

# Evaluation of cardiovascular complaints in higher education students experiencing elevated level of situational anxiety during the martial law and peacetime

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## ABSTRACT

**Aim:** To calculate the average score of situational anxiety level and compare the risk of developing cardiovascular complaints in higher education students from the country in the martial law and the country in peacetime according to the respondents' level of situational anxiety. To analyze the impact of place of residence on the frequency of complaints among students with an elevated level of situational anxiety in both countries.

**Materials and Methods:** Descriptive and inferential statistics: cluster method, qualitative analysis method; exploratory observational analytical short-term case-control study. The State-Trait Anxiety Inventory (STAI) [1] questionnaire was used to calculate the situational anxiety level indicator. Calculations were conducted using Excel and MedStat software.

**Results:** The research results demonstrated higher level of situational anxiety among students who belonged to higher educational institutions in the country under the martial law. The odds ratio is 0,42 (95% CI 0,27-0,66), indicating that the elevated level of situational anxiety was encountered more frequently in the study group compared to the control group of students.

**Conclusions:** The average score of situational anxiety level was found to be higher among students from a country where the martial law has been implemented. The presence of the martial law in the country was identified as a factor associated with an increased risk of complaints from the cardiovascular system among students. The risk of developing cardiovascular complaints in the context of elevated situational anxiety is confirmed.

**KEY WORDS:** Armed Conflict, Cardiovascular Diseases, Public Health, Stress Disorders

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## INTRODUCTION

Two years into the martial law in Ukraine are ongoing; the multifaceted repercussions of this period on the nation's well-being cannot be overlooked. Beyond its immediate impact on political and social structures, the prolonged state of military preparedness has cast a shadow over the health of the population, particularly the younger generation. Hans Selye emphasized several key stress pathogenesis concepts, with particular distinction given to the following three:

- The type of individual (species of animal) experiencing stress does not determine the physiological response to it.
- The general adaptation syndrome encompasses three specific stages representing the defensive reaction when exposed to a recurring stressor.
- The likelihood of developing an adaptation disease increases with the strength and duration of the body's defensive response to stress [1].

The data collected from respondents regarding the emergence of cardiovascular complaints during the martial law suggest a confirmation of the third proposition. This confirmation gradually becomes evident, aligning with Selye's main purpose for this proposition, which is to identify risk factors for stress-related psychosomatic illnesses, particularly cardiovascular diseases [2]. There are the various adverse effects that the martial law has influence on the health of Ukrainians, shedding light on the implications for the well-being of the country's youth. As we navigate through the intricate web of factors influencing health in times of conflict, it becomes imperative to understand the nuanced interplay between the declared the martial law and the overall health landscape, with a specific focus on the well-being of the younger demographic [3].

## AIM

To calculate the average score of situational anxiety level and compare the risk of developing cardiovascular complaints in higher education students from the country in the martial law and the country in peacetime according to the respondents' level of situational anxiety. To analyze the impact of place of residence on the frequency of complaints among students with an elevated level of situational anxiety in both countries.

## MATERIALS AND METHODS

Descriptive and inferential statistics: cluster method, qualitative analysis method; exploratory observational analytical short-term case-control study. Information was collected by distributing surveys with Google Forms online. Online survey distribution was preferred due to the method's accessibility, speed of dissemination and respondent pool expansion. Additionally, we considered ecological considerations to preserve forests and reduce carbon dioxide emissions. The study group consisted of the students who were exposed to the conditions of the martial law for a period of two full years; exposure included stress due to massive missile strikes, attacks by unmanned aerial vehicles, experience of incursions into the territory they lived, forced displacement/residence in an occupied area and so on. In an anonymous online survey, 102 participants from various age groups in Ukraine took part, including 70 female respondents (68.6%) and 32 male respondents (31.4%). The age distribution of respondents included: 17-18 years (2.9%), 19-20 years (18.6%), 21-22 years (27.5%), 23-24 years (24.5%), 25-26 years (14.7%), 27-28 years (4.9%), 29-30 years (3.9%), and over 30 years (3%). The first section of the questionnaire included general questions about the respondents' characteristics and questions from The State-Trait Anxiety Inventory (STAI) [1] questionnaire. The last question in the first section of the survey clarified whether respondents reported cardiovascular system complaints from 24.02.22 until the time of the survey (February, 2024). In case of a positive response, the second section of the questionnaire opened, focusing on detailing the complaints. The control group comprised higher education students from a country where the martial law has not been declared, no armed conflicts were recorded. At the same time 94 students from higher education institutions in Poland participated the survey, comprising 66 female respondents (70.2%) and 28 male respondents (29.8%). The age distribution of respondents included: 17-18 years (4.3%), 19-20 years (17%), 21-22 years (17%), 23-24 years (43.6%), 25-26 years (12.8%), 27-28 years (4.3%), and 29-30 years (1%). The first section of the question-

naire was identical to the first section of the survey for students from Ukraine. The second section of the questionnaire was dedicated to detailing complaints, but it also analyzed domestic factors during peacetime that students associated with the mentioned complaints. This survey format is validated from the previous studies [4,5]. Calculations were conducted using Excel and MedStat software.

