ASSESSMENT OF ANXIETY, DEPRESSION, STRESS AND VITAMIN D LEVELS IN WOMEN IN WARFARE

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INTRODUCTION

Because of the war, women in the country face serious risks, increased burdens of caring for children, enormous stress and difficulties associated with living in war zones [1, 2]. It is women who are constantly on the front lines of conflict – as soldiers and combatants, doctors and nurses, volunteers, peace fighters, caregivers of their communities and families, internally displaced persons, refugees and very often as victims and survivors.

Ukraine faced a new reality – military actions in which women are involved. In accordance with the Law of Ukraine No. 2232-XII of 25.03.1992 "On Military Duty and Military Service", the following paragraph was added on August 9, 2019: "Women perform military duty on an equal basis with men (except for cases provided for by law on the protection of motherhood and childhood, as well as the prohibition of discrimination based on gender), which includes voluntary acceptance (under a contract) and conscription for military service, military service, being in the military reserve, performing military duty in the reserve and observing rules of military accounting". It is this law that gives women the opportunity to hold the position of an officer, receive an appropriate salary and the status of a combat veteran on a par with men [1, 3, 4].

As of March 1, 2023, 60,538 women were employed in the Armed Forces of Ukraine (AFU) [3]. Since this is a new experience for our country, and the number of women in the military is increasing every year, we decided to investigate the changes in the female body associated with the chosen new profession [1].

In addition, a large number of women who are not military personnel are also involved in the military conflict – they are employees of the police, border guards, rescue teams, volunteers, people related to military supply and military production, etc.

However, social factors also become important and influence a woman's health [5]. Among them, special attention should be paid to stress, the mechanisms of which significantly affect the processes of menstrual function and lead to its disorders [6, 7]. According to the results of previous studies, almost every third woman in the ranks of the Armed Forces notes signs of chronic stress.

As a result of research conducted by Ukrainian specialists, it was found that female military personnel are more sensitive to factors of combat stress and are more likely to develop post-traumatic stress disorder and depression than men [8].

Stress is divided by duration into acute and chronic, and by the object of influence it can be physiological and psychological (emotional) [9]. It is believed that psychological stress arises as a result of disorders of the psychological stability of the individual as a result of various factors and may be the result of psychological overload (danger to life, significant volume of work, increased responsibility, long-term work). The concept of professional stress is distinguished, which reflects the emotional state of a person in the conditions of a stressful situation at work, conflicts, mental overload and can lead to the syndrome of emotional burnout. The role of stress in the genesis of various somatic pathologies has been proven [10, 11].

Female military personnel experience two types of stress due to reasons - military and military. Military is connected with the completion of service, with the performance of professional duties [11, 12]. Military, or "combat", caused directly by war events, is considered more severe and traumatic. In the zone of armed conflict, the devastating consequences for women's health, in addition to immediate danger to life, are: psychophysical stress with restriction of sleep and food, difficult living conditions, hypothermia, noise, vibration, radiation, chemical and physical pollution after bombings and destruction, complicated access to consultations and gynecological care, as well as to medicines, etc. [13].

Women are more sensitive to stress [14]. They may potentially have higher levels of depression and anxiety, as well as symptoms of post-traumatic stress disorder. Men have an open reaction to an acute stressful situation, and women are more prone to manifestations of psychosomatic reactions, which are often associated with reproductive health [15].

The obtained preliminary data on gender-specific features of the response to stress indicate the need for interdisciplinary approaches to the diagnosis and correction of reproductive and mental health disorders of women who are in or have returned from the combat zone, as well as other representatives of the female population involved in the military conflict [9].

Recently, the study of the role of vitamin D in the development of gynecological pathology has become important [16, 17]. It has been established that vitamin D is involved in the proliferation and differentiation of cells of many organs and tissues, in the process of modulating the immune response, functional activity of the cardiovascular system, gastrointestinal tract, and muscle tissue cells [18, 19, 20]. In addition, vitamin D supports the functioning of the nervous system. Its deficiency causes memory problems and concentration of attention, as well as mental disorders such as depression and anxiety [21].

On the other hand, today there is enough evidence that a violation of D-vitamin status in a woman's body leads to changes in menstrual, reproductive and psychosomatic functions in the body and the occurrence of various pathological changes in their regulation [22, 23, 24]. Therefore, determining the level of 25-hydroxycholecalciferol (25(OH)D) in the blood plasma for the timely detection and correction of hypovitaminosis in women is of particular importance in view of the prevention and prevention of reproductive health disorders in women [21, 25, 26].

