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Gender differences in early complications after STEMI and their associations with anxiety and depression

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Abstract. – OBJECTIVE: The female gender is known to be associated with a poor outcome in ST-Elevation Myocardial Infarction (STEMI). Anxiety and depression are more common in women and they may contribute to the increase in early complications after STEMI. We sought to determine the gender differences in early complications after STEMI and their relationship with patients' anxiety and depression.

SUBJECTS AND METHODS: This is a prospective observational study. The Hospital Anxiety and Depression Scale (HADS) is used to screen depression (HADS-D) and anxiety (HADS-A).

RESULTS: A total of 188 patients (age 56.8±10.5, 69.2% male) with STEMI were included in this study. The incidence of the early complications was significantly higher in women than in men (50.0% *vs.* 14.6%, *p*<0.001). The prevalence of anxiety and depression was significantly higher in women than in men (60.3% *vs.* 40.0% and 50.0% *vs.* 14.6%, respectively). In multivariable analyses, left ventricular ejection fraction (LVEF) level (OR: 0.942; 0.891-0.996, *p*=0.036), HADS-A (OR: 1.593; 1.341-1.891, *p*<0.001) and HADS-D (OR: 1.254; 1.057-1.488, *p*=0.01) scores were found to be independent risk factors for early complications after STEMI.

CONCLUSIONS: The incidence of early complications and the prevalence of anxiety and depression were significantly higher in women. LVEF level, HADS-A, and HADS-D scores were found to be independent risk factors for early complications.

Key Words:
STEMI, Early complications, Gender, Anxiety, Depression.

Introduction

Cardiovascular diseases still rank first among the causes of death both in the world and in Turkey[1,2]. Acute myocardial infarction (AMI) is a serious life-threatening event and the most common cause of cardiovascular mortality. The presentation and outcomes of patients diagnosed with AMI differ by gender[3], and its prevalence is higher in men than in women[4,5]. According to the findings of the national TURKMI study[6] (fifty centers, n=1,930) that included the baseline and clinical characteristics of patients admitted to the hospital with AMI in Turkey, 26.1% of the patients were women.

The female gender is known to be associated with a poor outcome in AMI[5]. The female gender was found to be an independent risk factor for major adverse cardiovascular events in a study of 21 randomized percutaneous coronary intervention studies[7] (n=32,877, 28% female). Considering the in-hospital mortality, women have a higher mortality rate than men[8,9]. Early in-hospital complications after an AMI include dysrhythmias, recurrent ischemia, re-infarction, acute pulmonary edema, cardiogenic shock, and death[10-13].

In heart diseases, especially after AMI, serious emotional distress is seen in the early period, and the fear of death is the basis of this[14]. The fear of death is associated with the emergence of psychological conditions such as anxiety and depression. Since the increase in anxiety in patients with AMI increases sympathetic stimulation, it may also cause an increase in post-MI complications[15].

Anxiety and depression are more common in women in the general population and after AMI[8,9,16-19]. There is still a significant lack of knowledge in the literature about gender differences after AMI, particularly in developing countries. As a result, gender studies, in particular, have clearly gained interest in recent years. The objective of this study was to look into gender differences in early complications of STEMI and their relationship with patients' anxiety and depression.

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Subjects and Methods

This is a prospective observational study which included 188 patients. The study was conducted in a tertiary care center from August 2022 to October 2022. Appropriate permissions were obtained from the institution where the study was conducted. Ethics Committee approval was obtained from the University Institutional Review Board (IRB date and number: 28.07.2022/2022.119). Informed consent was obtained from patients who met the study criteria. The participants were assured that their responses would remain anonymous and confidential. The study conforms with the ethical principles outlined in the Declaration of Helsinki.

Study Population

During the recruitment period, all adult patients admitted to the Coronary Care Unit were invited to participate in the study. Patients over the age of 18 who were diagnosed with AMI by a cardiologist, had stable hemodynamics during the interview and no chest pain, had no communication problems, and agreed to participate were included in this study. Those with hemodynamic instability or chest pain during the interview, cognitive impairment, a diagnosed psychiatric illness, or who declined to participate were excluded from the study. The final study population consisted of 188 patients.

