

ASSESSMENT OF SLEEP QUALITY IN UKRAINIANS DURING THE MARTIAL LAW AND THE RISK OF CARDIOVASCULAR COMPLAINTS DEVELOPMENT IN THE CONTEXT OF CLINICALLY SEVERE INSOMNIA

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Summary

The aim: To study the problem of insomnia in Ukrainians during the first 11 months of the martial law in the country. To determine the predominant type of insomnia in the population. To calculate and assess the risk indicator for the development of cardiovascular complaints in the context of deteriorating sleep quality during the martial law and the risk ratio.

Materials and methods: Anamnestic, statistical and calculative methods were used. 321 participants from Ukrainian population took part in an anonymous online survey. 210 respondents were female (65.4 %) and 111 were male (34.6 %). The age distribution was as follows: 18-19 years old (23.1 %), 20-21 years old (14 %), 22-23 years old (28.7 %), 24-25 years old (8.1 %), 26-27 years old (6.2 %), 28-29 years old (6.2 %), 30 years and older (13.7 %). The questionnaire included several sections: general questions regarding the respondents' characteristics and presence of sleep disorders; questions of the Pittsburgh Sleep Quality Index (PSQI) [2]; subjective assessment of the sleep quality of the respondents during the first 11 months of the martial law and the presence of cardiovascular complaints that appeared or intensified during this period; details of mentioned complaints.

Results: 245 respondents (76.3 % of 321) of the entire sample reported about sleep disturbances that developed after February 24, 2022. According to the PSQI, only 17 respondents (7 %) scored 0-7 points, indicating the absence of insomnia, 180 respondents (73 %) scored 8-14 points, suggesting subclinical insomnia, 48 respondents (20 %) scored 15-21 points, indicating clinically significant insomnia. 209 (85.3 %) attributed these changes to the wartime events in the country. The most significant deterioration in sleep quality during the first 11 months of martial law in the country was observed in March 2022 and the best level of sleep quality was indicated in July. The odds ratio in risk calculation was 3.01; the significance level of the obtained data is 0.006.

Conclusions: Subclinical insomnia dominates among Ukrainians during the martial law in the country. There is an increased risk of cardiovascular complaints in the population of Ukraine in the presence of clinically significant sleep disorders related to the martial law. Prolonged exposure to stress for Ukrainians can result in deteriorating sleep quality and increasing in cardiovascular complaints.

Key words: armed conflict, cardiovascular diseases, sleep disorders

INTRODUCTION

February 24, 2022, has been etched in world history as the day from which the population of Ukraine has been enduring prolonged stress condition. Epidemiological studies show that sleep disturbances, especially insomnia, affect approximately 50 % of individuals with anxiety, and that insufficient sleep can trigger or further exacerbate it [3]. The loss of restful sleep leads to a deterioration in health in

general [1]. One of the manifestations of such deterioration is the onset of sleep disorders, insomnia, and development of complaints related to organ systems, including the cardiovascular one [9].

THE AIM OF THE ARTICLE

To study the problem of insomnia in Ukrainians during the first 11 months of the martial law in the

country. To determine the predominant type of insomnia in the population. To analyze the factors influencing the development of insomnia in the population. To calculate and assess the risk indicator for the development of cardiovascular complaints in the context of deteriorating sleep quality during the martial law and the risk ratio.

MATERIALS AND METHODS

Anamnestic, statistical and calculative methods were used in this longitudinal retrospective study. The inclusion criteria for the study group from all of the respondents who participated in the survey were continuous presence in Ukraine from February 24, 2022 until the time of the survey and the presence of periodic complaints about their own sleep that respondents attributed to the martial law. The questionnaire was distributed in regions that were not occupied during December 2022.

321 participants from Ukrainian population took part in an anonymous online survey. 210 respondents were female (65.4 %) and 111 were male (34.6 %). The age distribution was as follows: 18-19 years old (23.1 %), 20-21 years old (14 %), 22-23 years old (28.7 %), 24-25 years old (8.1 %), 26-27 years old (6.2 %), 28-29 years old (6.2 %), 30 years and older (13.7 %). The first section of the survey included general questions about the respondents' characteristics (gender, age, permanent presence in Ukraine since the onset of the martial law in the country), as well as questions about the presence

of sleep disorders that appeared after February 24, 2022. If there was a positive answer to the last question, respondents were directed to the second section of the survey, which allowed them to assess the extent of sleep disorders according to the PSQI. The survey was conducted in Ukrainian among the civilian population, simultaneously with a subjective assessment of sleeping based on the condition of respondents during the previous 11 months. All respondents were located in the non-occupied part of Ukraine at the time of the survey. The Ukrainian-language version of this questionnaire was previously tested in earlier studies [1]. The last section was dedicated to detailing the cardiovascular complaints that developed in connection with the deterioration of sleep quality due to the martial law in Ukraine. Respondents indicated their consent to the processing of the collected data and the conduct of the research before participating in the survey.

