Symptoms of depression and anxiety after cardiac arrest

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Summary

Aim. The aim of the study was to assess the incidence of depression and anxiety symptoms in patients after cardiac arrest (SCA) in relation to patients with a history of myocardial infarction without SCA and in healthy individuals. The analysis of the impact of selected socio-demographic and clinical parameters and duration of SCA on the presence and severity of depression and anxiety symptoms in different groups was also performed.

Material and methods. The study involved 30 patients after SCA and 31 patients with a history of myocardial infarction without SCA. The control group consisted of 30 healthy subjects. To assess the mental state, a specially developed questionnaire was used, while the presence and severity of the symptoms were assessed using the Hamilton Depression Rating Scale (HDRS) and the Hamilton Anxiety Rating Scale (HAM-A).

Results. Statistically, a significantly higher average level of depression and a higher incidence of anxiety was demonstrated in patients after a sudden cardiac arrest (study group) and after myocardial infarction (reference group) compared with the control group. There were no statistically significant differences in the incidence of anxiety between the study and reference groups. No impact of the duration of cardiac arrest on the incidence of depression and anxiety symptoms in the study group was observed.

Conclusions. In the group of people with a history of cardiac arrest, the most common mental disorder is depression. Anxiety and depression are significantly more frequent in patients with a history of SCA than in healthy individuals. There were no differences in the incidence and severity of depression symptoms in patients after SCA compared to patients

after myocardial infarction without SCA. The described socio-demographic parameters and clinical characteristics had no impact on the symptoms of depression and anxiety in the investigated groups.

Key words: depression, anxiety, cardiac arrest, coronary artery disease

Introduction

Sudden cardiac arrest (SCA) is a sudden cessation of the cardiovascular system function, which leads to clinical death. There are three mechanisms of sudden cardiac arrest: ventricular fibrillation, asystole, and electromechanical dissociation. The most common causes of SCA are coronary artery disease and acute myocardial infarction. Other cardiac causes include: valvular heart disease, cardiomyopathy, atrio-ventricular conduction disorders, sick sinus syndrome and others. Non-cardiac causes include: airway obstruction, respiratory paralysis, severe hypoxia, electrolyte imbalance, intoxication, electric shock, severe hypothermia and anaphylaxis [1, 2]. Due to the particular sensitivity of brain tissue to hypoxia, it is assumed that cardiac arrest lasting for more than 3–4 minutes causes irreversible changes in the cerebral cortex [3–6]. Taking more than 5 minutes to commence resuscitation is mentioned as one of the factors of unfavourable prognosis, but even after 10 minutes after a cardiac arrest episode there is still a chance of a favourable outcome of resuscitation [7–16].

People with a history of cardiac arrest, which is a life-threatening situation, are particularly vulnerable to the development of depressive and anxiety disorders [17]. According to the literature, in patients with a history of myocardial infarction without SCA, mood disorders, anxiety and post-traumatic stress occur more often than in healthy population of similar age and sex [18]. A relationship between depression and the risk of unfavourable course of ischemic heart disease and myocardial infarction has been confirmed. It has also been demonstrated that depressive disorders occur more frequently in patients treated due to coronary artery disease than in the general population [19].

There are only a few publications in Polish and international literature assessing mood disorders and anxiety disorders in patients after SCA [20]. Ladwig et al. describe the occurrence of these type of consequences in a group of several dozen patients with a history of SCA [21]. Also Roine et al. demonstrate the presence of depression in 45% of 54 study subjects 12 months after SCA [22]. Additionally, there are only a few case reports describing this kind of disorder in patients with a history of SCA [23, 24]. These reports, however, do not differentiate between a group of patients after SCA and other patients suffering from cardiovascular diseases, or ignore the well-known over-representation of mental disorders in this group of patients.