Objective of the study: to evaluate the levels of vitamin D (25(OH)D) in the blood serum of military women and women involved in a military conflict, as well as to identify the relationship of its indicators with the level of anxiety, depression and stress.

MATERIALS AND METHODS

52 women serving in the AFU and other categories of women involved in the military conflict were surveyed. They entered the main group. The comparison group included 50 women not related to military events.

The concentration of vitamin D (25(OH)D) in blood serum was determined in all women by enzyme immunoassay using the ELISA kit for the determination of 25-hydroxyvitamin D by DBC-Diagnostics Biochem Canada Inc. The assessment of the vitamin level was carried out according to the recommendations developed for the population of Central European countries: vitamin D deficiency was determined at a level of less than 20 ng/ml, suboptimal (insufficient) status – within 21-29 ng/ml, optimal (sufficient level) – 30–50 ng/ml.

The stress level was studied using the Depression Anxiety and Stress Scale (DASS-21). The questionnaire includes 21 questions and is a Ukrainian modification of the large-format DASS questionnaire, which contains 42 questions. Each question of the questionnaire can be scored from 0 (not applicable to me at all, not at all) to 3 (is typical for me). After calculating the sum of points on various scales that assess depression, anxiety and stress separately, they are compared with the standards, which allows assessing the level of indicators (Table 1).

The depression scale of the DASS-21 test analyses:
- self-loathing;
- depression, gloom;
- the belief that life has no meaning or value;
- a pessimistic view of the future;
- Inability to experience pleasure or satisfaction;
- the inability to be interested in or involved in something;
- lack of initiative, slowness.

The anxiety scale of the DASS-21 test includes questions aimed at identifying such manifestations as:
- anxiety, panic;
- trembling;
- dry mouth, difficulty breathing, palpitations, sweating of the palms;
- anxiety about the possibility of losing control and productivity.

The stress scale of the DASS-21 test assesses:
- overexcitement, tension;
- inability to relax;
- resentfulness, easy upset;
- irritability;
- fearfulness;
- nervousness, capriciousness;
- intolerance of delay or interruption.

The obtained data were statistically processed by the methods of variation statistics and rank correlation using the standard Microsoft Office Excel application package. The probability of differences in parametric indicators was assessed using Student's t-test and Pearson's correlation coefficient. For all types of analysis, the value of $p < 0.05$ was considered statistically significant.

The study was approved by the Ethics commission of the SI «O.M. Lukyanova IPOG of the NAMS of Ukraine» at meeting No. 3 dated 05/26/2022. All patients gave informed consent for the study.

RESULTS

Analysis of the vitamin D status in the main group, showed that the majority of women (76.5%) were diagnosed with hypovitaminosis conditions, which significantly exceeded the specific gravity of such patients in the comparison group – 46.0% ($p < 0.05$). A more thorough analysis showed that the main group was more likely to be diagnosed with vitamin D insufficiency – in 61.54% of cases compared to civilian women – in 40% of cases ($p < 0.05$), and its deficiency – twice as often – in 15.38% of the examined compared to 6% of women in the general population (Fig. 1). And only 12 (23.08%) women asso-

Table 1. Standards of the DASS-21 test for determining levels of depression, anxiety and stress, points

Level of the indicator	Depression	Alert	Stress
Normal	0–4	0–3	0–7
Lightweight	5–6	4–5	8–9
Moderate	7–10	6–7	10–12
Heavy	11–13	8–9	13–16
Very heavy	> 14	> 10	> 17

ciated with war events had a normal level of vitamin D, which was twice as low as the specific gravity of such patients in the comparison group – 54% ($p < 0.05$).

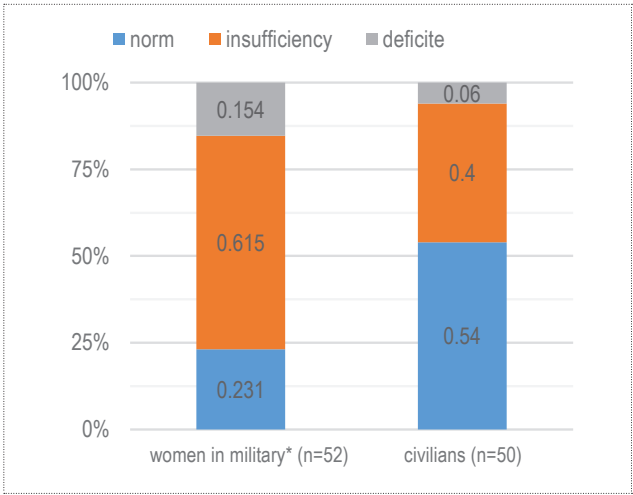

Figure 1. Frequency of D-hypovitaminosis in women of the study groups, %
* difference in the group of military women is significant compared to the indicator in the group of non-military women ($p < 0.05$).