Data Collection

The data were collected within 72 hours of hospital admission. Socio-demographic and clinical characteristics of the patients were obtained from them by the researchers through interviews at the index admission to the hospital and from their charts and the hospital's electronic medical record system. The hospital anxiety and depression scale was also administered at this interview.

The Hospital Anxiety and Depression Scale (HADS)

This scale was developed by Zigmond and Snaith[20] in 1997 and was adapted to the Turkish language by Aydemir et al[21]. It comprises two subscales and a total of 14 items, seven of which are about anxiety symptoms and seven about depression symptoms. Each item on the scale, which is a four-point Likert scale, is scored between 0 and 3. A score between 0 and 21 points can be obtained from both subscales. The cut-off points of the scale are 10 points for the anxiety subscale and 7 points for the depression subscale. Individuals who score above these scores are considered at risk. The Cronbach's alpha values for the HADS scale were 0.65 for the anxiety subscale, 0.65 for the depression subscales, and 0.74 for general HADS. In this study, Cronbach's alpha values for the HADS scale were 0.64 for the anxiety subscale, 0.65 for the depression subscales, and 0.78 for general HADS.

Definitions

ST-elevation myocardial infarction (STEMI) was diagnosed using the 2017 ESC Guidelines[13] for the management of acute myocardial infarction in patients presenting with ST-segment elevation and the 2018 Fourth Universal Definition of Myocardial Infarction[22].

Early complications after STEMI were defined as follows: (1) reinfarction evidenced by elevated cardiac enzymes and standard ECG changes; (2) supraventricular tachyarrhythmia; (3) acute recurrent ischemia evidenced by new onset of chest pain with ECG changes or hemodynamic instability; (4) sustained ventricular tachycardia (>30 seconds) or any ventricular tachycardia requiring pharmacological and/or electrical intervention; (5) ventricular fibrillation; (6) cardiogenic shock; (7) acute pulmonary edema; or (8) in-hospital death.

HADS is a self-administered questionnaire that is used to screen for depression and anxiety symptoms. The HADS is not intended to be a complete diagnostic tool, but rather to identify patients who require additional psychiatric evaluation and assistance. The HADS has two subscales: the HADS-A (anxiety subscale) and the HADS-D (depression subscale). Patients with a HADS-A score >10 and a HADS-D score >7 were defined as having a high risk of anxiety and depression, respectively.

Study Endpoints

The primary endpoints of the study were to assess the gender-based differences in:
1) early complications after STEMI, 2) anxiety and depression symptomatology after STEMI.

The secondary endpoint of the study was to determine whether anxiety and depression were independent risk factors for the development of early complications.

Statistical Analysis

Continuous variables were expressed as means ± SD, and categorical variables were expressed as numbers and percentages. To compare groups,

the χ^2 test for categorical variables and the *t*-test for continuous variables were used. Univariable and multivariable risk factors for the occurrence of early complications were assessed using the binary logistic regression method, and odds ratios (OR) were reported. Variables with a *p*-value <0.1 in the univariable analysis were entered into the model in the multivariable analyses. A backward stepwise multivariable logistic regression model was carried out to determine the independent relationship between variables and early complications. For all tests, two-sided *p*-values <0.05 were considered significant. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows (IBM Corp., Armonk, NY, USA).

Results

A total of 188 patients were included in this study. The mean age of the patients was 56.8±10.5 years and 130 (69.2%) were male. The majority of them were married (79.8%), had an education level less than high school (52.2%), were current smokers (60.6%), and lived with their families (97.3%). The leading comorbidities of the patients were hypertension (59.0%) and diabetes mellitus (39.9%). While 42.6% of the patients had a history of MI/angina, it was more common in men than in women (p=0.006). Other socio-demographic and clinical characteristics of the patients are given in Table I.

The prevalence of marriage and of those with a high school degree or higher education level were significantly lower in patients who developed early complications (68.8% *vs.* 83.6% and 35.4% *vs.*52.1%, respectively). Patients with early complications also had a significantly lower mean LVEF level (43.44±11.77 *vs.* 48.59±7.82, p=0.006). Patients with early complications had significantly longer Intensive Care Unit (ICU) and hospital stays than those without early complications (2.19±1.51 days *vs.* 1.68±1.35 days, p=0.03 and 4.62±2.63 days *vs.* 3.51±3.44 days, p=0.04) (Table II).

