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## Anxiety in patients with acute coronary syndromes

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**ABSTRACT – Background and Objectives:** Anxiety is frequently encountered in acute coronary syndrome. It is believed that the prevalence of anxiety among cardiac patients is between 15 and 50%. The goal of our study was to determine whether there is an association between current anxiety and anxiety tendency in patients with acute coronary syndrome. A secondary goal was to establish possible distinct features of acute coronary syndromes in patients with the anxiety.

**Methods and results:** Our study included 30 patients suffering from acute coronary syndrome. To obtain additional data on physical and mental health, we applied specially designed and validated questionnaires. In a groups without the anxiety and intensive anxiety there were no patients, while in the group with mild anxiety there were 21 patients (70%) and 9 patients had moderate anxiety (30%). The average number of hospital treatments was significantly higher in patients with moderate anxiety (average 2.3). Patients who were first time hospitalized due to cardiovascular disease, at the highest percentage (81%) had low current anxiety. Those patients who had intensive anxiety traits and propensity to anxiety response had the highest average number of hospital days (9 days). Patients who had intensive anxiety traits had the lowest values of internal locus of control (had feeling that only themselves were cause of the disease).

**Conclusions:** Current anxiety and anxious personality structure are strongly associated with the course of the coronary heart disease. In particular, this refers to the length of hospital stay and number of hospitalizations.

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## Introduction

It is a known fact that somatic disorders, in a certain percentage, are associated with a mental health problems, whether in a form of two co-existent diseases, whether psychological problems are only associated symptoms and/or response to somatic disease.

Anxiety is a psychological symptom frequently encountered in patients suffering from acute coronary syndrome. It is believed that the prevalence of anxiety among cardiac patients is between 15 and 50%. The prevalence of depression is also high in patients with coronary heart disease (CHD). Rates of major depressive disorder of near 15% have been found in patients with acute coronary disease. Recently, the EUROASPIRE III study on 8580 patients after hospitalization for coronary heart disease revealed that the proportion of patients with depression, measured by the Hospital Anxiety and Depression Scale, varied from 8.2 - 35.7% in men and 10.3 - 62.5% in women<sup>1,2</sup>.

In CHD patients undergoing elective percutaneous coronary interventions (PCI), lower anxiety levels are positively associated with survival and reduce the risk for major adverse coronary events (MACE) during the first five years after index PCI. The beneficial effects of anxiety on cardiovascular mortality and morbidity suggest that a differentiated approach to diagnosing and treating anxiety in CHD patients is warranted<sup>3</sup>.

In study with heart failure patients it was found that anxiety is a better prognostic indicator than depression and that anxiety increases the risk for 3-fold of unwanted cardiac events (myocardial infarction, sudden cardiac death)<sup>4</sup>. Anxiety is one of the established risk factors for sudden cardiac death.

Several studies have demonstrated increased risk of sudden cardiac death in patients with phobic, generalized anxiety and panic disorders. Anxiety increases the mortality rate in patients with heart diseases by increasing the risk from ventricular arrhythmias and sudden cardiac death, consequently<sup>5</sup>. Continuation of exhibiting a high level of anxiety after the diagnosis of coronary artery disease is a significant risk factor for the development of myocardial infarction or death in these individuals<sup>6</sup>.

An increasing number of data from prospective studies show that negative emotions such as anxiety, anger and depression are risk factors for coronary artery disease. Several mechanisms explain this finding including links between negative emotions with bad habits such as smoking, nutritional habits, reduction of physical activity. Also emotional stress has the direct negative effect on the progression of atherosclerosis and it reduces threshold for ventricular arrhythmias and possibly sudden cardiac death<sup>7</sup>. Anxiety increases blood coagulability during and after the emotional stress, which is one of the mechanisms that may link this emotion and cardiac disease<sup>8</sup>. The possibility that anxiety and depressive symptoms and subsequent acute myocardial infarction are caused by subclinical manifestations of atherosclerosis is among the greatest challenges for researchers. Atherosclerosis may facilitate anxiety and depressive symptoms even before generating cardiac ischaemia creating a spurious *circulus vitiosus*. One possible pathway is the depressogenic actions of the increased inflammatory activity. Moreover, neuroimaging and neuropathology studies suggest that late onset depression often has a cerebrovascular origin. Cerebral atherosclerosis may thus facilitate depressive symptoms and anxiety even before coronary atherosclerosis generates cardiac ischaemia<sup>9</sup>.

## Objective

Since previous studies found that anxiety is associated with CHD, the goal of our study was to determine whether there is an association between current anxiety and anxiety tendency in CHD patients. A secondary goal was to establish possible distinct features of acute coronary syndromes in patients with the anxiety. Specifically, we were interested in whether some variables in CHD are associated with current levels of anxiety or a general tendency towards anxiety reaction or specific type of personality.

## Methods

Our study included 30 patients suffering from acute coronary syndrome (unstable angina pectoris, myocardial infarction with and without ST segment elevation – STEMI and NSTEMI) who were at the time of the study hospitalized at the Clinical Center of Nis. We included patients hospitalized at our Clinic for cardiovascular diseases during consecutive 7 days.

