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ABSTRACT

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THE STATE OF PERIODONTAL TISSUES IN MILITARY PERSONNEL OF THE ARMED FORCES OF UKRAINE DEPENDING ON THE PSYCHO-EMOTIONAL STATE

The aim of the study: To assess the periodontal tissue condition of military personnel in the Armed Forces of Ukraine based on their psycho-emotional state.

Materials and methods. A periodontal examination was conducted on 142 male military personnel of the Armed Forces of Ukraine who were undergoing rehabilitation or were on rotation, in order to achieve the stated goal. The age range of the subjects was 27 to 60 years, and their period of stay in the combat zone ranged from 3 months to 2 years. The patients underwent clinical and dental examination according to a standardized scheme, which included taking anamnesis and analyzing patients' complaints. The periodontal tissue condition was assessed using Danilevsky's M.F. (1994) classification, with additions by Mashchenko I.S. (2002).

To identify symptoms of post-traumatic stress disorder (PTSD) in military personnel of the Armed Forces of Ukraine, we administered the PSL-5 questionnaire developed by the National Centre for PTSD. We also determined the presence and degree of psychoemotional stress in the study group using the methodology of Holmes T.H. and Rahe R.H. (1967). The level of reactive and personal anxiety was measured using the Spielberger-Hanin method, specifically the State-Trait Anxiety Inventory (STAI) from 1970.

Results. The study found that the presence of PTSD in military personnel of the Armed Forces of Ukraine intensifies periodontal tissue diseases. This is shown by an increase in advanced forms of generalized periodontitis (19.74±4.50 % of patients with PTSD vs. 5.00±4.87 % of patients without PTSD, $p<0.01$) and a minimal frequency of detection of inflammatory diseases of periodontal tissues ($p<0.05$). The study examined the correlation between periodontal tissue diseases and stress resistance and reactive anxiety levels in military personnel of the Armed

Forces of Ukraine. The results showed that patients with a very high and high degree of stress resistance and a low level of reactive anxiety (I, II groups) exhibited a greater degree of resistance to stress. No changes were made to the original text as it already adheres to the desired characteristics. Inflammatory diseases were found to be more prevalent in the structure of periodontal diseases. Meanwhile, dystrophic-inflammatory lesions of periodontal tissues were more common in individuals with threshold resistance to stress and moderate reactive anxiety (III group) and those with low resistance to stress and high levels of reactive anxiety (IV group).

Conclusions. The study found a close relationship between the psychoemotional disorders of the subjects and the condition of their periodontal tissues. This relationship is likely one of the leading factors that determine the intensity and severity of inflammatory and dystrophic-inflammatory diseases of periodontal tissues in this cohort of patients.

Keywords: periodontal tissues, military personnel, post-traumatic stress disorder, stress resistance, reactive anxiety.

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РЕЗЮМЕ

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СТАН ТКАНИН ПАРОДОНТА У ВІЙСЬКОВОСЛУЖБОВЦІВ ЗБРОЙНИХ СИЛ УКРАЇНИ В ЗАЛЕЖНОСТІ ВІД ПСИХО- ЕМОЦІЙНОГО СТАНУ

Мета дослідження: оцінити стан тканин пародонта у військовослужбовців ЗСУ в залежності від їхнього психоемоційного стану.

Матеріали і методи. Для досягнення поставленої мети було проведено пародонтологічне обстеження 142 військовослужбовців Збройних Сил України чоловічої статі, які проходили реабілітацію, або перебували на ротації. Вік обстежених коливався від 27 до 60 років, а термін перебування у зоні бойових дій від 3 місяців до 2 років. Клінічно-стоматологічне обстеження пацієнтів проводили згідно стандартної схеми, яка включала в себе збір анамнезу та аналіз скарг хворих. Для оцінки стану тканин пародонта використовували класифікацію М. Ф. Данилевського (1994) з доповненнями І. С. Машенко (2002).

Для виявлення симптомів посттравматичних стресових розладів (ПТСР) у військовослужбовців ЗСУ було проведено анкетування згідно опитувальника PSL-5 (National Center for PTSD). Визначення наявності психоемоційного напруження та його ступеня (стресостійкості), у пацієнтів групи дослідження, проводили за методикою Holmes TH, Rahe RH, 1967. Дослідження рівня реактивної і особистої тривожності проводили за методикою Спілбергера-Ханіна (State-Trait Anxiety Inventory, STAI, 1970).