Early Complications after STEMI

Fourty-eight patients (25.5%) developed one or more complications during hospitalization. Incidence of the early complications were significantly higher in women than men (50.0% *vs.* 14.6%, p<0.001). Acute recurrent ischemia was the most common early complication in both genders and its incidence was significantly higher in women (29.3% *vs.* 6.9%, p<0.001) There were no significant differences regarding the other complications (Table I).

Early Complications, Anxiety and Depression by Gender

Patients with early complications had significantly higher mean HADS-A and HADS-D scores than those without early complications (15.39±3.38 *vs.* 8.43±3.01, p<0.001 and 10.62±3.63 *vs.* 6.27±2.28, p<0.001, respectively). In patients with early complications, the rates of those at high risk of anxiety (HADS-A>10) and depression (HADS-D>7) were significantly higher than in patients without complications (91.7% *vs.* 30.7%, p<0.001 and 75.0% *vs.* 26.4%, p<0.001, respectively) (Table II).

The mean HADS-D subscale score for all patients was 7.38±3.29. Women had a significantly higher HADS-D score than men (9.00±4.00 *vs.* 6.66±2.63, respectively, p<0.001). Women were also at a significantly higher risk of depression (HADS-D>7) than men (51.7% *vs.* 33.1%, respectively, p=0.01). The mean HADS-A subscale score for all patients was 10.21±4.35. Women had a significantly higher HADS-A score than men (13.03±4.67 *vs.* 8.95±3.55, respectively, p<0.001). Women were also at a significantly higher risk of anxiety (HADS-A> 10) than men (60.3% *vs.* 40.0%, respectively, p=0.01) (Table I).

Independent Risk Factors for Early Complications

On univariable analysis for occurrence of early complications, age, female gender, marital status, education level, history of previous MI or angina pectoris, diastolic BP, LVEF, HADS-A and HADS-D scores had a *p*-value <0.10. These variables were included in the model in multivariable analyses using binary logistic regression. LVEF level (OR: 0.942; 0.891-0.996, p=0.036), HADS-A (OR: 1.593; 1.341-1.891, p<0.001) and HADS-D (OR: 1.254; 1.057-1.488, p=0.01) scores were found to be independent risk factors for early complications in multivariable analysis (Table III).

Discussion

This study demonstrated that the incidence of early complications was significantly higher in women than in men. Women were more likely than men to have depression (HADS-D>7) and

Table I. Baseline characteristics, early complications, and HADS score of the patients by gender.