RESULTS

245 respondents (76.3 % of 321) of the entire sample reported about sleep disturbances that developed after February 24, 2022. According to the PSQI, only 17 respondents (7 %) scored 0-7 points, indicating the absence of insomnia, 180 respondents (73 %) scored 8-14 points, suggesting subclinical insomnia, 48 respondents (20 %) scored 15-21 points, indicating clinically significant insomnia (Figure 1).

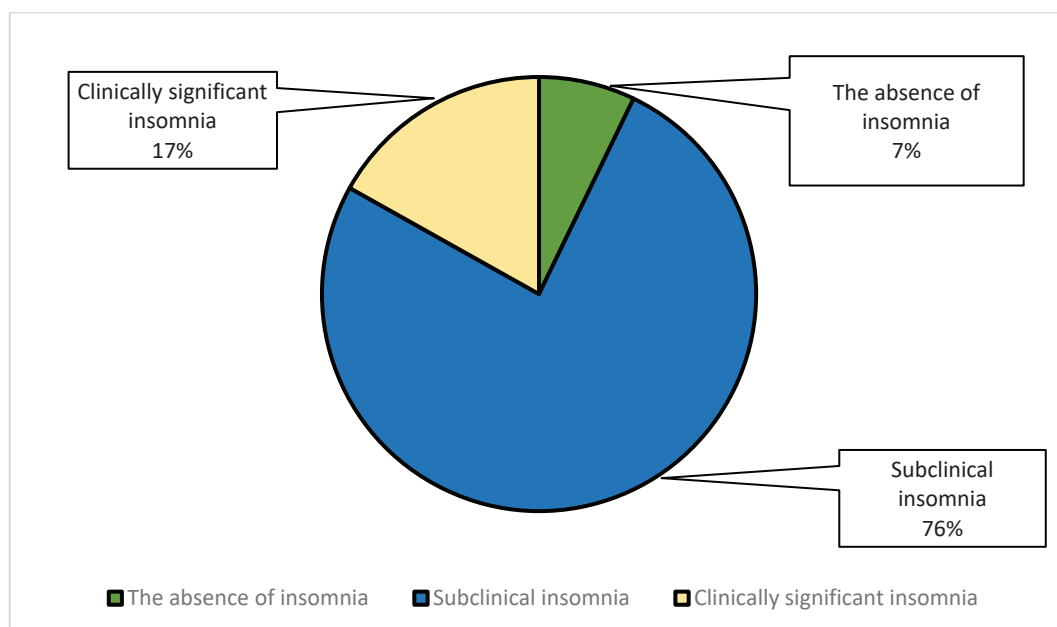


Fig. 1. Percentage of respondents who reported the onset of sleep disorders after 24.02.22

According to the obtained data, 209 respondents (85.3 %) associate these changes in their own sleep with the wartime events in the country, 149 respondents (71.2 % of 209) also link the deterioration of sleep quality to damage

of Ukrainian energy infrastructure. The most significant deterioration in sleep quality during the first 11 months of martial law in the country was observed in March 2022 and the best level of sleep quality was indicated in July (Figure 2).