## RESULTS

From the entire sample of students from Ukraine, the situational anxiety level indicator for 20 of them remained within the normal range - up to 30 points, for 39 students, the indicator ranged from 30 to 45 points, indicating a moderate increase in situational anxiety. In the majority, 43 individuals had this indicator at 46 points or higher, indicating a significant increase in the level of situational anxiety. The vast majority of the Polish students - 44 people - scored 30 points or less, indicating a situational anxiety level within the normal range; 28 students scored between 30-45 points, and the minority, consisting of 22 students, scored 46 points or more, suggesting a higher level of situational anxiety (Table 1).

Upon detecting the influence of residing in Ukraine on the elevation of the situational anxiety level indicator, it was found that the risk ratio is 0.42 (95% CI 0.27-0.66). In the experimental group, the event occurs more frequently than in the control group (Table 2). In those students who lived in Ukraine during the period of martial law at the time of the study, an elevated level of situational anxiety was more common compared to the control group of students from Poland.

An investigation was carried out to examine the odds of developing cardiovascular complaints in the presence of elevated anxiety, separately for Ukrainian and Polish students. It was found that for Ukrainian students with the elevated level of situational anxiety the odds ratio is 2.29 (95% CI 1.05-5.01). The risk of developing complaints from the cardiovascular system is higher in Ukrainian students whose level of situational anxiety was moderately or significantly elevated than in students who don't have it. Furthermore, for Polish students, the odds ratio is 3.52 (95% CI 1.82-6.81). It means the event occurs more rarely in the group of students without any changes in their anxiety level.

Analysis was conducted to assess the influence of residing in Ukraine on the development of complaints from the cardiovascular system («Pathology») among students who had an elevated level of situational anxiety, compared to students from Poland (Table 3).

**Table 1.** Data on the level of situational anxiety and complaints from the cardiovascular system among students obtained from the survey

The anxiety level indicator	Amount of students	Ukraine (Case)	Amount of students	Poland (Control)
The normal range (up to 30 points)	20	15 did not report complaints	44	36 did not report complaints
		5 reported complaints		8 reported complaints
Moderately elevated (30-45 points inclusive)	39	17 did not report complaints	28	11 did not report complaints
		22 reported complaints		17 reported complaints
Significantly elevated (46 points or more)	43	18 did not report complaints	22	7 did not report complaints
		25 reported complaints		15 reported complaints
Total	102		94	

**Table 2.** Table of calculations on the impact of residing in Ukraine on the elevation of the situational anxiety level indicator (OR=0.42 [95% CI 0.27-0.66])

	Ukrainian students (Case)	Polish students (Control)
The level of situational anxiety within the normal range	20	44
The level of situational anxiety is elevated (moderately + significantly)	82	50

**Table 3.** Comparison of the number of students in two countries who experienced elevated level of situational anxiety

	Ukrainian students	Polish students
Pathology	47	32
Without pathology	35	18
Total	82	50

**Table 4.** Table of comparative risk of pathology amid elevated levels of situational anxiety in Ukrainian and Polish students

The indicator	Ukrainian students (n=102)	Polish students (n=94)	The significance level, p
Risk of pathology	52 (51,0%)	40 (42,6%)	<0,001