Variables	All patients n=188	Female n=58 (30.8%)	Male (130) n=130 (69.2%)	p
Socio-demographic variables				
Age (year)	56.78±10.48	61.59±12.53	54.63±10.33	**<0.001**
BMI (kg/m²)	28.40±4.63	29.22±5.23	28.03±4.31	0.10
Marital status Married Single	 150 (79.8) 38 (20.2)	 41 (70.7) 17 (29.3)	 109 (83.8) 21 (16.2)	**0.03**
Education level < High school ≥ High school	 98 (52.1) 90 (47.9)	 46 (79.3) 12 (20.7)	 52 (40.0) 78 (60.0)	**<0.001**
Working status Working Not working	 98 (52.1) 90 (47.9)	 8 (13.8) 50 (86.2)	 90 (69.2) 40 (30.8)	**<0.001**
Economic status Income more than expenses Income equal or less than expenses	 124 (66.0) 64 (34.0)	 25 (43.1) 33 (56.9)	 99 (76.2) 31 (23.8)	**<0.001**
Current smoker	100 (53.2)	20 (34.5)	80 (64.5)	**0.001**
Current alcohol use	34 (18.1)	2 (3.4)	32 (24.6)	**<0.001**
Home status Alone Living with a family member	 5 (2.7) 183 (97.3)	 0 (0.0) 58 (100.0)	 5 (3.8) 125 (96.2)	0.15
Clinical variables				
LVEF (%)	47.28±9.24	46.90±10.12	47.45±8.85	0.70
ICU stay duration (day)	1.81±1.41	1.84±1.22	1.79±1.49	0.81
Hospital stay duration (day)	3.80±3.28	4.03±2.14	3.69±3.68	0.51
SBP on admission	135.66±19.07	141.14±15.49	133.21±20.04	**0.008**
DBP on admission	78.23±10.99	80.19±10.43	77.36±11.16	0.10
HR on admission	77.17±10.25	78.65±8.44	76.51±10.92	0.18
Presence of comorbidities	140 (74.5)	51 (87.9)	89 (68.5)	**0.003**
Comorbidites* HT DM HL COPD CKD AF	 111 (59.0) 75 (39.9) 53 (28.2) 5 (2.7) 3 (1.6) 1 (0.5)	 39 (67.2) 31 (53.4) 15 (25.9) 2 (3.4) 2 (3.4) 0 (0.0)	 72 (55.4) 44 (33.8) 38 (29.2) 3 (2.3) 1 (0.8) 1 (0.8)	 0.12 **0.01** 0.63 0.65 0.17 0.50
History of MI/angina	80 (42.6)	16 (27.6)	64 (49.2)	**0.006**
History of CABG	13 (6.9)	5 (8.6)	8 (6.2)	0.53
History of PCI	57 (30.3)	13 (22.4)	44 (33.8)	0.11
Occurrence of complication	48 (25.5)	29 (50.0)	19 (14.6)	**<0.001**
Complications on admission* Acute recurrent ischemia Reinfarction Sustained ventricular tachycardia Acute pulmonary edema Supraventricular tachyarrhythmia Cardiogenic shock Ventricular fibrillation In-hospital death	 26 (13.8) 7 (3.7) 7 (3.7) 6 (3.2) 5 (2.7) 4 (2.1) 3 (1.6) 2 (1.1)	 17 (29.3) 4 (6.9) 3 (5.2) 3 (5.2) 3 (5.2) 2 (3.4) 2 (3.4) 1 (1.7)	 9 (6.9) 3 (2.3) 4 (3.1) 3 (2.3) 2 (1.5) 2 (1.5) 1 (0.8) 1 (0.8)	 **<0.001** 0.13 0.37 0.26 0.17 0.36 0.22 0.52
HADS-A score	10.21±4.35	13.03±4.67	8.95±3.55	**<0.001**
HAD-D score	7.38±3.29	9.00±4.00	6.66±2.63	**<0.001**
High risk of anxiety (HADS-A>10)	87 (46.3)	35 (60.3)	52 (40.0)	**0.01**
High risk of depression (HADS-D>7)	73 (38.8)	30 (51.7)	43 (33.1)	**0.01**

AF: atrial fibrillation, BMI: body mass index, CABG: coronary artery bypass graft surgery, CKD: chronic kidney disease, COPD: chronic obstructive pulmonary disease, DBP: diastolic blood pressure, DM: diabetes mellitus, HADS-A: hospital anxiety and depression scale -anxiety subscale, HADS-D: hospital anxiety and depression scale -depression subscale, HL: hyperlipidemia, HR: heart rate, HT: hypertension, ICU: intensive care unit, LVEF: left ventricular ejection fraction, MI: myocardial infarction, PCI: percutaneous coronary intervention, SBP: systolic blood pressure. *One or more options/conditions may apply.

Table II. Comparison of the patients' baseline characteristics and HADS scores by the occurrence of the early complications.