Average vitamin D levels were significantly lower in the study group than in the comparison group (Table 2).

Table 2. Mean concentration of 25(OH)D in the blood serum of the examined women (M ± m)

Indicator	Women serving in the AFU and involved in the military conflict (n = 52)	Civilian women (n = 50)
25(OH)D, ng/ml	21.91 ± 2.14*	32.74 ± 3.53

* difference is significant in relation to civilian women ($p < 0.05$)

Consequently, women in the military and other categories of women involved in military conflict have lower vitamin D concentrations than civilian women, which may be exacerbated by depression, stress and anxiety.

The observed differences in the results of the DASS-21 test are probably related to working conditions and stress, in particular, the manifestations of depression, anxiety and stress are more pronounced (manifest) in women serving in the AFU.

Thus, in the group of military women, the mean values of the DASS-21 depression scale (n = 52) were 5.74 ± 0.26 points, while in civilian women – 4.57 ± 0.31 points ($p < 0.05$), and the stress scale – 8.22 ± 0.24 points and 6.67 ± 0.28 points, respectively ($p < 0.05$); while anxiety levels, on the contrary, were more pronounced in civilian women. This is indicated by a higher average level of anxiety – 5.81 ± 0.24 points compared to the group of patients involved in military conflict ($p < 0.001$).

The percentage of people with depression, anxiety and stress among military women is significantly higher than among non-military women.

According to the DASS-21 questionnaire, the depressive component was present in the majority of women in both groups with no significant difference, and only 11 (21.16%) military women and 11 (26%) civilian women had no signs of depression (Fig. 2). At the same time, the analysis of the severity of these disorders showed a significantly higher degree in the main group: the proportion of patients with severe and moderate depression – 23 (44.23%) significantly exceeded the percentage of such women in the comparison group – 12 (24.0%) ($p < 0.05$). Very severe depression was detected in 3 (5.76%) female defenders and was not observed in civilian women. The mean value of the DASS-21 depression scale in civilian women was 4.57 ± 0.31 points, while in women in the military and those involved in military conflict it was significantly higher – 6.44 ± 0.47 points, $p < 0.05$). The data obtained indicate a greater severity of depressive mood of the DASS-21 scale in women involved in military conflict.

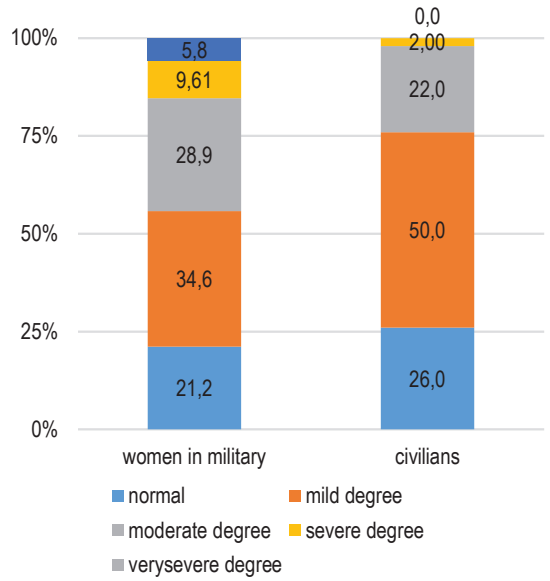

Figure 2. Severity of signs of depression in the surveyed women, %

Signs of anxiety, on the contrary, were more common in civilian women (84.0%) than in women involved in military conflict (61.54%) ($p < 0.05$). However, the proportion of patients with different levels of this disorder almost did not differ between the groups (Fig. 3). Moderate anxiety was noted in 10 (19.24%) women serving and involved in military conflict and 12 (24%) civilian women, severe anxiety – in 4 (7.69%) and 5 (10%), respectively, and very severe anxiety – in 1 (1.92%) and 2 (4%), respectively. The average values of the anxiety scale even tended to be higher in civilians (5.81 ± 0.74 points) than in those involved in the military conflict (4.40 ± 0.65 points), with no significant difference.