Cardiac arrest is associated with disturbed blood circulation in the brain tissue [25–27]. The mechanism of the process of ischemic lesion formation in the central nervous system (CNS) is relatively well understood. Sjesjö lists the mechanisms present in the cells of the central nervous system during hypoxia, stressing the importance of differences in the sensitivity of particular areas of the brain to oxygen deficiency [27]. When describing the neurological aspects of sudden cardiac arrest, Chmielewski et

al. pays attention to the relationship between the development of ischemic lesions in CNS and duration of SCA [25]. The available literature data indicates that a longer incident of SCA, burdened with an increased risk of ischemic damage to the central nervous system [26, 28–30] may become a risk factor for organic mental disorders, often manifest cognitive impairmen [31].

Aim

The aim of the study was to assess the incidence of depression and anxiety symptoms in patients after sudden cardiac arrest (SCA) in relation to patients with a history of myocardial infarction without SCA and healthy individuals. The analysis of the impact of selected socio-demographic and clinical parameters and duration of SCA on the presence and severity of depression and anxiety symptoms in different groups was also performed.

Material

The study included subjects with a history of SCA, at least one month and not more than 6 months after the incident. The reference group consisted of patients with a history of myocardial infarction without cardiac arrest, at least one month and not more than 6 months after the infarction. The control group included healthy individuals suitably matched for age and sex. The study was conducted at the Independent Public Health Care of the Upper Silesian Rehabilitation Centre "Repty". The study was approved by the Bioethics Committee of the Medical University of Silesia in Katowice.

The influence of selected factors with a potential impact on the risk of depression and anxiety symptoms was analysed, including: sex, age, marital status (divided into two categories: a) single, and b) married), education, administered medications that may affect the mental state of the subject (due to the complex interactions of drugs; for practical purposes, patients were divided into two groups: a) taking drugs that may affect the mental state, and b) not taking drugs that may affect the mental state), the duration of sudden cardiac arrest (due to the difficulty in determining precisely the duration of cardiac arrest episodes in individual patients, based on available medical records, interviews with patients and their families, two general categories were selected: a) patients in whom a cardiac arrest episode lasted less than three minutes, and b) patients in whom cardiac arrest lasted more than three minutes), invasive treatment of patients after cardiac arrest and myocardial infarction (a) patients who were not treated invasively, and b) patients treated with methods of interventional cardiology), presence of ischemic heart disease, presence of hypertension, and presence of other diseases. The inclusion criteria were: informed written consent to participate in the study, a history of sudden cardiac arrest (at least one month after the incident), a history of myocardial infarction without cardiac arrest (at least one month after the incident). The exclusion criteria were: withdrawal of consent during the study, diseases and mental disorders diagnosed before the occurrence of sudden cardiac arrest, current stressors of high intensity, drug and/or alcohol dependence, other mental disorders of the organic and somatogenic origin, and age below 18 and above 65 years.

Method

In order to assess the mental state of subjects, an especially developed questionnaire was used, while the presence and severity of mental disorders were assessed using the standard psychopathological scales and inventories: Hamilton Depression Rating Scale and Hamilton Anxiety Rating Scale.

Developed by the authors specifically for the study questionnaire took into account demographics and selected clinical parameters and the subjective feeling of stress associated with trauma and current stressors of high intensity. In addition to these data it contained questions regarding psychopathology, which were formulated and interpreted in accordance with the applicable ICD-10

Hamilton Depression Rating Scale (CDRS) consisting of 21 points, which is used to assess the depth of depression was employed [32]. The following limits were assumed: 0–7 points – no depression, 8–17 points – mild depression, 18–25 points – moderate depression, and more than 25 points – severe depression.

Hamilton Anxiety Rating Scale (HAM-A) is used to assess the clinical features of anxiety as a psychopathological syndrome; it also enables the assessment of the severity of anxiety. To assess the severity of anxiety, the assumed values used in the tests of heart recipients and patients undergoing invasive diagnosis of coronary artery disease, were used: 7–14 points – moderate anxiety, 14–22 points – strong anxiety, 23 points and higher – very strong anxiety [33, 34].

In addition to these questionnaires, patient information was collected on the basis of medical history, medical records and contact with the medical staff of the Rehabilitation Centre "Repty."

Statistical analysis of data

The following statistical tests were used for analyses: Shapiro-Wilk test, Kruskal-Wallis test, Mann-Whitney U test, Chi-squared test with Yates' correction, Fisher's exact test, Spearman's rank correlation test, and Cochran's Q test. The level of significance $p \leq 0.05$ was considered statistically significant.