Variables	All patients (n=188)	With early complication n=48 (25.5%)	Without early complication n=140 (74.5%)	p
Socio-demographic variables				
Age (year)	56.78±10.48	59.69±14.55	55.78±10.09	0.08
Gender Female Male	 58 (30.8) 130 (69.2)	 29 (60.3) 19 (39.7)	 29 (20.7) 111 (79.3)	**<0.001**
BMI (kg/m²)	28.40±4.63	29.08±4.77	28.17±4.58	0.24
Marital status Married Single	 150 (79.8) 38 (20.2)	 33 (68.8) 15 (31.2)	 117 (83.6) 23 (16.4)	**0.02**
Education level < High school ≥ High school	 98 (52.1) 90 (47.9)	 31 (64.6) 17 (35.4)	 67 (47.9) 73 (52.1)	**0.04**
Working status Working Not working	 98 (52.1) 90 (47.9)	 22 (45.8) 26 (54.2)	 76 (54.3) 64 (45.7)	0.31
Economic status Income more than expenses Income equal or less than expenses	 124 (66.0) 64 (34.0)	 28 (58.3) 20 (41.7)	 96 (68.6) 44 (31.4)	0.19
Current smoker	114 (60.6)	22 (45.8)	78 (55.7)	0.23
Current alcohol use	34 (18.1)	6 (12.5)	28 (20.0)	0.24
Home status Alone Living with a family member	 5 (2.7) 183 (97.3)	 0 (0.0) 48 (100.0)	 5 (3.6) 135 (96.4)	0.22
Clinical variables				
LVEF (%)	47.28±9.24	43.44±11.77	48.59±7.82	**0.006**
Length of ICU stay (day)	1.81±1.41	2.19±1.51	1.68±1.35	**0.03**
Length of Hospital stay (day)	3.80±3.28	4.62±2.63	3.51±3.44	**0.04**
SBP on admission	135.66±19.07	134.77±24.86	135.96±16.73	0.70
DBP on admission	78.23±10.99	80.67±11.10	77.40±10.86	0.07
HR on admission	77.17±10.25	76.87±8.70	77.24±10.75	0.81
Presence of comorbidities	140 (74.5)	35 (72.9)	105 (75.0)	0.77
Comorbidities* HT DM HL COPD CKD AF	 111 (59.0) 75 (39.9) 53 (28.2) 5 (2.7) 3 (1.6) 1 (0.5)	 29 (64.4) 21 (43.8) 13 (27.1) 0 (0.0) 1 (0.5) 0 (0.0)	 82 (58.6) 54 (38.6) 40 (28.6) 5 (3.6) 2 (1.1) 1 (0.7)	 0.82 0.52 0.50 0.22 0.59 0.74
History of MI/angina	80 (42.6)	15 (31.2)	65 (46.4)	0.06
History of CABG	13 (6.9)	3 (6.2)	10 (7.1)	0.56
History of PCI	57 (30.3)	13 (27.1)	44 (31.4)	0.57
HADS-A score	10.21±4.35	15.39±3.38	8.43±3.01	**<0.001**
HADS-D score	7.38±3.29	10.62±3.63	6.27±2.28	**<0.001**
High risk of anxiety (HADS-A>10)	87 (46.3)	44 (91.7)	43 (30.7)	**<0.001**
High risk of depression (HADS-D>7)	73 (38.8)	36 (75.0)	37 (26.4)	**<0.001**

AF: Atrial fibrillation, BMI: body mass index, CABG: coronary artery bypass graft surgery, CKD: chronic kidney disease, COPD: chronic obstructive pulmonary disease, DBP: diastolic blood pressure, DM: diabetes mellitus, HADS-A: hospital anxiety and depression scale -anxiety subscale, HADS-D: hospital anxiety and depression scale -depression subscale, HL: hyperlipidemia, HR: heart rate, HT: hypertension, ICU: intensive care unit, LVEF: left ventricular ejection fraction, MI: myocardial infarction, PCI: percutaneous coronary intervention, SBP: systolic blood pressure. *One or more options/conditions may apply.

Table III. Independent risk factors for occurrence of early complications in univariable and multivariable analyses.

	Occurrence of early complications					
Variable	**Univariable analysis**			**Multivariable analysis**		
	OR	**95% CI**	***p***	**OR**	**95% CI**	***p***
Age, years	1.030	1.001-1.060	0.044			
Female gender	5.842	2.877-11.863	<0.001			
Marital status (married)	0.432	0.203-0.922	0.03			
Education level (<High school)	1.987	1.008-3.914	0.047			
History of previous MI or angina pectoris	1.907	0.952-3.820	0.07			
Diastolic BP, mmHg	1.026	0.997-1.056	0.08			
LVEF, %	0.939	0.904-0.976	0.001	0.942	0.891- 0.996	**0.036**
HADS-A score	1.731	1.482-2.021	<0.001	1.593	1.341- 1.891	**<0.001**
HADS-D score	1.544	1.358-1.756	<0.001	1.254	1.057- 1.488	**0.01**

BP: blood pressure, CI: confidence interval, HADS: hospital anxiety and depression scale, LVEF: left ventricular ejection fraction, MI: myocardial infarction, OR: odds ratio.

anxiety (HADS-A>10). Patients with anxiety or depression had a significantly higher risk of early complications. Although female gender was associated with a higher incidence of early complications as well as a higher prevalence of anxiety and depression, it was not an independent risk factor for early complications. LVEF level, HADS-A, and HADS-D scores were found to be independent risk factors for early complications.

