

# The effect of gender on anxiety and depressive symptoms in Turkish cardiac rehabilitation patients

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## Abstract

**Aim:** This study was performed to investigate the gender differences of anxiety and depressive symptoms in Turkish cardiac rehabilitation (CR) patients. We also aimed to reveal the gender differences of functionality status before and after CR.

**Material and Methods:** 53 patients who met the inclusion criteria were recruited. Depression was measured using Beck's Depression Inventory (BDI), anxiety was measured with the State and Trait Anxiety Inventories (STAI I-II) and functional status was measured with The Dartmouth Primary Care Cooperative Information Project (COOP) and at two points in time: before and after CR. After measuring anxiety, depression and functional status in both groups, participated in 36 cardiac rehabilitation sessions over a 12-week period. At the end, anxiety and depression were measured again. Physiological values, such as maximum exercise capacity (METs), average METs, maximum heart rate (HR), average HR, and left ventricular ejection fraction (LVEF), were recorded before and after CR.

**Results:** There are statistically difference between the percent changes of average METs, maximum METs, BDI and STAI I-II scores for male and female participants. There is no statistical difference among HR, maximum HR and LVEF. Feelings, daily activities, social activities and total COOP scores were statistically significant between female and male patients.

**Conclusion:** Findings have shed light on cardiac rehabilitation for Turkish cardiac patients. According to the result, men are more likely to benefit from CR than women in depressive and anxiety symptoms. Our study also revealed that before CR women had worse functional status.

**Keywords:** Anxiety; Depression; Functional Status; Gender; Cardiac Rehabilitation.

## INTRODUCTION

Cardiac rehabilitation (CR) that is known to be an effective method for increasing life quality and reducing Coronary artery disease (CAD)-related deaths, is a multidisciplinary program that includes patient assessment, nutrition counseling, biopsychosocial management and recognition of metabolic cardiac risk factors, and physical activity counseling (1). In addition, CR that is included interventions such as family member education, lifestyle changes, group training and stress management, is applied by a team of specialists including physicians, physiologists, psychologists and nurses in the field of CR (2). Besides all these, it is known that CR decreases the severity of anxiety and depression, which is more common in CAD patients than in the normal population (3,4). There is considerable evidence that depression in cardiac patients is a strong predictor of a later cardiac event (5,6). From this perspective, treatment of depression and anxiety in cardiac patients has a high clinical important (7).

It is known that depressive and anxiety disorder increases the risk of heart disease and is associated with poor prognosis in heart patients (8,9). Previous reports have reported that depression and anxiety is also common, especially among CR patients. According to the study by Egger and et al. comparing before and after program depression and anxiety scores in CR patients, CR provides relief of depression and anxiety symptomatology in patients (10). In the same direction, according to the study of McGrady and et al. with 380 CR patients, CR has shown to be useful in the improvement of depression and anxiety in men and women. Moreover, they are shown that this effect did not change with the cardiac diagnosis (11). Similarly, the study of Josephson et al. with 402 CR patients suggests that CR improve symptoms of depression and anxiety and the patients without depression and men have higher rate completed the program. They also found that women had a higher depression score than men before the program (12). In

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the literature, there are many studies that investigate the effects of CR on anxiety and depression. But, in Turkey, because the number of CR centers is inadequate, there are limited number of studies investigating the effects of CR on depression and anxiety (13,14). According to a randomized controlled trial on 44 Turkish CR patients by Kulcu and et al., CR provides reduction of anxiety and depression symptoms and increased quality of life(13). On the other hand, according to the study conducted by Solak and his colleagues retrospectively on 50 CR patients, there was an increase in the quality of life according to the CR program. However, there was no improvement in the depressions of Coronary Artery Bypass Graft Surgery (CABG) patients while improvement was observed in CAD patients(14). Surprisingly, however, the effect of CR on depression and anxiety has not been investigated in female and male. Thus, there is a need to investigate the effect of CR on depression and anxiety in the Turkish cardiac patient population.

The primary purpose of this retrospective study was to investigate the gender difference of CR depression and anxiety on the Turkish CR patient population. We also aimed to reveal the gender differences of pre-programmed functionalities of CR patients.