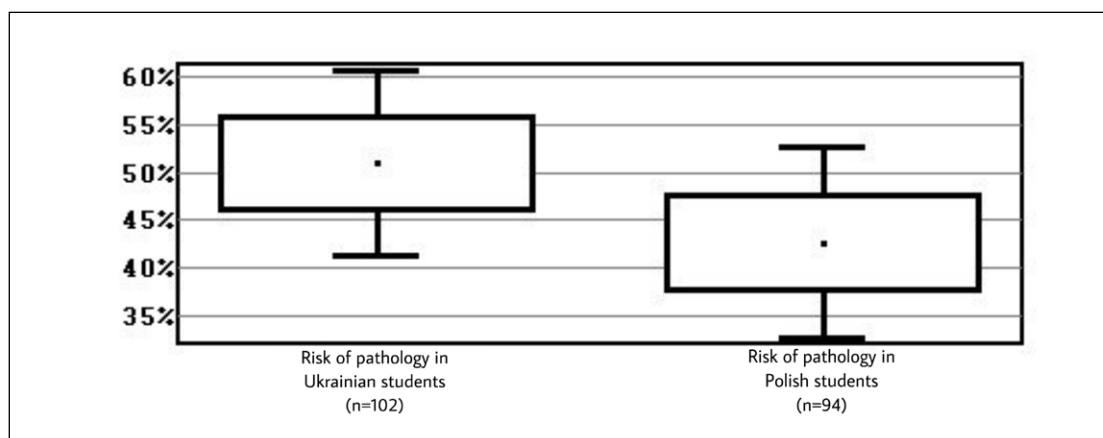
The normality of the distribution was checked using the Shapiro-Wilk test for both indicators. For both, the distribution differs from normal,  $p < 0,05$ . Percentage of «Pathology» ( $D_1$ ) for Ukrainian students (determination of the confidence interval; Fisher's angular transformation method; Sample size:  $N=102$ ) was 51.0% with interval estimate  $41.2\% \leq D_1 \leq 60.7\%$  at a significance level of  $p=0.05$ . Percentage of «Pathology» ( $D_2$ ) for Polish students (determination of the confidence interval; Fisher's angular transformation method; Sample size:  $N=94$ ) was 42.6% with interval estimate  $32.7\% \leq D_2 \leq 52.8\%$  at a significance level of  $p=0.05$  (Table 4, Fig. 1.).

The two groups were compared using the chi-square test with a two-sided critical region. Variables have 2 levels. Chi-square = 0.98, degrees of freedom  $k = 1$ . The difference is not statistically significant at the significance level,  $p = 0.323$ . Therefore, under conditions of elevated levels of situational anxiety, there is a risk of developing cardiovascular complaints for students in higher education institutions, regardless of the country they are in. However, for students in the both countries, the risk of developing cardiovascular complaints in

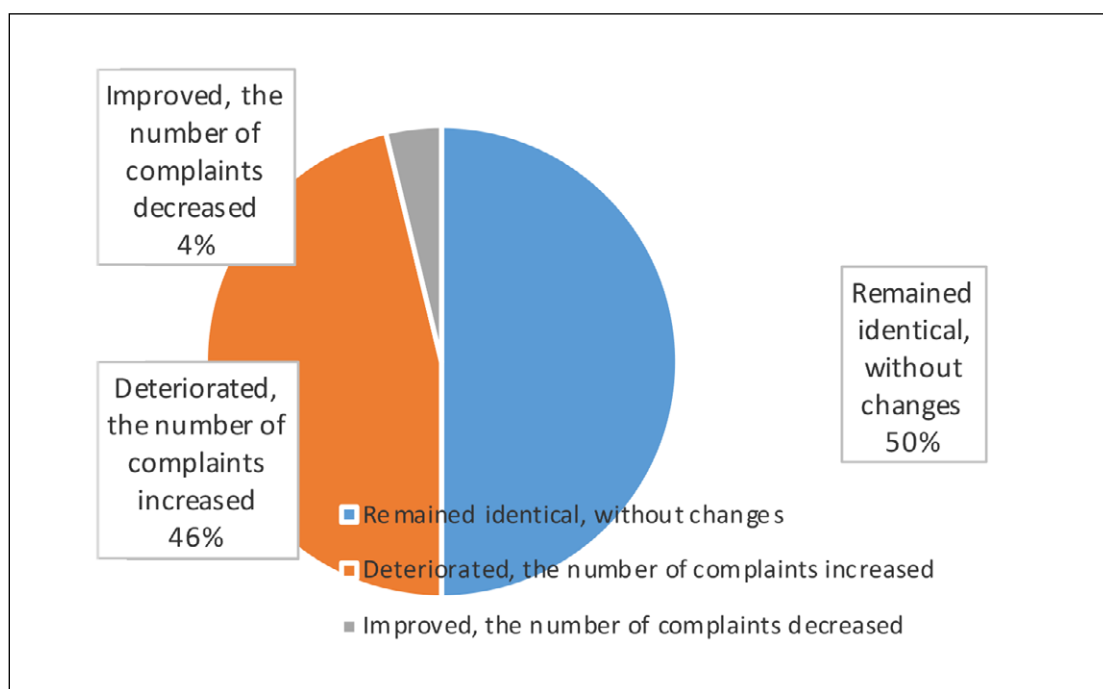
the context of elevated situational anxiety has been confirmed: for Ukraine, the odds ratio is 2.29 (95% CI 1.05-5.01); for Poland, the odds ratio is 3.52 (95% CI 1.82-6.81).

For students from Ukraine, an additional question was separately added: «How has the condition of your cardiovascular system changed based on subjective feelings compared to the previous year?» This question was included because the questionnaire was distributed among students who participated in the survey for our previous research. The responses to this question were as follows: 26 students (50%) chose the answer «Remained identical, without changes»; 24 students (46.2%) selected the answer «Deteriorated, the number of complaints increased»; 2 students (3.8%) chose the answer «Improved, the number of complaints decreased» (Fig. 2.).