The study was performed according to the Good Clinical Practice guidelines and the Declaration of Helsinki. Study protocol was approved by the Ethic Committee of Clinical Centre Nis. Written informed consent was obtained from all participants prior to their inclusion in the study.

Patients were analyzed by standard procedures involving laboratory tests, ECG and echocardiography.

To obtain additional data, we applied the following questionnaires:

1. General questionnaire by which we obtained socio-demographic data and informa-

tion on the progress of cardiac disease (duration of treatment, number of treatments), heredity, association with psychological stress disorders.

2. State and Trait Anxiety Inventory (STAI) – a questionnaire consisting of 40 questions to assess the intensity of the two forms of anxiety – the current level of anxiety (state of anxiety) and anxiety as a personality trait (trait anxiety). Based on the recent researches both types of anxiety can be divided into mild, moderate and intense anxiety. Also, by using the special table we transformed both primary scores into Z -scores (0-100) that allowed these two types of anxiety to be compared.

3. Health Locus of Control (LOC) – a questionnaire that measures where the patient places the center of disease control – internal (considers him/her to be dominantly responsible for their own health and the disease) and external (considers external factors such as chance or fate, doctors and other people to be crucial that he will get sick and/or be cured). By processing the result we got the intensity scores for:

- (a) Internal control center.
- (b) Control center linked to the coincidence/fate.
- (c) Control center linked to doctors.
- (d) Control center linked to the other persons.

After the division of the entire group of patients in the subgroups without anxiety and with mild, moderate and intensive anxiety, subgroups were mutually compared in relation to the clinical features of acute coronary syndrome (a type of disorder, localization of myocardial infarction, inflammatory markers, risk factors, laboratory findings, ECG findings, echocardiography results) and its progression.

## Place of research

Research was conducted at the Clinic for cardiovascular diseases, Clinical Center Nis.

## Statistical data

Data were analyzed in SPSS 12 program, continuous variables were correlated using *T* student test and *ANOVA* analysis, while chi-square test was used for categorical variables. We correlated numeric variables using Pearson's correlation.

## Results

Study included 30 consecutive patients admitted to Coronary Care Unit during one week (19 males or 63.3% and 11 women or 36.7%), mean age  $61.75 \pm 8.4$  years. We did not include comatose patients, those with severe hemodynamic and electromechanical complications of myocardial infarction, cerebrovascular insult (older or *de novo*) and massive hemorrhage due to aggressive antithrombotic therapy in this clinical setting. The baseline patients' characteristics are given in Table 1.

Table 1  
Baseline patients' characteristics.

Type of acute coronary syndrome	STEMI	NSTEMI	Unstable angina pectoris
Myocardial wall affected by infarction	82% anterior wall 18% inferior-posterior wall	50% anterior wall 50% inferior-posterior wall	77% anterior wall 23% inferior-posterior
Left ventricular ejection fraction	47.5%	48.8%	46.7%
Glucose at admission	9.8 mmol/L	7.77 mmol/L	6.99 mmol/L
Cholesterol at admission	5.6 mmol/L	4.88 mmol/L	5.01 mmol/L
CRP at admission	6.6 mg/dL	4.7 mg/dL	3.1 mg/dL
% of smokers	69%	72%	73%
% of diabetics	62%	67%	71%
% of patients with familial history of coronary artery disease	11%	9%	9%
BMI (kg/m <sup>2</sup> ) average	27.7	28.0	26.9

STEMI- myocardial infarction with ST segment elevation, NSTEMI- myocardial infarction without ST segment elevation, CRP- C reactive protein, BMI- body mass index.

After patient division according to the levels of anxiety, in a groups without the anxiety and intensive anxiety there were no patients, while in the group with mild anxiety there were 21 patients (70%) and 9 patients

had moderate anxiety (30%). In terms of anxiety traits – in a subgroup of patients with anxiety we found that 19 patients (63.33%) had mild, 9 patients had moderate (30%) and 1 patient had pronounced (6.67%) anxiety.

Statistical analysis showed a statistically significant relationship between several variables (Table 2). The average number of hospital treatments due to CHD was significantly higher in patients with moderate anxiety (average 2.3) than in those with mild anxiety (average 1.33) ( $F = 6.308, p = 0.018$ ). Patients who were hospitalized first time due to cardiac causes had at the highest percentage (81%) low current anxiety, and with the increasing number of hospitalizations moderate anxiety was dominant ( $\chi^2 = 8.779, p = 0.012$ ) (Figure 1). Those patients who had intensive anxiety traits and an inclination towards anx-

ety response had the highest average number of hospital days (9 days) ( $\chi^2 = 25.427, p = 0.031$ ). Patients who had intensive anxiety traits had the lowest values of internal locus of control ( $F = 5.379, p = 0.011$ ). Current levels of anxiety positively correlated with the age and level of blood glucose, while they negatively correlated with cholesterol levels (Table 3). Anxiety traits positively correlated only with the number of hospitalizations due to CHD ( $r = 0.432, p = 0.019$ ). Statistically significant negative correlation was found between internal locus of control and the number of patient days ( $r = -0.593, p = 0.001$ ).