## **MATERIAL and METHODS**

### **Participant**

A total of 53 consecutive patients (17 females, 36 males) who were admitted and completed Phase II cardiac rehabilitation program at Sultan Abdulhamid Han Training and Research Hospital between January 2016 and September 2018 were evaluated retrospectively. Patients admitted the study had one of the following diagnoses: history of acute MI, history of CABG, heart failure and percutaneous coronary intervention of patients; some patients had more than one clinical event. All patients were admitted to the CR program 4-8 weeks after their clinical event. The inclusion criteria to the study were; a) have at least one of the above diagnoses, b) to complete the CR program, c) not having had a psychiatric diagnosis before, d) have enough cognitive functions for the study, and e) able to read, write, and speak Turkish. The exclusion criteria were; a) psychiatric drug use, b) having physical impairment, c) not continue to the CR program, d) had uncontrolled arrhythmias, hypertension, angina pectoris, congestive heart failure, e) were not primarily cardiac patients (e. g. lung disease patients), and f) uncontrolled metabolic disease.

The protocol was approved by the Zeynep Kamil Training and Research Hospital Clinical Research Ethics Committee. Before rehabilitation, all patients completed the questionnaires, and the group who completed the treatment completed the questionnaires after rehabilitation. Physiological values, such as maximum exercise capacity (METs), average METs, maximum heart rate (HR), average HR, and left ventricular ejection fraction (LVEF), were recorded before and after CR.

### **CR Protocol**

Consisting of 36 training and exercise sessions outpatient phase II CR for 12 weeks was applied to the patients. Exercise intensity was prescribed to the patient according to the data obtained in the entry cardiopulmonary exercise test. Exercise training was given 3 times a week. Each session consisted of a 10-15 minute warm-up, followed by continuous 30 minutes of sustained aerobic exercise and use of light hand weights, followed by approximately 10 minutes of a cool-down period. In addition to the exercise program, the patients have been trained on dietary guidelines, cardiac risk factors, stress management, diabetes management, managing high blood pressure and smoking cessation. Completion of the CR program has been determined in two ways; 1) discharge of the patient by the CR program manager, 2) Considering previous studies, it is assumed that the patient program has been completed for at least 30 of the 36 CR sessions (15).

### **Measurement**

The Beck Depression Inventory, the most commonly used screening tool for depression in the general population, was used to measure the level and severity of depressive symptoms in the patients (16). The inventory is a 21-item self-report measure. The items are evaluated on a graded scale ranging from zero to three according to the severity of the depression. The score range is 0-63 and the cut-off score is reported to be 17. The validity and reliability study of the Beck Depression Scale adapted to the Turkish society was conducted by Hisli (17).

State and Trait Anxiety Inventories (STAI I-II), which are frequently used clinically, were used to determine the state and trait anxiety levels of the patients (18). The inventory consists of 20 questions, each of which consists of two subscale. The state anxiety scale determines how an individual feels himself or herself in a particular situation and in certain conditions. The trait anxiety scale determines how the individual feels himself / herself independently of the situation and conditions in which he / she is living. The high scores on the scale indicate that patients are more anxious. The Turkish validity and reliability study was conducted by Öner and Le Compte (19).

The Dartmouth Primary Care Cooperative Information Project (COOP) was used to assess the functional status of the patients (20). It assesses six areas of functionality, including physical health status, mood status, daily living activities, social activities, general health, and change in health. The assessment of pain status can be added on demand. It aims to evaluate the last two weeks. The scale consists of 6 picture cards. Each carton is a question of the COOP scale. There is a question about the situation, and a scale of 5 points and a simple figure are found. Each answer scores from 1 to 5 points. Higher scores indicate worse, more restricted functional status (21).

### **Statistically Analyses**

Data were analyzed using SPSS 20 statistical software. Descriptive statistics included means  $\pm$  standard

deviations or frequencies expressed as percentages. Parametric tests (Student T Test) were used to compare male and female characteristics with normal distribution, and nonparametric tests (Mann Whitney U Test) were used if normal distribution was not appropriate. Chi square test was used to compare categorical variables. Correlation analysis was done when the relations of numerical variables were examined.  $0.5 \leq$  were considered statistically significant.