The in-hospital mortality of unselected STEMI patients ranges between 4 and 12% in Europe[23]. Despite advances in medicine, more women than men die within a year of their first AMI (26% *vs.* 19%), regardless of age[3]. The emergence of early complications is associated with poor outcomes after STEMI[3,13,24]. The incidence of early complications has been reported to range between 27% and 38.4% in various studies[11,12,25,26].

Despite similar treatment success rates, women experience more complications after MI than men. Mechanical complications and heart failure (HF) are more common in women, whereas ventricular arrhythmias occur at similar rates in both sexes following an AMI[3]. AbuRuz and Al-Dweik[11] assessed the difference in depression levels and rates of complications based on gender early after acute myocardial infarction. Women had more complications than men (40.0% *vs.* 33.0%). In another study by AbuRuz and Masa'Deh[12], similarly, women had more complications than men (41.4% *vs.* 36.4%). In this study, we found that the incidence of early complications (experiencing one or more complications) was 25.5% and women had more complications than men (50.0% *vs.* 14.6%). The incidence of acute recurrent ischemia was significantly higher in women, which accounts for the main difference between women and men in the incidence of early complications (29.3% *vs.* 6.9%).

LVEF is a common clinical indicator of left ventricular (LV) systolic function. Long-term adverse outcomes were significantly associated with incident LV systolic dysfunction following AMI[27]. Women have a higher LVEF than men in the general population[28], and Kosmidou et al[29] discovered that early LVEF was higher in women than men after STEMI (an individual patient-level pooled analysis of ten randomized trials). They[29] also discovered that the worse prognosis for women after STEMI, compared to men, does not appear to be related to differences in LVEF. However, women are more likely to develop symptoms of HF in the setting of AMI[3]. Moser et al[25] found that LVEF was an independent predictor of in-hospital complications after AMI (OR: 0.97, p=0.04; per 1-unit increase). Similarly, Huffman et al[26] found that LVEF was an independent predictor of in-hospital complications after AMI (OR: 942, p=0.01; per 1-unit increase). In our study, there was no difference in LVEF between men and women. LVEF, however, has been identified as an independent risk factor for the occurrence of early complications after MI (OR: 0.942; p=0.036; per 1-unit increase).

Psychosocial risk factors, in addition to traditional risk factors, have recently been linked to the development of poor outcomes in women after AMI. Psychological features, such as depression and anxiety symptoms, are more common than usual after an acute MI. The prevalence of depression and anxiety varies between studies due to the different settings and severity of symptoms or the use of different scoring systems, or even using different cut-off values for the same scoring systems.

Depressive disorder (according to DSM-III-R criteria) affects 4.5-9.3% of women and 2.3-3.2% of men in the general population[16]. According to Lichtman et al[30], the prevalence of depression in post-MI patients is around 20%, which is several times higher than in the general population, and is roughly twice as high in women with MI as in men with MI. A meta-analysis by Feng et al[19] revealed that women with AMI were significantly more likely to develop depressive symptoms than men (30% *vs.* 39%; $p<0.05$), pooling data from 19 research in 10 countries and 12,315 patients. Kala et al[18] discovered that depression symptoms (BDI-II 14) were present in 17 patients (21.5%) within 24 hours of primary percutaneous coronary intervention (pPCI). The PREMIER study[31] included 807 women and 1,604 men, with the PHQ-9 survey administered within 72 hours of AMI. Women were more likely to have moderate to severe depressive symptoms than men (29% *vs.* 18%, $p<0.001$). AbuRuz et al[11] found that the mean HADS-D score was significantly higher in women than in men (14.4±3.5 *vs.* 8.3±2.6, $p<0.01$). In a study by Serpytis et al[14], the mean HADS-D score was significantly higher in women than in men (8.66±3.717 *vs.* 6.87±4.531, $p=0.004$). About 54.2% of women and 47.5% of men had depression symptoms. In line with these findings, we discovered that women had a significantly higher HADS-D score than men, and the prevalence of depression (HADS-D>7) was significantly higher in women (51.7% *vs.* 33.1%).