The stress scale scores were positive for the majority of women surveyed, with a higher severity among women serving in the Armed Forces and otherwise involved in the military conflict (Fig. 4). Only 5 (9.62%) female defenders and 15 (30%) civilians did not show signs of stress. At the same time, the severity of stress in the main group was significantly higher: severe stress was detected in 17 (32.7%) women of the main group only in 6 (12%) civilians ($p < 0.05$), and very severe stress was noted in 4 (7.69%) female defenders and not in any non-military women. At the same time, in the comparison group, a mild degree of stress disorders was detected more often (in 21 patients –

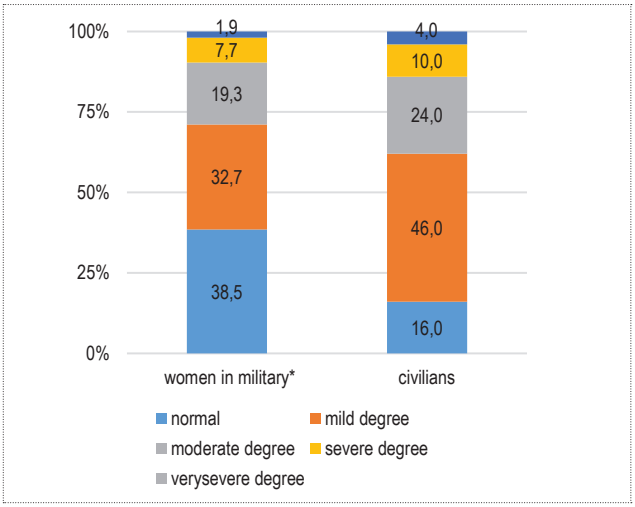

Figure 3. Severity of anxiety symptoms in the surveyed women, %
* difference in the group of military women is significant compared to the indicator in the group of non-military women ($p < 0.05$).

42.0%), which exceeded the corresponding data in the main group (14 patients – 26.91%). The higher severity of stress in women of the main group is also indicated by the higher mean scores of the DASS-21 scale – 10.22 ± 0.54 points, which significantly exceeded this indicator in the comparison group – 6.67 ± 0.71 points($p < 0.05$).

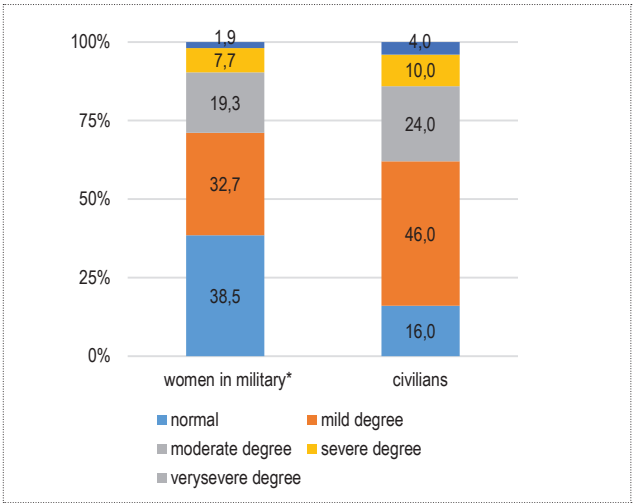

Figure 4. Severity of stress signs in the surveyed women, %

A more pronounced deficiency of vitamin D was found in women of the main group, while a tendency to increase the specific weight of hypovitaminosis D in women with chronic stress was established. Thus, the analysis of average data on the concentration of 25(OH)D depending on the psycho-emotional state showed that patients with disorders of psycho-emotional stability according to the DASS-21 questionnaire in both groups had a more pronounced vitamin D deficiency than women with a normal psycho-emotional state (Table 3). At the same time, the lowest average concentrations of 25(OH)D were observed in the women of the main group with pronounced deviations of the psycho-emotional state (moderate and severe degrees of disturbance according to the DASS-21 scale).

Consequently, in female military personnel, a decrease in the concentration of vitamin D compared to civilian women is noted, which deepens against the background of depression, stress and anxiety. Only 9 military women had normal levels of vitamin D, and 43 showed a decrease in the concentration of this vitamin against the background of increased at least one of the indicators of the DASS scale, or two or more.

DISCUSSION

The conducted study showed that women who serve in the Armed Forces and are otherwise involved in military conflict are more likely to have vitamin D deficiency conditions. This may be related to the type of the chosen profession, service conditions and psycho-emotional stress.