## RESULTS

The socio-demographics and diagnosis of the 53 patients are presented in Table 1. The mean age of the patients included in the study was  $61.58 \pm 13.17$  and 32.1% were female. There were no significant differences in age, BMI, marital status, smoking and diagnosis, between male and female. There was a statistical difference between male and female patients only who had history of CABG ( $p=0.003$ ). The largest diagnostic category was CAD (88.7%).

The results of before and after CR and present change of participants, physiological and psychological data

are presented in Table 2. According to our data, there are statistically difference between before and after CR on the average heart rate, average METs, maximum METs, BDI, STAI I and STAI II scores for in both man and woman participants. There are statistically difference between the percent changes of average METs, maximum METs, BDI, STAI I and STAI II scores for male and female participants (Respectively, p value, 0.045, 0.041, 0.015, 0.024 and 0.042). There is no statistical difference for average HR, maximum HR and LVEF.

Before CR, COOP averages and female-male comparison of patients were presented in Table 3. Feelings, daily activities, social activities and total COOP scores were statistically significant between female and male (Respectively p value,  $<0.001$ , 0.045, 0.045, and 0.049). But there were no statistically significant for physical fitness, pain, change in health, overall health, social support and quality of life.

The relationship between the changes in the physiological and psychological scores of the patients is presented in Table 4.

**Table 1. The socio-demographics and diagnosis of the patients**

Variable	Total	Female	Male	T/U Value	p Value
	Mean $\pm$ SD/n (%)	Mean $\pm$ SD/n (%)	Mean $\pm$ SD/n (%)		
N		17 (32.1)	36 (67.9)		
Age	$61.58 \pm 13.17$	$57.00 \pm 11.86$	$63.75 \pm 13.36$	-1.776	a0.082
BMI	$27.96 \pm 4.66$	$28.51 \pm 5.05$	$27.72 \pm 4.56$	-0.427	b0.637
Married	46 (86.8)	15 (88.2)	31 (86.1)	0.045	c0.831
Smoking	19 (35.8)	3 (17.6)	16 (44.4)	3.606	c0.058
Diagnosis					
CAD	47 (88.7)	13 (76.3)	34 (94.4)	3.716	c0.054
MI	25 (47.2)	5 (29.4)	20 (55.6)	3.167	c0.075
CABG	14 (26.4)	0 (0)	14 (38.9)	8.984	c0.003**
Heart Failure	19 (35.8)	6 (35.3)	13 (36.1)	0.003	c0.954
Stent	26 (49.1)	7 (41.2)	19 (52.8)	0.622	c0.430
AF	7 (13.2)	1 (5.9)	6 (16.7)	1.172	c0.279
HT	31 (58.5)	11 (64.7)	20 (55.6)	0.398	c0.528
DM	16 (30.2)	7 (41.2)	9 (25.0)	1.434	c0.231
COPD	10 (18.9)	3 (17.6)	7 (19.4)	0.024	c0.876

AF; Atrial Fibrillation, BMI; Body Mass Index, CABG; Coronary Artery Bypass Graft Surgery, CAD; Coroner Artery Disease, COPD; Chronic Obstructive Pulmonary Disease, DM; Diabetes Mellitus, MI; Myocardial Infarction, HT; Hypertension, <sup>a</sup> Student T Test, <sup>b</sup> Mann Whitney U Test, <sup>c</sup> Chi-Square Test, \*\*  $p \leq 0.001$