Результати та їх обговорення. У результаті проведених досліджень встановлено, що наявність ПТСР у військовослужбовців ЗСУ викликає інтенсифікацію захворювань тканин пародонта, котра проявляється збільшенням розвинутих форм генералізованого пародонтиту ($19,74 \pm 4,50$ % хворих з ПТСР проти $5,00 \pm 4,87$ % хворих без ПТСР, $p < 0,01$) та мінімальною частотою виявлення запальних захворювань тканин пародонта, $p < 0,05$. Водночас, визначення ступеня опору до стресу та рівня

реактивної тривожності у військовослужбовців ЗСУ з захворюваннями тканин пародонта дозволили з'ясувати, що у пацієнтів з дуже високим і високим ступенем опору до стресу та низьким рівнем реактивної тривожності (I, II група) у структурі захворювань пародонта превалювали запальні захворювання, тоді як у осіб з пороговим опором до стресу і помірною реактивною тривожністю (III група), та з низьким опором до стресу та високим рівнем реактивної тривожності (IV група) були більш поширеними дистрофічно-запальні ураження тканин пародонта.

Висновки. Отже, в результаті проведеного дослідження встановлено, що розлади психоемоційної сфери досліджуваних знаходились у тісному взаємозв'язку з станом тканин пародонта, та, ймовірно, виступають одним з провідних чинників, котрі обумовлюють інтенсивність та важкість перебігу запальних і дистрофічно-запальних захворювань тканин пародонта у даної когорти хворих.

Ключові слова: тканини пародонта, військовослужбовці, посттравматичний стресовий розлад, стресостійкість, реактивна тривожність.

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ABBREVIATIONS:

PTSD – post-traumatic stress disorder

CCG – chronic catarrhal gingivitis

LP – localized periodontitis

GP – generalized periodontitis

INTRODUCTION / ВСТУП

War has a detrimental effect on both mental health and physical health. It can lead to an increase in the incidence and prevalence of various pathologies, including dental issues [1]. Currently, the formation of combat units in the Armed Forces of Ukraine occurs during wartime, where there is a high prevalence of somatic diseases, including dental issues [2, 3]. The combat readiness and capability of the Armed Forces of Ukraine depend on the health of its military personnel, including their oral health, specifically the condition of their periodontal tissue. Research conducted among individuals involved in hostilities and those impacted by war indicates a significant prevalence of mental health disorders, such as depression, anxiety, and post-traumatic stress disorder (PTSD). Research has demonstrated that individuals with PTSD are more vulnerable to a range of illnesses, both physical and psychological [4].

Periodontal tissue diseases are currently one of the most prevalent dental diseases. They are often not diagnosed in a timely manner and may not respond well to therapy [5, 6, 7]. According to the WHO, destructive diseases of periodontal tissues increase arithmetically

with age. A high level of psychoemotional stress has been identified as one of the factors that contribute to the increase in the number of infectious diseases, including periodontal tissue diseases [8, 9]. Stressful conditions are known to have an immunosuppressive effect, which can negatively impact the hygienic status and antimicrobial protection of the oral cavity. Experimental studies have demonstrated the influence of stressors on the development of periodontal tissue lesions. This highlights the necessity for a more comprehensive evaluation of the impact of stress on the etiology, pathogenesis, prevention, and treatment of periodontal tissue diseases [10, 11]. Although stress has been the subject of numerous studies, its impact on the development of dental diseases has not been thoroughly investigated. Thus, investigating the correlation between the psychological and emotional state and periodontal tissue disease in military personnel of the Armed Forces of Ukraine is a pertinent and significant research topic.

Objective: To assess the periodontal tissue condition of military personnel in the Armed Forces of Ukraine, based on their psycho-emotional state.

Materials and methods. To accomplish this objective, we conducted a periodontal examination of 142

male military personnel from the Armed Forces of Ukraine, who were either undergoing rehabilitation at Ternopil University Hospital of I. Gorbachevsky Ternopil National Medical University Ministry of Health of Ukraine, or were on rotation. The survey participants' ages ranged from 27 to 60 years old, and their periods of stay in the combat zone ranged from 3 months to 2 years. The patients underwent a clinical and dental examination following a standardized scheme, which involved obtaining their medical history and analyzing their complaints. The periodontal tissue condition was assessed using the classification of M.F. Danilevsky (1994) with additions by I.S. Mashchenko (2002) [12].

