outcomes, were presented as frequencies and percentages. We stratified in-hospital outcomes by demographics and comorbidities using the chi-square test, considering a P value of ≤ 0.05 as notable.

RESULTS

The mean age of our patients was 58.00 ± 13.23 years, and their mean Body Mass Index was 25.77 ± 1.84 kg/m^2. Gender: There were 133 (53.0%) male and 118 (47.0%) female patients. The majority were non-smokers (180, 71.7%), while 71 (28.3%) were smokers. Diabetes mellitus was present in 87 (34.7%) and hypertension in 94 (37.5%) patients (Table 1).

Analysis of in-hospital outcomes showed that tricuspid regurgitation was present in 80 (31.9%) patients. Mitral regurgitation was present in 51 (20.3%) patients, and arrhythmias were observed in 48 (19.1%) cases. Heart failure was observed in 30 (12.0%) patients (Table 2).

A gender-based subgroup analysis of the outcomes revealed that tricuspid regurgitation occurred in 41 (30.8%) male and 39 (33.1%) female patients (p = 0.70). Arrhythmia showed no significant gender difference, with 22 (16.5%) males and 26 (22.0%) females affected (p = 0.26). Heart failure was observed in 8 (6.0%) male patients and 22 (18.6%) female patients (p = 0.002). Mitral regurgitation affected 31 (26.3%) female and 20 (15.0%) male patients (p = 0.02) (Table 3). Table 4 presents the stratification of in-hospital outcomes with demographics and comorbidities

Table 1: Demographic details and comorbidities

Demographics & comorbidities		n	%
Gender	Male	133	53.0%
	Female	118	47.0%
Education	Literate	118	47.0%
	Illiterate	133	53.0%
Occupation status	Employed	114	45.4%
	Unemployed	137	54.6%
Place of living	Urban	135	53.8%
	Rural	116	46.2%
Socioeconomic status	Lower class	78	31.1%
	Middle class	115	45.8%
	Upper class	58	23.1%
Smoking	Yes	71	28.3%
	No	180	71.7%
Diabetes	Yes	87	34.7%
	No	164	65.3%
Hypertension	Yes	94	37.5%
	No	157	62.5%

Table 2: In-hospital outcomes of STEMI

In-hospital outcomes		n	%
Tricuspid Regurgitation	Yes	80	31.9%
	No	171	68.1%
Heart Failure	Yes	30	12.0%
	No	221	88.0%
Mitral Regurgitation	Yes	51	20.3%
	No	200	79.7%
Arrhythmia	Yes	48	19.1%
	No	203	80.9%

Table 3: In-hospital outcomes of STEMI according to gender

In hospital outcomes		Gender				P value
		Male		Female		
		n	%	n	%	
Tricuspid Regurgitation	Yes	41	30.8%	39	33.1%	0.70
	No	92	69.2%	79	66.9%	
Heart Failure	Yes	8	6.0%	22	18.6%	0.002
	No	125	94.0%	96	81.4%	
Mitral Regurgitation	Yes	20	15.0%	31	26.3%	0.02
	No	113	85.0%	87	73.7%	
Arrhythmia	Yes	22	16.5%	26	22.0%	0.26
	No	111	83.5%	92	78.0%	

Table 4: Association of in-hospital outcomes of STEMI with demographics & comorbidities

Demographics & comorbidities		In-hospital outcomes							
		Tricuspid Regurgitation		Heart Failure		Mitral Regurgitation		Arrhythmia	
		Yes	No	Yes	No	Yes	No	Yes	No
Education	Literate	45.0%	48.0%	50.0%	46.6%	39.2%	49.0%	52.1%	45.8%
	Illiterate	55.0%	52.0%	50.0%	53.4%	60.8%	51.0%	47.9%	54.2%
P value		**P > 0.05**		**P > 0.05**		**P > 0.05**		**P > 0.05**	
Occupation status	Employed	47.5%	44.4%	46.7%	45.2%	49.0%	44.5%	47.9%	44.8%
	Unemployed	52.5%	55.6%	53.3%	54.8%	51.0%	55.5%	52.1%	55.2%
P value		**P > 0.05**		**P > 0.05**		**P > 0.05**		**P > 0.05**	
Place of living	Urban	57.5%	52.0%	60.0%	52.9%	51.0%	54.5%	56.2%	53.2%
	Rural	42.5%	48.0%	40.0%	47.1%	49.0%	45.5%	43.8%	46.8%
P value		**P > 0.05**		**P > 0.05**		**P > 0.05**		**P > 0.05**	
SES	Lower class	33.8%	29.8%	20.0%	32.6%	23.5%	33.0%	35.4%	30.0%
	Middle class	43.8%	46.8%	63.3%	43.4%	52.9%	44.0%	41.7%	46.8%
	Upper class	22.5%	23.4%	16.7%	24.0%	23.5%	23.0%	22.9%	23.2%
P value		**P > 0.05**		**P > 0.05**		**P > 0.05**		**P > 0.05**	
Age groups (Years)	30 to 45	21.2%	21.6%	10.0%	23.1%	19.6%	22.0%	16.7%	22.7%
	46 to 60	28.8%	21.1%	26.7%	23.1%	23.5%	23.5%	29.2%	22.2%