Using the DASS-21 questionnaire, it was found that women who serve in the AFU and take part in a military conflict are more prone to depression and stress compared to civilian women. At the same time, civilian women, unlike military women, have more signs of anxiety.

Drawing parallels between the concentrations of vitamin D in blood serum and the DASS-21 questionnaire indicators made it possible to reveal the dependence between these categories: the greater the vitamin D deficiency, the more pronounced the symptoms of anxiety, stress and depression. The most significant decrease in the concentration of vitamin D was found in military women against the background of high stress. However, the cause-and-effect relationship has not been definitively clarified and may be two-way: psycho-emotional stress may contribute to increased utilization and disruption of vitamin D synthesis, while at the same time, hypovitaminosis D may result in greater susceptibility to depressive states and lower stress resistance.

Therefore, in view of the obtained data, it can be assumed that periodic examination of military women and other categories of women who are involved in military events, with the determination of the concentration of vitamin D in the blood serum and the addition of preventive doses of vitamin D to the diet can be useful in view of not only the preservation general

Table 3. Average concentration of 25 (OH)D against the background of chronic stress in the examined women (M ± m)

Women in military (n = 52)		Civilian women (n = 50)	
With normal DASS scores and mild disorders	Wwith elevated DASS scores (moderate to severe)	With normal DASS scores and mild disorders	Wwith high DASS scores (moderate to severe)
n = 9	n = 43	n = 12	n = 38
30.74 ± 2.83, ng/ml	19.26 ± 3.19, ng/ml	37.04 ± 2.74, ng/ml	26.25 ± 5.28, ng/ml

health, but also to increase stress resistance and preserve the reproductive potential of this part of the female population, because this vitamin-hormone plays an extremely important role in the functioning of the female reproductive system.

CONCLUSIONS

Thus, our study indicates that today vitamin D deficiency is a widespread problem among women regardless of occupation. But a more pronounced decrease in its level was found in military women and other categories of women involved in the military conflict, which is related to the type of chosen profession, service conditions and psycho-emotional stress.

Using the DASS-21 questionnaire, it was found that women serving in the ranks of the AFU are more prone to depression and stress – 78.84% and 90.38%, respectively. Instead, civilian women have more signs of anxiety (84%) than military women (61.54%). The revealed relationship between the concentration of vitamin D in the blood and the increased indicators of the DASS-21 questionnaire in both groups indicates the importance of this vitamin in psycho-emotional stability.

The most pronounced decrease in the concentration of vitamin D, found in military women against the background of high stress load, substantiates the feasibility of a rational approach to the scope of examination before military service and periodic determination of the level of vitamin D, as well as regular use of adequate preventive doses of this vitamin. Such actions are likely to reduce levels of anxiety, depression and stress in women involved in military conflict, as well as improve the physical, psycho-emotional and reproductive health of women in war.

Conflict of interest

There is no conflict of interest.

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ОЦІНКА РІВНІВ ТРИВОГИ, ДЕПРЕСІЇ, СТРЕСУ ТА РІВНІВ ВІТАМІНУ D У ЖІНОК В УМОВАХ ВІЙНИ

