RESEARCH ARTICLE

MYOCARDIAL INFARCTION AND ANXIETY - DEPRESSIVE DISORDERS

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ABSTRACT

Introduction: Depression is common as a comorbidity with anxiety disorders and physical ailments. The aim of the study was to investigate whether the patients who had survived myocardial infarction (MI) develop symptoms of depression and anxiety more frequently than a healthy population.
Methodology: The research was conducted as a retrospective-prospective, comparative, analytical, study on 108 subjects, of which 69 were male and 39 were female. The patients were divided in two groups: patients with confirmed MI diagnosis, and control group - reference population without previous myocardial infarction.
Results: Thirty-seven percent of patients with diagnosed MI had depression symptoms compared to 9.3% in the control group (p = 0.003). 42.6% of subjects after MI were positive for anxiety and 18.5% in the control group (p = 0.001). Participants with higher scores on depression hada lower left-ventricle ejection fraction (p = 0.0001), as well as a higher score on anxiety (p = 0.007).
Conclusion: MI is a precipitating factor for the development of depression and anxiety. Most patients who develo p depressive symptoms after MI develop depression and anxiety, which does not spontaneously resolve after MI. The lower ejection fraction (EF) after MI is a predictor for depression and anxiety. Interventional and surgical procedures are not protective factorsagainst the development of depression and anxiety.

INTRODUCTION

Necrosis of the myocardium caused by a sudden decrease or a complete breakdown of the coronary circulation is called acute myocardial infarction (Kumar, 2010). MI is of an exceptional socio-medical importance, especially in the developed countries, due to high mortality and disability, as well as due to the large material resources allocated for the treatment, rehabilitation and the prevention of illness. In Eastern European countries, especially in the developing countries, it still carries a high mortality rate, especially in men older than 45 and women olderthan 65 years of age (Šmalcelj, 2008). Depression is a psychiatric disorder, which is classified as a mood disorder. It is a part of the disorder in which the mood is declining, resulting in a number of changes in the appearance, behavior, thinking, experience of the surrounding world and of the patients themselves (Ballenger, 2001). According to the estimates of the World Health Organization, depression in the total population is the fourth most important health problem. Based on the epidemiological surveillance in the world, there is a continuous increase in the number of depressed people, which indicates that depression will become the second world

health problem by 2020, and looking only at the female population, health problem number one. Depression a is common comorbidity with anxiety disorders and physical ailments. Patients with the anxiety disorder are nine times more likely to develop depression, while the patients with chronic disease are six times more likely to develop depression than the general population (Hotujac, 1998). Anxiety is a pathological condition characterized by an irrational and excessive sense of scarcity. Anxiety is a ccompanied by signs caused by the hyperactivity of the vegetative nervous system. It differs from fear, which is the answer to a known cause (World Health Report, 2001). Anxiety is a diffuse, very unpleasant, often vague feeling of uneasiness associated with one or more somatic experiences - e.g. abdominal void, chest tightness, heart palpitations, rapid breathing, headache, or a sudden need for excretion. The condition can be called an anxiety disorder when the anxiety is strong, long-lasting and restricts psychological and social functioning (Semple, 2005). Anxiety symptoms are present in about 90 percent of the depressed patients, and 50 percent of these patients at the same time, meet the criteria for anxiety disorder as a comorbidity. Labor disability is twice as long in those with mixed disorders than in those with a single disorder. Of all emotional states, depression is the most commonly correlated with coronary disease. The two-way MI link, depressive and anxiety states

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are undisputable. In one direction, the psychologic states are a consequence of a myocardial infarction, and in the second, the anxiety and depressive states of "bona fide" are the risk factors for the same (Jiang, 2005).