**Table 2. The results of before and after CR and present change of participants, physiological and psychological data**

Variable	Gender	Before CR	After CR	p Value	Percent Change	T/U Value	p Value
Average Heart Rate	Female	87.31±13.97	92.31±16.60	<sup>c</sup> 0.048*	5.98±10.03	-0.435	<sup>a</sup> 0.666
	Male	83.20±17.46	88.62±16.44	<sup>c</sup> 0.004**	7.65±12.95		
Maximum Heart Rate	Female	110.25±23.66	107.06±19.72	<sup>c</sup> 0.717	42.06±30.24	-1.132	<sup>b</sup> 0.258
	Male	104.33±24.82	109.87±24.39	<sup>c</sup> 0.078	66.56±39.16		
Average Exercise Capacity (METs)	Female	1.95±0.46	2.69±0.81	<sup>c</sup> 0.001**	38.03±29.19	-2.002	<sup>b</sup> 0.045*
	Male	1.75±0.46	2.89±0.82	<sup>c</sup> <0.001**	70.24±47.63		
Maximum Exercise Capacity (METs)	Female	2.31±0.58	3.27±0.94	<sup>c</sup> 0.001**	42.08±30.24	-2.111	<sup>a</sup> 0.041*
	Male	2.18±0.49	3.56±0.93	<sup>c</sup> <0.001**	66.56±39.19		
Ejection Fraction	Female	48.28±16.00	59.50±10.31	<sup>c</sup> 0.019*	14.90±16.54	0.542	<sup>a</sup> 0.591
	Male	47.12±16.62	56.08±15.70	<sup>c</sup> <0.001**	12.07±13.24		
Beck Depression Inventory	Female	18.00±9.73	11.00±5.01	<sup>c</sup> 0.001**	-33.65±17.71	2.515	<sup>a</sup> 0.015*
	Male	14.58±9.23	6.72±3.65	<sup>c</sup> <0.001**	-49.21±22.27		
STAI-1	Female	38.50±11.18	31.68±7.54	<sup>c</sup> 0.001**	-15.65±13.66	2.345	<sup>a</sup> 0.024*
	Male	38.00±10.46	27.54±8.46	<sup>c</sup> <0.001**	-27.22±16.25		
STAI-2	Female	43.31±18.22	38.68±8.14	<sup>c</sup> 0.002**	-10.59±9.91	2.100	<sup>a</sup> 0.042*
	Male	39.16±10.32	31.75±9.15	<sup>c</sup> <0.001**	-19.74±15.41		

STAI; Spielberger Anxiety Scale, <sup>a</sup> Student T-test, <sup>b</sup> Mann Withney U test, <sup>c</sup> Wilcoxon Signed Ranks Test, \* <0.05, \*\* ≤0.001

**Table 3. Before CR, Dartmouth COOP averages and female-male comparison of patients**

Variable	Total	Female	Male	T/U Value	p Value
	Mean±SD/n (%)	Mean±SD/n (%)	Mean±SD/n (%)		
Physical FitnessCOOP1	3.28±0.96	3.17±1.23	3.33±0.82	-0.547	a0.537
FeelingsCOOP2	2.69±1.15	3.52±0.94	2.30±1.03	4.124	a<0.001**
Daily ActivitiesCOOP3	2.62±1.13	3.05±1.08	2.41±1.10	-2.064	b0.045*
Social ActivitiesCOOP4	2.35±1.31	2.88±1.31	2.11±1.25	2.050	a0.045*
PainCOOP5	2.75±1.05	3.11±0.99	2.58±1.05	1.756	a0.085
Change In HealthCOOP6	2.50±0.86	2.70±0.91	2.41±0.84	1.134	a0.262
Overall HealthCOOP7	3.00±0.62	3.17±0.63	2.91±0.60	0.361	a0.157
Social SupportCOOP8	2.15±1.44	1.70±1.15	2.36±1.53	-1.601	b0.109
Quality Of LifeCOOP9	2.41±0.77	2.41±0.79	2.41±0.76	-0.021	a0.983
Total	23.79±5.04	25.76±4.68	22.86±4.99	2.013	a0.049*

COOP; The Dartmouth Primary Care Cooperative Information Project, <sup>a</sup> Student T Test, <sup>b</sup> Mann Withney U Test, \* p<0.05, \*\* p ≤0.001

**Table 4. The relationship between the changes in the physiological and psychological scores of the patients**

	Age	BMI Difference	BDI Difference	STAI1 Difference	STAI2 Difference	Ejection Fraction Difference	Maximum Heart Rate Difference	Average Heart Rate Difference	Maximum Exercise Capacity Difference	Average Exercise Capacity Difference
Age	1									
BMI Difference	0.033	1								
BDI Difference	-0.167	0.045	1							
STAI1 Difference	-0.216	-0.074	<b>0.544**</b>	1						
STAI2 Difference	-0.083	-0.139	<b>0.460**</b>	<b>0.517**</b>	1					
Ejection Fraction Difference	-0.201	-0.274	-0.002	-0.210	<b>-0.404*</b>	1				
Maximum Heart Rate Difference	-0.107	-0.066	0.247	0.055	0.111	0.060	1			
Average Heart Rate Difference	-0.458**	0.135	-0.098	-0.095	-0.073	0.084	<b>0.364*</b>	1		
Maximum Exercise Capacity Difference	-0.059	-0.024	0.116	0.003	0.155	-0.126	<b>0.473**</b>	-0.005	1	
Average Exercise Capacity Difference	-0.036	0.024	0.043	-0.075	0.053	-0.137	<b>0.531**</b>	-0.049	<b>0.887**</b>	1