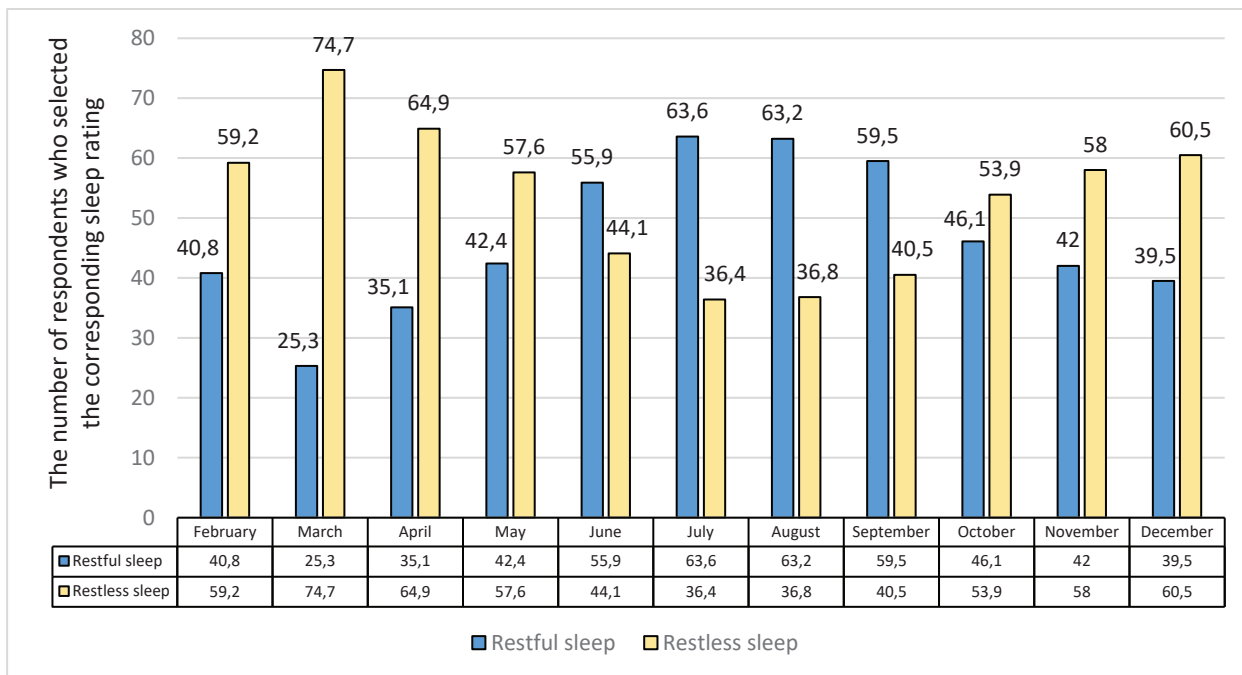


Fig. 2. Subjective assessment of the quality of sleep by respondents during the first 11 months of the martial law in Ukraine, %

According to the previously obtained data, two groups of respondents were formed. Respondents who have clinically significant insomnia belonged to the first group and respondents without clinical manifestations, only with predispositions to the development of insomnia – its subclinical variant, belonged to the second one. Both individuals that reported complaints related to the cardiovascular system in the context of the state of war and ones who were not included in each group.

The odds ratio was used for calculating the risk of developing the mentioned complaints. (Table 1). Mentioned ratio calculated from the contingency table was 3.01. The odds ratio exceeds 1.0, this indicates an increased risk of experiencing the mentioned complaints under the influence

of the factor of clinically significant sleep disturbance in the exposed individuals. During the calculation of the risk ratio, in the two-tailed critical region, the risks of developing cardiovascular complaints due to the deterioration of sleep quality during the state of war significantly differ between the groups, the significance level of the obtained data (p) is 0.006. The standard error (m) = 2.52 with a significance level of p = 0.05. The calculation was performed using the MedStat software. The value of p is less than 0.01, therefore, according to the traditional interpretation of significance levels with p = 0.05, there is high significance indicating a deviation from the statistical hypothesis. Thus, the possible statistical contribution: the differences identified are at a high level of statistical significance.

Table 1

Contingency table for calculating the odds ratio, respondents (M±2.52)

Clinically significant insomnia	Cardiovascular complaints		Total
	Present	Absent	
Present	40	8	48
Absent	123	74	197
Total	163	82	245

According to the survey data, the most common complaints were: palpitation (75.5 %), episodes of tachycardia (66.9 %), a sensation of coldness in the extremities due to stressful situations (63.2 %), dizziness (52.8 %), a feeling of tightness and pain in the chest (49.7 %), shortness of breath during physical exertion (46 %), episodes of elevated blood pressure above normal levels (35 %), as well as episodes of decreased blood pressure below normal values (29.4 %).