Results

Characteristics of the study groups

The group of subjects with a history of SCA consisted of 30 patients, of which 22 subjects (73.3%) were male and 8 subjects (26.7%) were female. 10 subjects, i.e. 33.33% of patients, underwent percutaneous coronary intervention, most often combined with stenting (PTCA). This group also included subjects who underwent coronary artery bypass graft surgery (CABG); 26 subjects (86.67%) suffered from coronary artery disease. Among comorbidities, the most common condition was hypertension, which occurred in 15 (50%) patients, while other diseases (including diabetes, which was the most common, COPD, allergic diseases and gastric ulcer) were found

in 43.33% of subjects. In all study subjects, SCA occurred due to cardiac reasons; in most patients cardiac arrest was accompanied by a heart attack, in three patients it was associated with myocarditis, and in two patients it occurred on the basis of atrio-ventricular conduction disorders. In three subjects, a sudden cardiac arrest occurred during cardiac procedures (Table 1).

Table 1. **Characteristics of the study, control and reference groups in relation to sex, age and education**

Group	N	Female	Male	Age x ± SD	Education		
					primary/ vocational	secondary	higher
1. Study	30	8 (26.7%)	22 (73.3%)	52.9±0.8	12 (40.0%)	13 (43.3%)	5 (16.7%)
2. Control	30	8 (26.7%)	22 (73.3 %)	52.4±6.5	11 (36.7%)	13 (43.3%)	6 (20.0%)
3. Reference	31	11 (35.5%)	20 (64.5%)	55.3±7.0	13 (41.9%)	13 (41.9%)	5 (16.1%)
Comparison of groups	Chi-squared test: NS (p = 0.68)			Kruskal–Wallis test NS (p = 0.33)	Chi-squared test: NS (p = 0.88)		

Depression

Statistically, a significantly higher incidence and average level of depression in HDRS was demonstrated in patients from the study and reference groups than in patients from the control group. In the study group, depression occurred more frequently than in the reference group, but the difference was not statistically significant. The symptoms of mild depression predominated in both the study and reference group (46.67% and 32.26%, respectively); moderate depression was less common, whereas none of the subjects suffered from severe episodes of depression (Figure 1).

Anxiety

A significantly higher incidence of elevated anxiety levels assessed in the HAM-A scale was observed in patients from the study and reference groups compared with the control group. There were no statistically significant differences between the study and reference groups. Moderate anxiety predominated in the study and reference groups (36.67% and 32.26%, respectively); severe anxiety was observed in the study group in 13.33% of subjects, and in the reference group – in 19.35% of subjects (Figure 2).

Evaluation of the prevalence of the analysed parameters of mental state within groups

In the group of patients with a history of SCA, the most common mental disorder was depression, which affected 60% of subjects. In the reference group, the most
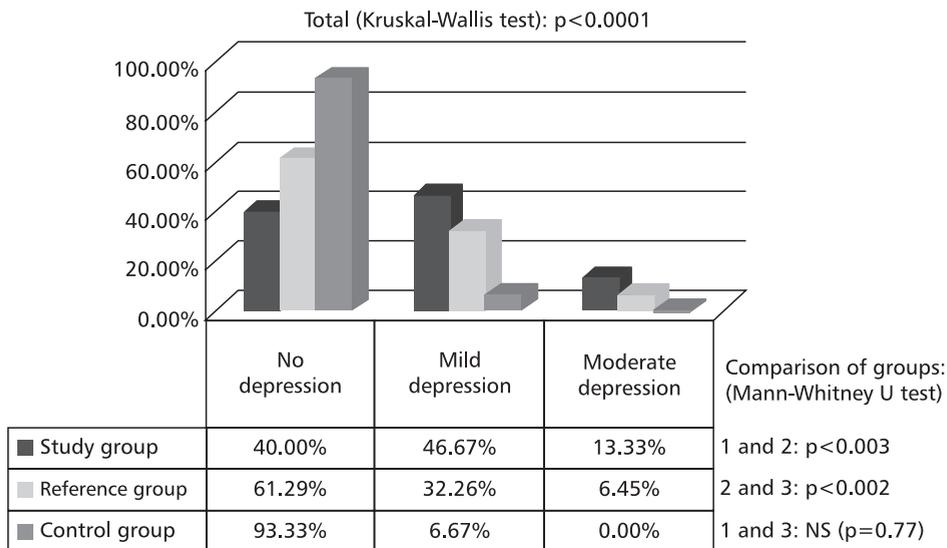
Total (Kruskal-Wallis test): p<0.0001