The goals of our research were

- To examine the incidence of depressive and anxiety symptoms in patients with MI.
- To examine how the time period after the MI affects the appearance of depressive and anxiety symptoms.
- To investigate whether the use of invasive procedures and surgeries in the repair of MI affects the extent of depressive and anxiety symptoms.
- To examine whether the values of the left-ventricle ejection fraction after MI have an effect on the incidence of depressive and anxiety symptoms in MI patients.
- To examine whether the employment and marital status of patients influence the occurrence of anxiety and depressive symptoms.

MATERIALS AND METHODS

This study included a total of 108 participants, at the Clinic for Heart Disease, Blood Vessels and Rheumatism in the Clinical Center of the University of Sarajevo. In the examined group there were subjects who have had a diagnosis of MI. In the control group were a subjects that did not have a MI diagnosis, so the criterion for inclusion in this group was the absence of an established diagnosis of MI, a second major cardiovascular disease, a cerebrovascular accident or a malignant disease.

score for depression and / or anxiety of 14 and more points on the BDI questionnaire was obtained, and it was coherent with data from the medical records that were collected in accordance with ethical and bioethical principles, while protecting the confidentiality and privacy of patients. For statistical testing, the difference was the Hi-square test according to Pearson or Yates, depending on the data distribution, Ficher's exact test for 2x2 tables, and Student's T test. The correlation analysis was carried out using the Spearman coefficient of the correlation coefficient. The results of all of these tests were considered statistically significant in the case of $p < 0.05$ or at a confidence interval level of 95%. The analysis was carried out using the statistical statistics IBM Statistics SPSS v22.0 (Chicago, Illinois USA) and Microsoft Excell 2007.

RESULTS

The male versus female ratio in the studied population was similar, and there was no significant difference in the age distribution of participants between the groups.Comparison with the average values of the scores on the Beck Depression or Anxiety Scale shows that the participants of the examined group had higher average scores for both anxiety and depression with a statistically significant difference between the groups.Based on the above analysis, it can be seen that patients with a longer period of time after MI had a higher percentage of signs of depression and anxiety.Participants which werealmost depressed or with values of anxiety below the limit (negative) showed statistically significant higher average left ventricle EF values, as well as a significant correlation, which means that subjects without depression and anxiety have higher EF values and vice versa. Statistically significant correlation was not observed in relation to

Table 1. Gender and age distribution by groups

Gender - Group					
			Group		Total
			Examined	Control	
Gender	Men	N	34	35	69
		%	63,0	64,8	63,9
	Women	N	20	19	39
		%	37,0	35,2	36,1
Total		N	54	54	108
		%	100,0	100,0	100,0

Age						
	N	X	SD	SG	Minimum	Maximum
Examined group	54	61,1667	8,41775	1,14551	40,00	77,00
Control group	54	59,7037	12,02455	1,63633	31,00	78,00
Total	108	57,9352	10,82855	1,04198	31,00	78,00

t=5,469; p=0,834

Table 2. Average values of Beck's depression rate and Beck's anxiety score by groups

			X	SD	SG	Mini-mum	Maxi-mum
Beck'sscor depression T=6,015; p=0,003	Examined group	54	10,91	7,133	,971	1	32
	Control group	54	7,50	4,32+	,588	0	17
	Total	108	9,20	6,114	,588	0	32
Beck'sscor anxiety T=7,604; p=0,001	Examined group	54	11,06	8,085	1,100	0	33
	Control group	54	6,65	5,002	,681	0	26
	Total	108	8,85	7,048	,678	0	33