DISCUSSION

The findings of the present study contribute to the debate regarding gender-based differences in the presentation and outcomes of STEMI. Our analysis revealed a mean age of 58.00 ± 13.23 years, which is lower than the mean ages reported in several other studies. Research conducted in Saudi Arabia and Iran documented mean ages of 65.7 and 66.0 years for female patients, and 58.9 and 59.5 years for males, respectively (11, 12). This younger age profile in our cohort may reflect regional demographic differences or specific population characteristics.

The near-equal gender distribution in our study contrasts with a study from India, which reported a significant male predominance of 82.03% (13). A study from Karachi documented a gender distribution similar to our findings, reporting 51.7% females and 48.3% males (14). This atypical distribution merits further investigation into local risk factors and healthcare-seeking behaviours.

The frequency of smoking in our study was 28.3%, diabetes 34.7% and hypertension 37.5%, which aligns with established patterns. Consistent with the broader literature, smoking was a more common habit among males, a trend universally observed from Saudi Arabia to Pakistan (11, 14). Conversely, hypertension and diabetes often show a higher propensity in females, as seen in a German study.[15] This grouping of metabolic risk factors in women is a critical point to be considered in future studies.

The core of our investigation focused on in-hospital complications, revealing notable gender differences that align with global concerns. The most important difference was observed in the incidence of heart failure, which developed in 18.6% of women compared to only 6.0% of men. This finding is consistent with a large multihospital study in Saudi Arabia that reported heart failure rates of 41.5% in females versus 27.0% in males (11). Similarly, studies from Iran and Pakistan found notably higher rates of heart failure in female patients (12, 14). Kytö et al. also reported higher rates for heart failure in females gender compared to males gender.[16] These similar patterns of heart failure strongly suggest that female gender is an important marker for increased risk of heart failure post-STEMI, likely mediated by a combination of older age, higher comorbidity burden and potentially different pathophysiological responses to myocardial ischemia.

Furthermore, our results indicated that mitral regurgitation (MR) was interestingly more common in women (26.3%) than in men (15.0%). This finding is similar to that of Alharbi et al., who reported MR in 31.5% of females compared to 21.9% of males (11). The higher prevalence of MR in women may be attributed to anatomical differences such as smaller left ventricular cavity size, increased wall stress and remodelling that follow a myocardial infarction. This mechanical complication undoubtedly contributes to the higher rates of heart failure observed in female patients (17).

Tricuspid regurgitation and arrhythmia did not differ significantly by gender in our cohort; this finding aligns with Alharbi et al., who did not report any notable difference in gender regarding the complications above (11).

Our study contributes towards the national and international literature. It affirms that women experiencing STEMI face a higher risk of in-hospital complications and adverse outcomes, especially heart failure and mitral regurgitation. Future research should focus on exploring more outcome variables in this context.

CONCLUSION

In conclusion, our study found a higher frequency of tricuspid regurgitation and mitral regurgitation, followed by arrhythmia, as in-hospital outcomes of ST-elevation myocardial infarction. We observed that heart failure and mitral regurgitation were significantly more common in females than in males.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB-572/DME/KMC)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTION

NAZIA SULTAN (Postgraduate Resident)
Conception of Study, Data Collection, Data Entry, Data Analysis, Manuscript drafting, Review of Manuscript, and Final Approval of Manuscript.
AMBER ASHRAF (Professor)
Study Design, Critical Guidance, Conception Of Study, And Final Approval Of Manuscript.
IMADULLAH KHAN(Postgraduate Resident)
Review of Literature
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REFERENCES