	No depression	Mild depression	Moderate depression	Comparison of groups: (Mann-Whitney U test)
▪ Study group	40.00%	46.67%	13.33%	1 and 2: p<0.003
▫ Reference group	61.29%	32.26%	6.45%	2 and 3: p<0.002
▪ Control group	93.33%	6.67%	0.00%	1 and 3: NS (p=0.77)

Figure 1. **Distribution of HDRS results in patients from each group**

Total (Kruskal-Wallis test): p<0.0002

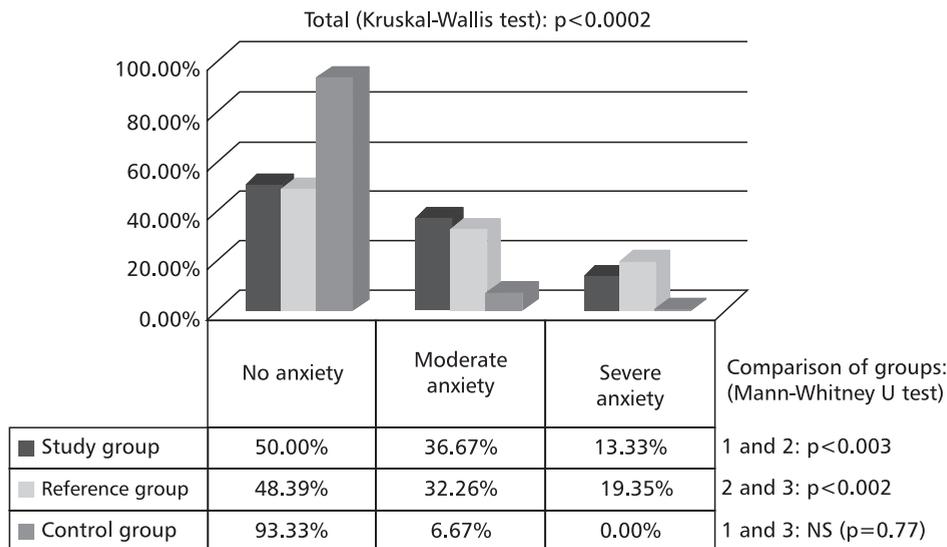|	No anxiety	Moderate anxiety	Severe anxiety	Comparison of groups: (Mann-Whitney U test)
▪ Study group	50.00%	36.67%	13.33%	1 and 2: p<0.003
▫ Reference group	48.39%	32.26%	19.35%	2 and 3: p<0.002
▪ Control group	93.33%	6.67%	0.00%	1 and 3: NS (p=0.77)

Figure 2. **Distribution of HAM-A results in patients from each group**

common disorder was anxiety, which was observed in 51.6% of subjects; depression was less frequent, affecting 38.7% of subjects. The control group was characterized by a similar proportion of patients (6.7%) who experienced anxiety and depression symptoms (Table 2).

Table 2. **Percentage of patients in each group with known a dysfunction based on the scales**

Scale	1. Study group	2. Control group	3. Reference group
HDRS	18 (60.0%)	2 (6.7%)	12 (38.7%)
HAM-A	15 (50.0%)	2 (6.7%)	16 (51.6%)
Cochran's Q test	p < 0.05	NS (p = 0.36)	p < 0.005

The impact of selected socio-demographic and clinical parameters in the study group on the severity and incidence of depression and anxiety symptoms

The correlation of factors characterizing the group with the scores obtained from the scales was analysed using Spearman's rank correlation test. A tendency towards higher HDRS values was observed among women. There was no significant correlation with any parameter analysed.