BMI; Body Mass Index, STAI; Spielberger Anxiety Scale, \* p<0.05, \*\* p ≤0.001

## DISCUSSION

The present study investigated the effect of cardiac rehabilitation in 53 cardiac patients in Turkey, on anxiety and depression and differences in the functional status of the patients by gender during CR entry. The most important finding of our study was that depression and anxiety scores of male CR patients showed more improvement than female. As far as we know, this finding is preliminary in the literature. In our results, it was also found that female had higher scores of anxiety and depression than male at CR entry. Another important finding of the study is that when the CR entry functional status of patients is examined, feelings, daily activities, social activities and total scores of female patients are higher than male patients. Findings of our study are consistent with previous studies showing that CR programs improve exercise capacity and behavioral characteristics, particularly depression and anxiety (11,13,14).

The mechanism of the relationship between cardiac events and depression and anxiety has not yet been fully elucidated (22). However, the positive effect of CR on life of quality, and depression has been clearly demonstrated (7,11,14). The results of the present study also revealed an increase in exercise capacity and a decrease in the depression and anxiety scores of the patients inconsistent with most studies in the literature. Despite the fact that depression and anxiety remediation are not specific targets of CR, we think that the main cause of this result is the exercise program, which CR can be affected depressive and anxiety symptoms. In addition, there is an absolute share in the psychosocial and behavioral change training given to the patients. On the other hand, it is an important benefit of the social intervention program with other patients at various stages of rehabilitation, and may contribute to positive development of depression and anxiety (23). Also, studies on the possible effects of depressive symptoms on the cardiovascular system, are suggested that sympathetic activity, hypothalamic-hypophysis axis stimulation and inflammatory process may be effective (24-26). More elaborate studies are needed to clarify this mechanism. For example, depression of somatic symptoms severity in patients.

It is known that women are at higher risk of life-long depression than men (27). So, it has been shown in previous studies by Caulin-Glaser and Lavie that women have lower rates of participation and completion in CR programs. They also suggest that women may have higher incomplete rates as the frequency of depressive symptoms increases (28,29). Caulin-Glaser et al. compared anxiety and depression score numerical differences before and after the CR program and documented no difference between men and women (28). In the present study, we compared percent changes between male and female patients before and after the CR program. There were more percentages of improvement in males than females in depression and anxiety. Having more nonspecific symptoms than men and personality traits of women, may

be possible reason of this consequences. Men's program adjustment and psychosocial factors may have caused this result. Other reason of this result may be due to the limited number of female patients. However, an increased risk of cardiac events and a lower CR involvement, may also have leading to poor prognosis women.

Our findings have shown that before CR program, emotional, daily activity, social activity and total functional status of women are worse than men. Previous studies indicate that women are less likely to participate in CR programs (28). In addition, women with depression or obesity have documented a lower completion rate of CR program (30). It is important for good prognosis is explained the mechanism of that women have less CR involvement compared to men and that the lower completion rates.

The results of present study should be evaluated with some limitations. The first is that there is retrospective and no control group in the study. So it is difficult to interpret CRs that have improvement of depression and anxiety without control group. Another limitation is the limited number of patients included in the study as well as the limited number of female patients. Finally, the symptoms of depression and anxiety are determined by self-report scale.

## CONCLUSION

In conclusion, findings have shed light on cardiac rehabilitation for Turkish cardiac patients. According to the result, men are more likely to benefit from CR than women, according to the results of the study, in depressive and anxiety symptoms. Our study also revealed that before CR women had worse functional status. Although the magnitude of change in each of the parameters revealed in our study is modest, the cumulative benefit of all improvements may be important. In future studies, the importance of multidisciplinary interventions should be more focused on increasing the quality of life of heart patients in order to increase both physical and mental health. Prospective and controlled studies with larger sample sizes are needed to support our findings.

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