DISCUSSION

During the first four months for which data were obtained, there is a significant prevalence of restless sleep, which is possible associated with the russian invasion activity in Ukraine and its scale in the early spring. In March 2022, the enemy had captured significant territories, accompanied by numerous human rights violations: according to the Office of the General Prosecutor of Ukraine, as of March 14th, 2023, there have been 71147

war crimes registered in Ukraine, committed by russians over the course of a year since the beginning of the full-scale invasion [10]. The deterioration in the sleep quality of the respondents also became more noticeable during October, November and December. The provided results coincide in time with the attacks by the russian armed forces on Ukraine's energy infrastructure at that time. According to the «Materials of the XXXI International Scientific and Practical Conference» (April 7th, 2023, Rome, Italy, held remotely), the Independent International Commission of the UN on the investigation of violations in Ukraine determined that serial attacks by the russian armed forces on Ukraine's energy infrastructure from October 10, 2022 and using of torture by the russian government may be considered crimes against humanity [10].

The events that took place on the country's territory during this time caused stress in the entire population of the country. According to Hans Selye's theory, stress is a nonspecific response of the body to increased demands placed upon it. On the other hand, Richard Lazarus studied stress from the perspective of physiological, psychological and behavioral levels and concluded that physiological stress is the immediate response of the body accompanied by «marked physiological disturbances, in reaction to various physical and chemical agents» [6].

Success on the front and on the international political stage may have provided grounds for an improvement in sleep quality when the Armed Forces of Ukraine began actively using Western-supplied weaponry, including HIMARS rocket artillery systems, which arrived from the United States in June 2022 [11]. The advantage of the Ukrainian army on many fronts significantly reduced the ambitions of the russian federation in Ukraine [5]. At that time, the beginning of a mass transfer of occupying forces to the right bank of Kherson region was recorded, indicating the retreat of the invaders from the territory that had been under occupation since the first days of the martial law [13]. The signing of the «grain» agreements in Istanbul on July 22, mediated by Turkey and the United Nations, also became a favorable event in terms of prognosis. These agreements provided guarantees for the safe export of grain from Ukrainian seaports [7].

Among the leading concepts of stress pathogenesis highlighted by Hans Selye, the following three are distinguished:

1. The physiological response to stress is not dependent on the type of individual (species of animal) experiencing it.
2. The defensive reaction when exposed to a recurring stressor goes through three specific stages, all together representing the general adaptation syndrome.
3. The stronger and more prolonged the defensive response of the body to stress, the more likely the development of the adaptation disease [6].

In the context of the data obtained from the respondents regarding the emergence of cardiovascular complaints against the backdrop of deteriorating sleep quality during the martial law it can be assumed that there is confirmation of the third proposition, which is gradually becoming evident. The main purpose of this proposition according to Selye is to identify the risk factors for stress-related psychosomatic illnesses, primarily cardiovascular diseases [6].

According to physiology, initially, there is the release of adrenaline, which enters the posterior nuclei of the hypothalamus and triggers a state of excitement in cells sensitive to it. Through neural and chemical pathways, this impulse reaches cells that produce releasing factors, resulting in the creation of corticotropin-releasing factor in the hypothalamus. This factor stimulates the anterior lobe of the pituitary gland to synthesize adrenocorticotrophic hormone, which, in turn, stimulates the adrenal cortex to produce and secrete glucocorticoids. Military events in Ukraine has an unpredictable trajectory for the civilian population with attacks aimed at various locations across the country and using of different quantities and types of weaponry, the state of stress persists constantly. The pathogenicity of stress, induced by the stimulation of the hypothalamus, is heightened when stress is accompanied by prolonged anxiety. Additional experimental factors that exacerbate stress include «the introduction of signals that predict an impending painful blow and the administration of blows at random, not too short intervals of time» [8]. Simple civilian population is unable to prepare themselves mentally for the future quantity of rockets or a series of explosions during air defense operations, therefore, each time it represents a kind of «unpredictable shock». At the same time, cortisol exhibits physiological diurnal fluctuations in secretion intensity: a decrease precedes the time before falling asleep and an increase occurs before waking up. From a physiological perspective, excessive nervous excitation, which goes through the reticular activating system to the limbic area and neocortex, leads to disorganize and dysfunctional nervous impulses, manifesting as symptoms of sleep disturbances and unwarranted anxiety [12]. One of the factors that can cause cardiovascular disorders is sleep disturbances, as disruptions in circadian rhythms can lead to an imbalance in the autonomic and hormonal regulation of the body's functions [4]. The issue requires further study for a better understanding of the potential future health status of Ukrainians living in conditions of the martial law and the development of prevention strategies to prevent its occurrence and progression.