The research was conducted as a retrospective-prospective, analytical, comparative study. Standardized questionnaires for depression and anxiety, BDI-II - Beck's Depression Questionnaire, Second Supplementary Version, and BAI-Beck's Anxiety Questionnaire were used, where a positive

depression ($\chi 2 = 3.302$; $p = 0.347$; ro = 0.139; $p = 0.315$), but compared to anxiety ($\chi 2 = 12.659$; $p = 0.005$; ro = 0.291; $p = 0.033$).According to the degree of depression in the examined group, 25.9% of the participants showed a score that is in the mild, 7.4% moderate and 3.7% severe range of depression, while as many as 22.2% of the participants in the working
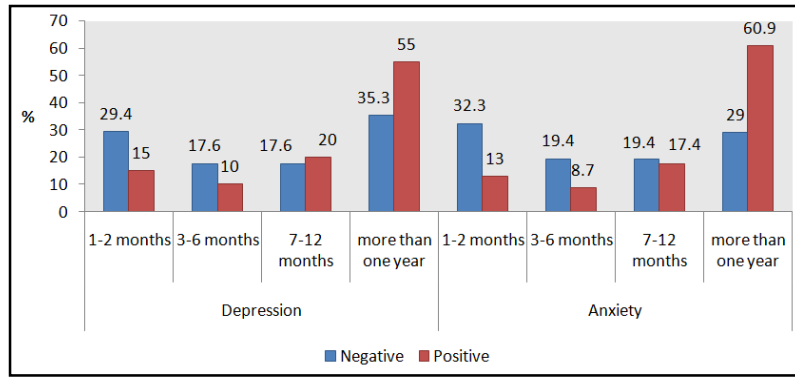
Chart 1. The ratio of time after the MI and the onset of depression and anxiety

Table 3. Effect of ejection fraction (EF) on depression and anxiety after MI. Average ejection fraction (EF%) – depression

Average ejection fraction (EF %) – Depression score						
	N	Average EF	SD	SG	Minimum	Maximum
Negtive score	31	47,8710	4,96482	,89171	39,00	58,00
Positivescore	16	39,8750	5,40216	1,35054	28,00	50,00
Total	47	45,1489	6,34507	,92552	28,00	58,00
Average ejection fraction (EF %) – Anxiety score						
	N	Average EF	SD	SG	Minimum	Maximum
Negative score	29	47,2069	5,82715	1,08207	35,00	58,00
Positivescore	18	41,8333	5,84355	1,37734	28,00	50,00
Total	47	45,1489	6,34507	,92552	28,00	58,00

For the occurrance of depression, t = 5.791; p = 0.0001; ro = -0.588; p = 0.0001
For the occurrence of anxiety t = 9.425; p = 0.0001; ro = -0.389; p = 0.007

Table 4. Distribution of participants by clinical forms of depression and anxiety in the examined and control group

| Beck's score-Depression – Group						
				Group		Total
				Examined	Control	
Beck's score-depression	No depression		N	34	49	83
			%	63,0	90,7	76,9
	Mild		N	14	5	19
			%	25,9	9,3	17,6
	Moderate		N	4	0	4
			%	7,4	0,0	3,7
	Severe		N	2	0	2
			%	3,7	0,0	1,9
Total			N	54	54	108
χ2=12,974; p=0,005			%	100,0	100,0	100,0
Beck's score- Anxiety- Group						
				Group		Total
				Working	Control	
Beck' score-Anxiety	No anxiety		N	31	44	75
			%	57,4	81,5	69,4
	Mild		N	12	7	19
			%	22,2	13,0	17,6
	Moderate		N	8	3	11
			%	14,8	5,6	10,2
	Severe		N	3	0	3
			%	5,6	0,0	2,8
Total			N	54	54	108
χ2=8,842; p=0,031			%	100,0	100,0	100,0
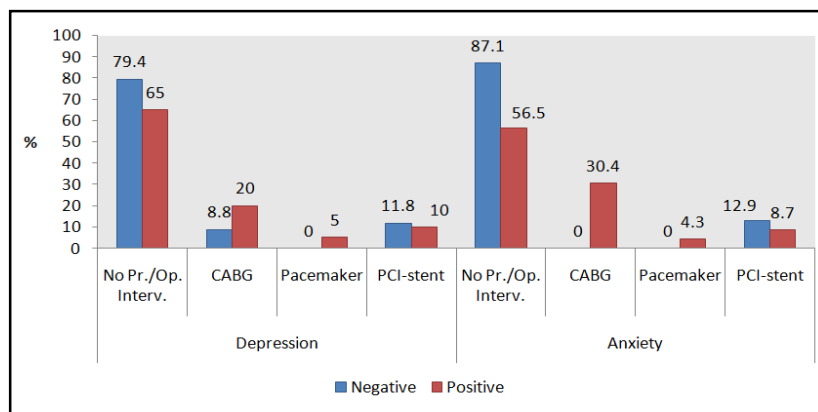
Chart 2. The influence of the procedure/operative intervention (Pr./Op. Interv.) on the occurrence of depression and anxiety after MI