Table 2

The average number of hospitalizations, number of hospital days and internal locus of control score in patients with different anxiety levels.

Level of current anxiety	Average number of hospitalizations due to CHD	Number of hospital days	Internal locus of control score
Without anxiety	0.00	0.00	00.00
Mild anxiety	1.33	4.47	28.63
Moderate anxiety	2.13	2.67	32.78
Intensive anxiety	0.00	9.00	17.00

Table 3

Correlation of current anxiety and clinical and biochemical parameters.

Parameter	Pearson correlation coefficient	P value
Age	0.424	0.022
Cholesterol	-0.503	0.006
Glycaemia	0.493	0.007

## Discussion

Data obtained in this study indicate that anxiety has a much greater influence on the course of coronary artery disease than its clinical correlates. It has been shown that patients who have two or more hospitalizations due to

coronary heart disease with new hospitalization have higher levels of anxiety. This information is important given that the literature has repeatedly emphasized the negative impact of anxiety on the outcome of coronary artery disease and it is considered that anxiety actually worsens the outcome of the disease<sup>6</sup>.

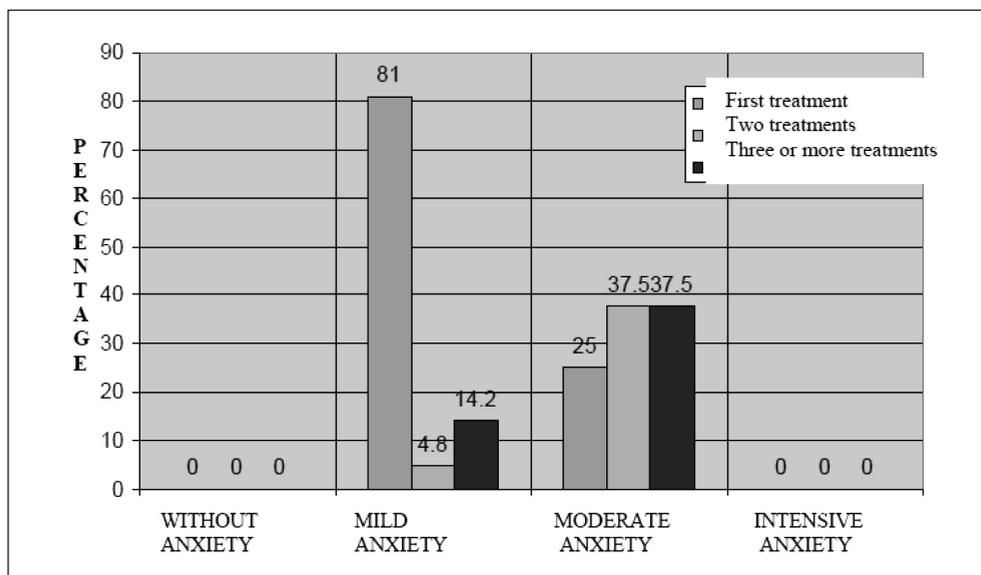


Figure 1. Percentage of patients with different number of hospital treatments due to CHD depending on the current level of anxiety.

Based on these data and data from the literature we can say that patients with a higher number of hospitalizations due to higher intensity of current anxiety are at a higher risk of re-infarction and lethal outcome.

Also those people, who basically were very anxious, had a significantly higher number of hospital days spent in a coronary care unit. Since the longer hospitalizations are associated with resistant symptoms or complications, patients with high basic anxiety probably have a tendency toward more severe disease and additional complications, which can only be confirmed by the new study specifically structured. Interestingly, patients who were extremely anxious basically have the lowest level of internal locus of control, which means that they think they have very low influence on the course and outcome of disease. This fact can de-motivate the patient to change behavior to that which will help to reduce the number of risk factors and reduce the likelihood of new coronary events. Also,

an internal locus of control negatively correlated with the number of hospital days, which means that those patients who have the impression that both they and medical professionals influence the outcome of the disease have a shorter hospital stay.

Current anxiety positively correlated with the age and blood glucose levels. This means that we can expect that elderly have a higher intensity of anxiety and consequently a higher risk for adverse outcome. Similarity exists with the level of blood glucose level, which is a significant risk factor for coronary heart disease and its complications.

It is interesting that anxiety negatively correlated with the level of cholesterol. This means that people with high levels of anxiety have lower cholesterol. In studies it is typically found that the anxiety is associated with higher levels of serum cholesterol while the depression and suicidal tendencies are associated with reduced levels of cholesterol. In

the literature we found conflicting evidence of a relationship between statins and mood. Further research is recommended in particular with older, female and lower socioeconomic status samples<sup>10,11</sup>.

Anxious traits in correlative analysis were clearly related with the number of hospital treatments which means that for patients with CHD who have a high basic anxiety we can expect a greater number of health deteriorations or acute coronary syndromes.

## Conclusion

Current anxiety and anxious personality structure are strongly associated with the course of the coronary heart disease. In particular, this refers to the length of hospital stay and number of hospitalizations.

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