In the PREMIER study, patients with a higher depression score had a higher absolute risk of one-year rehospitalization, one-year mortality, and angina after AMI[31]. In a study by AbuRuz and Al-Dweik[11], depressive symptoms were an independent predictor of the occurrence of early complications after MI in men and women (OR: 1.33; $p<0.0001$ and OR: 1.40; $p<0.001$, per 1-unit increase, respectively). In this study, we found that the depression symptoms (HADS-D score) were an independent risk factor for the occurrence of the early complications (OR: 1.254; $p=0.01$; per 1-unit increase).

Anxiety is also very common in the immediate post-MI period and like depression, its prevalence has been widely studied in literature. Its prevalence has been reported to be higher in women than men after AMI. Trotter et al[17] discovered that anxiety prevalence ranges between 25% and 37% in the first week following percutaneous coronary intervention (PCI). An international study[32] of 912 AMI patients from five countries compared anxiety levels in men and women within 72 hours of admission. In general, the study population's mean anxiety was 44% higher than that of normative adults, and women were twice as likely as men to report anxiety (16% *vs.* 8%), with no statistically significant differences between countries. AbuRuz and Masa'Deh[12] discovered that the mean HADS-A score was significantly higher in women than in men (15.5±3.6 *vs.* 8.1±2.9, $p<0.01$). Similarly, Serpytis et al[14] found that women had a higher mean HADS-A score than men (8.2±3.93 *vs.* 7.18±4.53, $p=0.142$) and 64.4% of women and 39.6% of men had anxiety symptoms. Consistent with these findings, we found that women had a significantly higher HADS-A score than men, and the prevalence of anxiety (HADS-A>10) was significantly higher in women (60.3% *vs.* 40.0%).

Moser et al[25] found that the patients with higher levels of anxiety had more complications than those with lower levels of anxiety after AMI (OR: 1.5; $p=0.01$; per 1-unit increase). Huffman et al[26] reported that a higher level of post-MI anxiety was independently associated with the development of early complications (OR: 1.17; $p=0.015$; per 1-unit increase). AbuRuz and Masa'Deh[12] also found that the higher level of anxiety (HADS-A score) was an independent risk factor for the occurrence of the early complications after AMI (OR: 1.20; $p<0.001$: per 1-unit increase). Similar to these findings, in this study we also found that the higher level of anxiety (HADS-A score) was an independent risk factor for the occurrence of the early complications after AMI (OR: 1.593; $p<0.001$: per 1-unit increase).

Study Limitations

This study has several limitations. First, this was a single-center, observational study with a relatively small sample size. Second, only patients with STEMI were included in the study; therefore, cannot be generalized to other acute coronary syndromes. Third, HADS scores were evaluated only once at the index admission and their changes over time during the admission or the follow-up period were not assessed.

Conclusions

This study demonstrated that the incidence of early complications and the prevalence of anxiety and depression were significantly higher in women than in men. Patients with anxiety or depression had a significantly higher risk of early complications. Although female gender was associated with a higher incidence of early complications as well as a higher prevalence of anxiety and depression, it was not an independent risk factor for early complications. LVEF level, HADS-A, and HADS-D scores were found to be independent risk factors for early complications.

Anxiety and depression should be screened in all STEMI patients using simple screening tools like HADS, which allow for a quick assessment of the patient's risk. Patients with a positive screen should have further diagnostic assessments with structured instruments or clinician interviews guided by a diagnostic checklist. Those at risk can thus be assisted if they are identified early during hospitalization or at discharge, potentially reducing future mental health problems and early STEMI complications.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Ethics Approval

This study was approved by the Istanbul Kültür University Non-interventional Ethical Board.

Informed Consent

All patients provided written informed consent.

Authors' Contributions

Concept: ST, ST; Design: ST, ST; Supervision: ST; Resources: ST, ST; Materials: ST, ST; Data Collection and/or Processing: ST; Analysis and/or Interpretation: ST, ST; Literature Search: ST, ST; Writing Manuscript: ST, ST; Critical Review: ST, ST.

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Availability of Data and Materials

Data are available upon request from the corresponding author.

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