Table 5. The correlation betweenempoyment and marital status and the occurrence of depression and anxiety by groups

Working status/ Marital status				Beck's score-depression- Group		
Group				Beck's score -depresssion		Total
				Negative	Positive	
Examined χ2=4,239; p=0,120 ro=-0,081;p=0,559	Working status	Unemployed	N	11	5	16
			%	32,4	25,0	29,6
		Retired	N	13	13	26
			%	38,2	65,0	48,1
		Employed	N	10	2	12
			%	29,4	10,0	22,2
	Total		N	34	20	54
			%	100,0	100,0	100,0
Control χ2=0,441; p=0,802 ro=0,007;p=0,962	Working status	Unemployed	N	14	1	15
			%	28,6	20,0	27,8
		Retired	N	13	2	15
			%	26,5	40,0	27,8
		Employed	N	22	2	24
			%	44,9	40,0	44,4
Examined χ2=2,337; p=0,505 ro=0,038;p=0,808	Marital status	Single	N	0	1	1
			%	0,0	5,0	1,9
		Married	N	28	14	42
			%	82,4	70,0	77,8
		Divorced	N	2	2	4
			%	5,9	10,0	7,4
		Widower/Widow	N	4	3	7
			%	11,8	15,0	13,0
	Total		N	34	20	54
			%	100,0	100,0	100,0
Control χ2=1,929; p=0,381 ro=-0,027;p=0,848	Marital status	Single	N	6	0	6
			%	12,2	0,0	11,1
		Married	N	35	5	40
			%	71,4	100,0	74,1
		Widower/Widow	N	8	0	8
			%	16,3	0,0	14,8
	Total χ2=2,017; p=0,570		N	49	5	54
			%	100,0	100,0	100,0

group show an anxiety score that is in the range of mild, 14.8% moderate, and 5.6% severe anxiety, with statistically significant difference in depression (p = 0.005) and anxiety (p = 0.031). Depression was most often present in the retired population in both groups but without statistically significant differences between the groups. The influence of marital status on depression was not observed in any of the groups. Anxiety within the examined group was most commonly recorded in the pensioners, and within the control group in the employed subjects, without statistically significant differences between the groups.

DISCUSSION

The gender distribution of the pariticipants was consistent with the gender distribution of MI, without a significant difference in the age distribution of the participants. We are pleased with the valid criteria of the Beck scale, where a positive score for depression / anxiety was achieved with 14 and more points on the BDI questionnaire. The results suggest that depression in patients who have experienced MI is clinically more evident and more serious in nature than in the control group (χ2 = 11.711; p = 0.001). A study by Lesperance and Smith showed that 9.7% of subjects with MI and moderate score were 4.3% for severe depression, which is quite similar to the results obtained in this study. Significant statistical difference is (T = 7,604; p = 0,001), as well as in the degree of manifestation of symptoms in favor of the patients in the MI group (moderate anxiety in 14,8% and severe in 5.6% patients after the MI). The mean value of BAI score in patients after the MI was greater and amounts to 11.06 points in relation to 6.65 points in the control group, with confirmed statistical significance.