The impact of the duration of sudden cardiac arrest on the results of the tests

Similarly, no impact of the duration of sudden cardiac arrest on the presence of depression and anxiety symptoms in the study group was observed (Figure 3 and 4).

Discussion

The severity and incidence of depression symptoms were examined in the study, control and reference groups. Both the study and reference group showed a higher incidence of depressive disorders. In the group of patients with a history of SCA, mild depression symptoms were predominant – they were observed in 14 patients (46.67%);
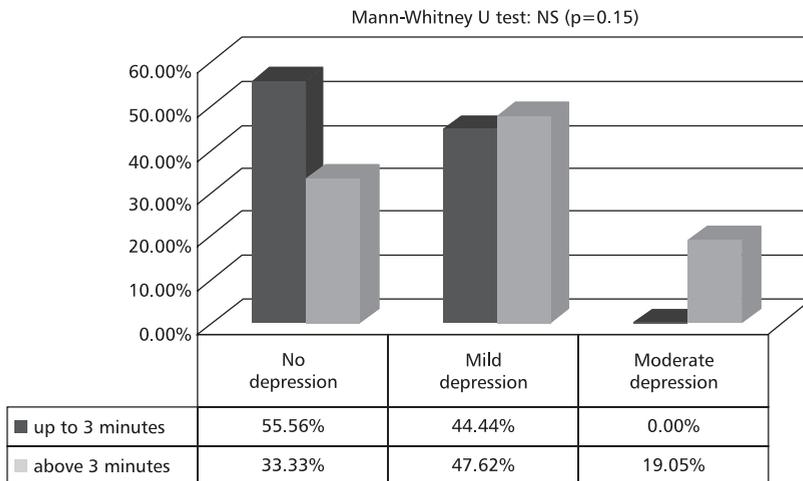
Mann-Whitney U test: NS (p=0.15)

	No depression	Mild depression	Moderate depression
up to 3 minutes	55.56%	44.44%	0.00%
above 3 minutes	33.33%	47.62%	19.05%

Figure 3. **Distribution of HDRS results in the study group depending on the duration of SCA**

Mann-Whitney U test: NS (p=0.15)

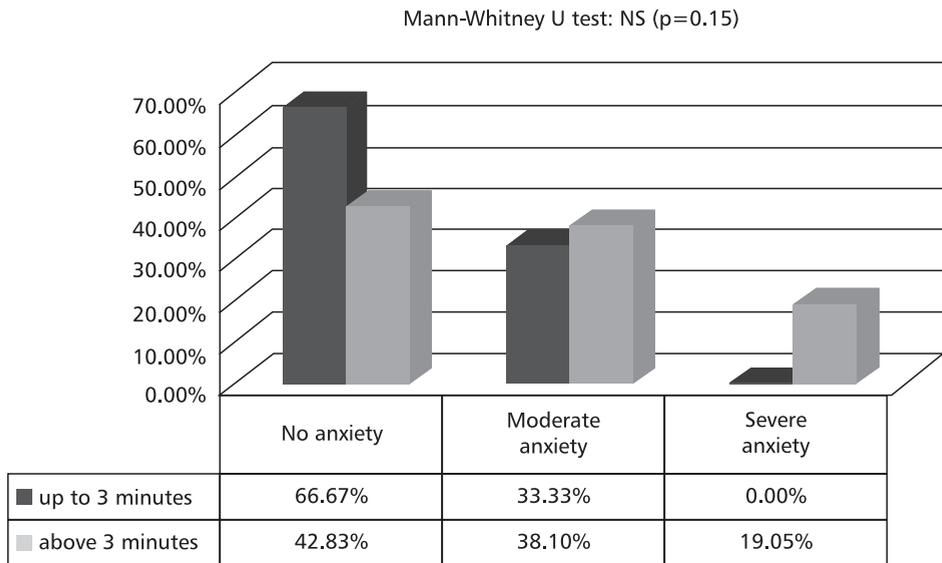|	No anxiety	Moderate anxiety	Severe anxiety
■ up to 3 minutes	66.67%	33.33%	0.00%
■ above 3 minutes	42.83%	38.10%	19.05%

Figure 4. **Distribution of HAM-A results in the study group depending on the duration of SCA**

moderate depression symptoms were less frequent and occurred in 4 patients (13.33%). Mild depression was predominant in the reference group, affecting 10 patients (32.26%), while moderate depression was diagnosed in 2 patients, which represents 6.46% of the subjects. To provide basis for comparison, mild depression was observed in 2 subjects (6.7%) from the control group, which did not differ significantly from the literature data on the prevalence of depressive disorders in the general population; there was no occurrence of moderate and severe depression symptoms in this group.