Students from Poland were offered options for responses regarding domestic reasons during peacetime, which could be associated with the increase in situational anxiety and corresponding complaints from the cardiovascular system. The reasons were distributed



**Fig. 1.** Comparative risk of pathology amid elevated levels of situational anxiety in Ukrainian and Polish students, standart error and 95% CI.



**Fig. 2.** Subjective Assessment of the Cardiovascular System State among Higher Education Students in Ukraine.

as follows: «Studying or working» - 43 students (78,2% of 55 Polish students with correspondent complaints), «Family relationship» - 17 (30,9%), «International news» - 12 (21,8%) students, «Global ecological conditions» - 3 (5,5%) students, «Inherent anomalies» - 3 (5,5%) students.

## DISCUSSION

The issue of predicting cardiovascular diseases in the context of elevated anxiety levels has been studied for a long time. In 2011 a study focusing on the correlation between the level of C-reactive protein and depression and anxiety in patients with ischemic heart disease was published [4]. This research demonstrated a connection between depression, anxiety, and an

increase in the level of C-reactive protein - a marker of systemic inflammation, which has been consistently shown to predict the risk of ischemic heart disease: «The research was performed in 80 patients (n = 80), mean age 60 ± 15 years. These patients have no high cholesterol level, high body mass index and n = 64 (80%) of them are no smoker. To evaluate depression we used Beck depression scale. Anxiety was assessed by the Spilberger State-trait anxiety scale. CRP was measured in venous blood. Results show that increased level of C-reactive protein was found in aorto-coronary bypass graft surgery group n = 28 (70%), in angioplasty group C-reactive protein n = 12 (30%);  $\chi^2 = 6.40$  p = 0.012. In angioplasty group patients who had increased level of CRP had high degree of depression p = 0.001. In these group was revealed high degree of trait anxiety

$p < 0.001$  too. In aorto-coronary bypass surgery group elevated level of CRP was associated with high degree of depression  $p = 0.001$  [4].

The topic of the emergence of complaints from the cardiovascular system among students in the context of a state of war in the country has been studied since the beginning of the full-scale invasion. The results of this research confirm the hypotheses formed during previous studies[5, 6]. The first survey was conducted among students of higher education institutions from all regions of Ukraine and included 411 individuals in the sample[4]. About 296 individuals (72%) of the 411 respondents reported manifestations of complaints from the cardiovascular system after February 24, 2022 (September 16, 2022). At that time, respondents most often associated the appearance of complaints from the cardiovascular system with emotional exhaustion (243 individuals or 79.7%), news (210 individuals or 68.9%), lack of sleep and sleep disturbances (201 individuals or 65.9%), sounds of explosions/air defense operations (189 individuals or 62%), as well as the sound of air raid sirens (165 individuals or 54.1%). In 2022, another study was conducted on students from Ukraine. At that time, 123 students from higher education institutions were surveyed, resulting in the hypothesis that there is an increased risk of complaints from the cardiovascular system among students during a state of war due to the factor of increased anxiety. In the surveyed individuals, the odds ratio was 5.08 (95% CI 2.39–7.76)[5]. The most common complaints reported by students then included episodes of tachycardia, pronounced sensation of palpitations, dizziness, pain in the chest area, shortness of breath during physical exertion. About 87% of the surveyed students who reported the appearance of complaints from the cardiovascular system or exacerbation of pre-existing

ones associated them with the wartime situation in the country. In our current study, the hypothesis formed in previous works has been confirmed. Data collection took place during the second half of February, a period when some students in Poland were undergoing exam sessions, including LEK exam. The obtained data on anxiety levels among students from Warsaw and Olsztyn are likely associated with this, as one of the leading causes of anxiety chosen by students was «Studying or working.» However, overall indicators were less pronounced when compared to students who assessed their stress from the perspective of living in the martial law. Consequently, we also obtained data indicating that under any external conditions, if the anxiety level is elevated, there is a risk of developing complaints from the cardiovascular system in students. At the same time, the level of situational anxiety is higher among students from Ukraine, so we can assume that for them, these risks may be somewhat higher. Anxiety holds direct relevance for uncovering mechanisms of cardiopathogenesis, developing novel therapeutic strategies, and initiating clinical interventions in the population at risk of developing heart disease [7]. The topic of this work requires further development and analysis.

## CONCLUSIONS

The average score of situational anxiety level was found to be higher among students from a country where the martial law has been implemented. The presence of the martial law in the country was identified as a factor associated with an increased risk of complaints from the cardiovascular system among students. The risk of developing cardiovascular complaints in the context of elevated situational anxiety is confirmed.

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### CONFLICT OF INTEREST













The Authors declare no conflict of interest

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