In a study done in 2002 by Lane D. *et al*, the incidence of anxiety, measured by the same principle, was 41.8% for patients after MI. One of the basics was to try to analyze the impact of the time passed after the MI on the onset of depression and anxiety. The results indicated that most of the anxiety and depressive patients after the MI were in the category of patients with more than a year after the coronary incident, with 55% of those positive for depression after the last year and 60.9% positive for anxiety, indicating a problem of inadequate diagnosis of these conditions and inadequate treatment, because it is obvious that symptoms will not spontaneously disappear with the passing of time after the MI. Significant statistical difference was not established for depression, but only for anxiety. Extensive studies were conducted that tracked patients over a period of one year, and it was found that most of the patients who were positive for depression or anxiety in the first month after the MI, continued to have the same results on BDI-II and BAI after a year. EF is a parameter that probably best reflects the overall severity of a patient's heart disease after MI, so an attempt to compare it with the values obtained on BDI-II and BAI is a good way to correlate physical illness with the mental state. According to the study of Lesperance F *et al*., there is a significant statistical correlation between low EF values and high values on the BDI-II scale. Frasure-Smith *et al*. state that there is an obvious reversed proportionality between EF values and values on the BDI-II scale. Some studies exhibit a very interesting EF concept as a predictor of depression after myocardial infarction. The results of this study are in favor of the correlation between these two parameters. It was found that participants with a negative rate of depression or anxiety show statistically significantly higher average EF values.

Although it was to be expected that patients who underwent an invasive treatment after MI were less likely to suffer from depression or anxiety, the results showed different reality. It was found that 57.14% of patients who underwent CABG and 33.33% PCI-patients had a positive BDI-II depression scores. Such results suggest that an invasive treatment performed after the MI was a facilitating factor for the occurrence of depression. Similar results were also recorded for anxiety, where it was found that depression was observed in 30.4% post-CABG patients and 8.7% post- PCI patients. According to Ravven *et al.*, in a study that followed patients before and after CABG, CABG managed to reduce the symptoms of depression in 20% of patients, but most of the patients with depression prior to CABG remained positive the after surgery. Park MW *et al.* examined the effect of PCI on the occurrence of depression after MI, and conclude that PCI contributes to increasing the risk of developing depressive symptoms. For anxiety, the authors cite many different conclusions, from those that confirm the positive mitigating effect of PCI and CABG on symptoms of anxiety, to the conclusion that anxiety develops in large numbers after invasive treatments. As Larsen says only 27 % of doctors in primary health care treated the depression in patients after MI. According to Akhtar *et al.*, his study found a link between the lower socioeconomic status and the onset of depression and anxiety after MI, but there was no correlation with the level education or marital status of the patient . In our study, it has been established that marital status does not have any influence on the occurrence of depression and anxiety, neither in the examined nor in the control group. With regard to the employment status, 60% of the participants that were positive for depression according to BAI-II were from the pensioner/ retired category. 10% of the participants in the employed category had depression. A statistically significant difference was noted in the effect of the status of pensioners on the occurrence of depression after the MI, since as many as 50% of the retired were positive for depression. As far as anxiety is concerned, the most dominant was retired population with 60.9% patients positive for anxiety from this category.

Conclusions

The incidence of depression and anxiety is significantly higher in patients after MI than in the general population. In those who have experienced MI, clinically more serious forms of depression and anxiety in BDI-II and BAI scale were present. The majority of patients who develop depression, also develop anxiety symptoms after MI and vice versa. Depression and anxiety occur after MI irrespectively of the time elapsed from the coronary incident, and the symptoms do not disappear spontaneously with time unless they are recognized and adequately treated. Lower EF after MI is a predictor of depression and anxiety. Applied interventional procedures and operative treatment (PCI, CABG and pacemaker implants) have no protective effect in terms of the incidence of depression and anxiety. Marital status does not affect the occurence of depression and anxiety after MI, while the employment status has a somewhat greater, but insignificant effect, except for the status of pensioners /retired population both in terms of depressive and anxiety symptoms.

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