CONCLUSIONS

1. The assessment of sleep quality in Ukrainians using the PSQI revealed that subclinical insomnia predominates among the population of Ukraine, which developed during the martial law.

2. There is an elevated risk of developing cardiovascular complaints in the population of Ukraine in the presence of clinically significant sleep disorders associated with the martial law.

3. The most common complaints include palpitation, episodes of tachycardia, feeling of cold in the extremities due to stressful situations, dizziness, a feeling of tightness and pain in the chest, shortness of breath during physical exertion, episodes of elevated blood pressure above normal levels, as well as episodes of blood pressure dropping below normal values.

4. Prolonged exposure to stress among Ukrainians may lead to deteriorations in sleep quality and increasing in cardiovascular complaints. Further research is

necessary to develop preventive measures addressing this issue.

FUNDING AND CONFLICT OF INTEREST

Conflict of interest is absent. The article is self-funded.

AUTHORS' CONTRIBUTIONS TO THE PREPARATION OF THE ARTICLE

Yaroslava V. Korost – conceptualization, methodology, data curation.

Anastasiia K. Shkvarok – software, formal analysis, resources.

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Резюме

ОЦІНКА ЯКОСТІ СНУ НАСЕЛЕННЯ УКРАЇНИ ПІД ЧАС ВОЄННОГО СТАНУ ТА РИЗИКУ РОЗВИТКУ СКАРГ З БОКУ СЕРЦЕВО-СУДИННОЇ СИСТЕМИ НА ФОНІ КЛІНІЧНО ВИРАЖЕНОГО БЕЗСОННЯ

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Мета: Дослідити проблему безсоння серед населення України протягом перших 11 місяців воєнного стану у країні. Встановити тип безсоння, який домінує серед населення. Розрахувати та оцінити показник ризику розвитку скарг з боку серцево-судинної системи на фоні погіршення якості сну під час воєнного стану, показник відношення ризиків.

Матеріали та методи: анамнестичний, статистичний, розрахунковий.

В анонімному онлайн-опитуванні взяв участь 321 представник населення України, з яких 210 респондентів – жіночої статі (65,4 %) та 111 – чоловічої (34,6 %), віком: 18-19 років (23,1 %), 20-21 рік (14 %), 22-23 роки (28,7 %), 24-25 років (8,1 %), 26-27 років (6,2 %), 28-29 років (6,2 %), 30 та більше років (13,7 %). Анкета складалась з кількох розділів, які по чергово включали у себе: загальні питання щодо характеристик респондентів, а також питання стосовно наявності розладів сну; Пітсбурзький опитувальник якості сну [2]; суб'єктивну оцінку якості сну респондентів за перші 11 місяців воєнного стану та наявність скарг з боку серцево-судинної системи, що з'явилися чи посилилися на фоні цього; деталізацію скарг з боку серцево-судинної системи.

Результати: З усієї вибірки відмітили у себе появу розладів сну 245 респондентів (76,3 % генеральної сукупності з 321 людини) після 24.02.22. За Пітсбурзьким опитувальником якості сну 17 (7 %) респондентів отримали 0-7 балів, що відповідає відсутності безсоння, 180 (73 %) респондентів – 8-14 балів, субклінічне безсоння, 48 (20 %) респондентів – 15-21 бал, клінічно виражене безсоння. 209 (85,3 %) респондентів пов'язують дані зміни з боку власного сну з воєнними подіями у країні. Найбільш виражене погіршення якості сну за суб'єктивною оцінкою респондентів спостерігалось у березні 2022 року, а найкращий рівень якості сну за воєнного стану в країні зафіксовано у липні. Показник відношення шансів при розрахунку ризику становив 3,01, рівень значущості отриманих даних становить 0,006.

Висновки: Серед населення України домінує наявність субклінічного безсоння, яке розвилось під час воєнного стану. Наявний підвищений ризик розвитку скарг з боку серцево-судинної системи серед населення України на фоні присутніх клінічно виражених розладів сну, пов'язаних з воєнним станом. Тривале перебування у стані стресу для українців може бути причиною погіршення якості сну та скарг з боку серцево-судинної системи.

Ключові слова: збройний конфлікт, серцево-судинні захворювання, розлади сну