The results obtained in the study group were slightly different from data obtained from other sources. Ladwig demonstrated the presence of moderate and severe depressive disorders in about 25% of patients with a history of SCA. Underlines the lack of differences in the prevalence of emotional disorders and impaired quality of life among patients after cardiac arrest and cardiac patients whose disease has not been complicated by the sudden cardic arrsst, which is consistent with the results of our research. He also notes that the symptoms of post-traumatic stress disorder are particularly frequently observed in a population of patients with an increased risk of serious emotional disturbance [21]. It seems important that Ladwig's study was conducted after approximately 39 months from SCA. The analysis and comparison of its results with those obtained in the present study may suggest a tendency to reduce the incidence of depression over time from the occurrence of SCA, especially mild and moderate depression. It should be noted, however, that due to the small number of available publications addressing this issue, an in-depth comparative analysis is difficult at the outset. The results obtained in the group of patients after myocardial infarction were similar to those known from the literature [35]. Data from a number of older studies

as well as data from recent meta-analyses clearly indicate that depression is a risk factor for cardiovascular and total mortality in the general population and in patients with a diagnosed heart disease [36, 37]. Numerous studies indicate that patients who experience depression after myocardial infarction are at increased risk of sudden cardiac death (SCD) [38, 39]. It is also worth to pay attention to the presence, in studied patients, of additional significant stressor that is experience a sudden cardic arrest, which complicates cardiac disease and may cause the disclosure of post-traumatic stress disorder, and significant impairment of functioning. However, a thorough description of the problem flagged requires careful analysis and exceeds the capabilities of this study. It will be the subject of another publication.

Increased incidence of depressive syndromes in patients after SCA is worth considering. Depressive disorders appear to be the most common mental disorders in the study group. We posed the question whether SCA survival significantly affects the incidence of symptoms of depression, or whether the reported prevalence of symptoms in this group of patients does not differ from a group of patients after myocardial infarction. The results of our study indicate that experience a sudden cardic arrest does not affect the frequent presence of depressive symptoms among patients after cardiac arrest in relation to patients after myocardial infarction, or this parameter does not differentiate between the two groups. We also want to emphasize, that when studying mental disorders after SCA, this group of patients should be compared with patients suffering from cardiovascular disorders, not only with healthy individuals. Similar suggestions apply to the occurrence of anxiety. The analysis of the study carried out by Wilder et al. demonstrate high levels of psychological stress. The incidence of depression ranged from 14–45%, whereas the incidence of anxiety was 13–61%; the authors indicate that a large variation between the results might be related to the methodology of individual studies [40]. Wachelder et al. present the evaluation of the quality of life in patients after SCA in the period from one year to 6 years after the incident. The study shows that 24% of subjects reported anxiety and/or depression [41].

As in the case of depression, there are not many studies concerning anxiety disorders in patients with a history of SCA. The results obtained in the presented study, in both the study and reference group, are similar to data obtained from other centres. Similar percentages were also reported by Drysdale and Ladwig [21, 42, 43].

A tendency towards a higher incidence of anxiety and depression in patients in whom the duration of SCA was longer should also be noted. Despite the lack of statistical significance, it could indicate a contribution of the organic factor in the pathogenesis of these disorders.

Conclusion

In the group of people with a history of SCA, the most common mental disorder is depression.

Anxiety and depression symptoms are significantly more frequent in patients with a history of SCA than in healthy individuals.

There were no differences in the incidence and severity of depression symptoms in patients after SCA compared to patients after myocardial infarction who had not experienced SCA.

The described socio-demographic parameters and clinical characteristics had no impact on the symptoms of depression and anxiety in the investigated groups of patients.

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