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Мета дослідження: оцінка рівнів вітаміну D (25(OH)D) у сироватці крові жінок-військових та інших жінок, залучених до військового конфлікту, а також виявлення зв'язку його показників із рівнем тривоги, депресії та стресу.
Матеріали та методи. Обстежено 52 жінки, які служать у лавах ЗСУ або в інший спосіб залучені до воєнного конфлікту. Вони увійшли до основної групи. До групи порівняння увійшли 50 жінок, які не залучені до військових подій.
У всіх жінок визначали концентрацію вітаміну D (25(OH)D) у сироватці крові за допомогою імуноферментного аналізу. Рівень стресу досліджували за шкалою стресу, тривоги та депресії (Depression Anxiety and Stress Scale, DASS-21).
Результати. У переважної більшості жінок основної групи (76,5%) діагностовано D-гіповітамінозні стани, що значно перевищувало питому вагу таких пацієнток у групі порівняння – 46,0% ($p < 0,05$). Лише у 12 (23,08%) жінок основної групи виявлено нормальний рівень вітаміну D, що було вдвічі менше за питому вагу таких пацієнток у групі порівняння – 54% ($p < 0,05$).
В основній групі показники тесту DASS-21 за шкалою депресії становили $5,74 \pm 0,26$ бала, водночас у групі порівняння – $4,57 \pm 0,31$ бала ($p < 0,05$), за шкалою стресу – відповідно $8,22 \pm 0,24$ й $6,67 \pm 0,28$ бала ($p < 0,05$). Тривога, навпаки, більш виражена була в цивільних жінок – $5,81 \pm 0,24$ бала порівняно з основною групою ($p < 0,001$). Ознаки тривоги виявлено у 84,0% цивільних жінок й у 61,54% жінок, залучених до воєнного конфлікту ($p < 0,05$). Однак питома вага пацієнток із різними рівнями тривоги майже не відрізнялась у різних груп.
Висновки. На сьогодні дефіцит вітаміну D є розповсюдженою проблемою серед жінок незалежно від професії. Але більш виражене зниження його рівня виявлено в жінок-військовослужбовиць та інших категорій жінок, залучених до воєнного конфлікту, що пов'язано з родом обраної професії, умовами служби та психоемоційним навантаженням.
Встановлено, що жінки, які служать в лавах ЗСУ, більш схильні до депресії та стресу. Натомість цивільні жінки частіше демонструють ознаки тривоги. Виявлена залежність між рівнями вітаміну D у крові та психічним станом жінок обох груп, про що свідчать підвищені показники опитувальника DASS-21, вказує на важливість цього вітаміну для формування психоемоційній стабільності. Виражене зниження концентрації вітаміну D, виявлене у жінок-військових на фоні високого стресового навантаження, обґрунтовує доцільність раціонального підходу до обсягу обстеження перед залученням до військової служби та періодичного визначення рівня вітаміну D, а також регулярного вживання його адекватних профілактичних доз.

Ключові слова: жінки-військовослужбовиці, цивільні жінки, вітамін D, дефіцит, стрес, депресія, тривога.

ASSESSMENT OF ANXIETY, DEPRESSION, STRESS AND VITAMIN D LEVELS IN WOMEN IN WARFARE

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Objective of the study: to assess the levels of vitamin D (25(OH)D) in the blood serum of military women and women involved in a military conflict, as well as to identify the relationship of its indicators with the level of anxiety, depression and stress.
Materials and methods. 52 women serving in the Armed Forces of Ukraine and other categories of women involved in the military conflict were surveyed. They entered the main group. The comparison group includes 50 women who are not related to military conflict.
The concentration of vitamin D (25(OH)D) in blood serum was determined by enzyme immunoassay In all women. The level of stress was studied using the Depression Anxiety and Stress Scale (DASS-21).
Results. The vast majority of women in the main group (76.5%) were diagnosed with vitamin D hypovitaminosis conditions, which significantly exceeded the specific gravity of such patients in the comparison group – 46.0% ($p < 0.05$). Only 12 (23.08%) women of the main group had a normal level of this vitamin, which was half as much as the specific gravity of such patients in the comparison group – 54% ($p < 0.05$).
The values of the DASS-21 test on the depression scale were 5.74 ± 0.26 points In the main group, while in the comparison group – 4.57 ± 0.31 points ($p < 0.05$), on the stress scale – 8.22 ± 0.24 points and 6.67 ± 0.28 points, respectively ($p < 0.05$). Anxiety levels, on the contrary, were more pronounced in civilian women – 5.81 ± 0.24 points compared to the main group ($p < 0.001$). Signs of anxiety were found in 84.0% of civilian women and in 61.54% of women involved in the military conflict ($p < 0.05$). However, the specific weight of patients with different levels of this disorder almost did not differ between groups.
Conclusions. Today, vitamin D deficiency is a widespread problem among women, regardless of profession. But a more pronounced decrease in its levels was found in female military personnel and other categories of women involved in the military conflict, which is related to the type of chosen profession, service conditions and psycho-emotional stress.
It has been established that women who serve in the Armed Forces of Ukraine are more prone to depression and stress. Civilian women, on the other hand, show more signs of anxiety. The revealed relationship between the levels of vitamin D in the blood and elevated scores of the DASS-21 questionnaire in both groups indicates the importance of this vitamin in psycho-emotional stability. The pronounced decrease in the concentration of vitamin D, found in military women against the background of high stress load, substantiates the feasibility of a rational approach to the examination before military service and periodic determination of the vitamin D level, as well as the regular use of its adequate preventive doses.

Keywords: military women, civilian women, vitamin D, deficiency, stress, depression, anxiety.