1. Bouisset F, Ruidavets JB, Dallongeville J, Moitry M, Montaye M, Biasch K, et al. Comparison of short- and long-term prognosis between ST-elevation and non-ST-elevation myocardial infarction. J Clin Med. 2021;10(2):180. https://doi.org/10.3390/jcm10020180
2. Zgheib H, Al Souky N, El Majzoub I, Wakil C, Sweidan K, Kaddoura R, et al. Comparison of outcomes in ST-elevation myocardial infarction according to age. Am J Emerg Med. 2020;38(3):485–90. https://doi.org/10.1016/j.ajem.2019.05.002
3. Chang SS, Lu CR, Chen KW, Kuo ZW, Yu SH, Lin SY, et al. Prognosis between ST-elevation and non-ST-elevation myocardial infarction in older adult patients. Front Cardiovasc Med. 2022;8:749072. https://doi.org/10.3389/fcvm.2021.749072
4. Norton JM, Reddy PK, Subedi K, Fabrizio CA, Wimmer NJ, Urrutia LE. Utilisation of an ICU severity of illness scoring system to triage patients with ST-elevation myocardial infarction. J Intensive Care Med. 2021;36(8):857–61. https://doi.org/10.1177/0885066620928263
5. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al.; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2016 update: a report from the American Heart Association. Circulation. 2016;133(4):e38–360. https://doi.org/10.1161/CIR.0000000000000350
6. Shah T, Haimi I, Yang Y, Gaston S, Taoutel R, Mehta S, et al. Meta-analysis of gender disparities in in-hospital care and outcomes in patients with ST-segment elevation myocardial infarction. Am J Cardiol. 2021;147:23–32. https://doi.org/10.1016/j.amjcard.2021.01.031
7. Hannan EL, Wu Y, Tamis-Holland J, Jacobs AK, Berger PB, Ling FS, et al. Sex differences in the treatment and outcomes of patients hospitalised with ST-elevation myocardial infarction. Catheter Cardiovasc Interv. 2020;95(2):196–204. https://doi.org/10.1002/ccd.28286
8. Hellgren T, Blöndal M, Jortveit J, Ferenci T, Faxén J, Lewinter C, et al. Sex-related differences in the management and outcomes of patients hospitalised with ST-elevation myocardial infarction: a comparison within four European myocardial infarction registries. Eur Heart J Open. 2022;2(4):oeac042. https://doi.org/10.1093/ehjopen/oeac042
9. Dreyer RP, Smolderen KG, Strait KM, Beltrame JF, Lichtman JH, Lorenze NP, et al. Gender differences in pre-event health status of young patients with acute myocardial infarction: a VIRGO study analysis. Eur Heart J Acute Cardiovasc Care. 2016;5(1):43–54. https://doi.org/10.1177/2048872615568967
10. Alharbi MS, Alanazi BK, Alquhays IA, Alhamied NA, Al Shimemeri A. Effect of gender on the outcomes of ST-elevation myocardial infarction at a tertiary care hospital in Riyadh, Saudi Arabia. Cureus. 2020;12(8):e10118. https://doi.org/10.7759/cureus.10118
11. Ghaffari S, Pourafkari L, Tajlil A, Bahmani-Oskoui R, Nader ND. Is female gender associated with worse outcomes after ST-elevation myocardial infarction? Indian Heart J. 2017;69(Suppl 1):S28–33. https://doi.org/10.1016/j.ihj.2016.12.003
12. Patel I, Vyas P, Natarajan K, Kanabar K, Sharma V, Jain S, et al. The gender spectrum of in-hospital survival post primary percutaneous coronary intervention for ST-elevation myocardial infarction: exploring age-driven trends. J Saudi Heart Assoc. 2024;36(1):34–41. https://doi.org/10.37616/2212-5043.1372
13. Zahra K, Memon SMI, Jahanzeb, Salma, Bai S, Farooqui KS. Gender differences in clinical outcomes among STEMI patients undergoing primary PCI: a prospective study from a tertiary care hospital. J Popul Ther Clin Pharmacol. 2024;31(7):1652–8. https://doi.org/10.53555/jptcp.v31i7.7545
14. Birkemeyer R, Schneider H, Rillig A, Ebeling J, Akin I, Kische S, et al. Do gender differences in primary PCI mortality represent a different adherence to guideline-recommended therapy? A multicenter observation. BMC Cardiovasc Disord. 2014;14:71. https://doi.org/10.1186/1471-2261-14-71
15. Kytö V, Sipilä J, Rautava P. Gender and in-hospital mortality of ST-segment elevation myocardial infarction (from a multihospital nationwide registry study of 31,689 patients). Am J Cardiol. 2015;115(3):303–6. https://doi.org/10.1016/j.amjcard.2014.11.001
16. Phua AIH, Le TT, Tara SW, De Marvao A, Duan J, Toh DF, et al. Paradoxical higher myocardial wall stress and increased cardiac remodelling despite lower mass in females. J Am Heart Assoc. 2020;9(4):e014781. https://doi.org/10.1161/JAHA.119.014781

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