An online survey was used on the Google Forms platform to identify symptoms of post-traumatic stress disorder (PTSD) in military personnel of the Armed Forces of Ukraine. The survey was designed to maximize respondent involvement and ensure anonymity. The survey used the PSL-5 questionnaire, a standardized self-assessment scale for PTSD developed by the National Center for PTSD. The questionnaire consists of 20 questions that correspond to the key symptoms of PTSD according to the DSM-5 diagnostic criteria [13]. The study group's patients' psycho-emotional stress and stress resistance were determined using Holmes and Rahe's method (Holmes TH, Rahe RH, 1967) [14]. The level of reactive and personal anxiety was measured using the Spielberger-Hanin method, specifically the State-Trait Anxiety Inventory (STAI, 1970) [15].

The study was conducted in accordance with the ICH GCP (1996), the 1975 Declaration of Helsinki (revised in 2000), the Council of Europe Convention on

Human Rights and Biomedicine (2007), and the recommendations of the Committee on Bioethics at the Presidium of the National Academy of Medical Sciences of Ukraine (2002). The study was subject to the approval of the bioethics committee of the I. Gorbachevsky Ternopil National Medical University, Ministry of Health of Ukraine.

The study data was statistically processed using licensed statistical analysis software «Microsoft Excel 2016». The materials were grouped by study population and relative and average values, along with their errors and t-test, were calculated. The critical level of significance for testing statistical hypotheses in this study was 0,05.

Results and Discussion. The research conducted on the presence of PTSD symptoms revealed that out of 142 surveyed military personnel, only 14.08 % did not exhibit any signs of PTSD (Table 1). The percentage of respondents increased with age, from 5.08 % among those aged 27-38 to 26.47 % among those aged 49-60. Subthreshold symptoms of PTSD (31-33 points) were observed in 32.39 % of the surveyed military personnel. The lowest proportion of detection was found in the age group of 27-37 years (22.03 %), while the highest frequency was observed in patients aged 49-60 years. During the clinical interview, 53.52 % of military personnel reported the presence of PTSD. The highest percentage of subjects with PTSD was found in the age group of 27-37 years (72.89 %), while the lowest frequency was observed in the age group of 49-60 years (32.35 %).

Table 1 – Results of posttraumatic stress disorder scoring in the main group according to the PSL-5 questionnaire

PSL-5, points	Age						Total	
	27-37 years		38-48 years		49-60 years			
	n	%	n	%	n	%	n	%
0 – 30 points	3	5.08	8	16.33	9	26.47	20	14.08
31 – 33 points	13	22.03	19	38.78	14	41.18	46	32.39
34 points and above	43	72.89	22	44.89	11	32.35	76	53.52
Total	59	41.55	49	34.51	34	23.94	142	100

Table 2 shows that military personnel of the Armed Forces of Ukraine in the main group had a prevalence of intact periodontium of 55.00±11.12 % in the absence of PTSD (0-30 points), which was 3.2 times higher than in patients with subthreshold symptoms of PTSD (31-33 points), $p<0.01$ and 6.0 times higher than in patients with PTSD (34 and more points), $p<0,01$.

Chronic catarrhal gingivitis (CCG) was more

prevalent in patients without PTSD, accounting for 30.00±10.25 % of patients, which was 1.3 times higher than in patients with subthreshold PTSD symptoms ($p>0.05$), and 4.6 times higher than in patients with PTSD (34 or more points), $p<0.05$.

Localized periodontitis (LP) was not diagnosed in subjects without PTSD. In patients with subthreshold symptoms of PTSD (31-33 points), LP was diagnosed in

only 2.17±2.15 % of those examined. In patients with PTSD (34 and more points), LP was determined in 5.26±2.56 % of patients.

It is worth noting that patients with PTSD were found to have a higher incidence of generalized periodontitis (GP) at the initial stage – I degree,

compared to subjects without PTSD and those with subthreshold symptoms of PTSD. The percentage of patients with GP was 38.16±5.57 %, which is 2.5 times higher than those without PTSD and 1.8 times higher than those with subthreshold symptoms of PTSD, $p>0.05$.

Table 2 – The state of the periodontal tissues of the military personnel in relation to the score of the post-traumatic stress disorder

Condition of periodontal tissues	PTSD score, points					
	0–30 points, (n=20)		31–33 points, (n=46)		34 points and above, (n=76)	
	n	%	n	%	n	%
Intact periodontium, (n=26)	11	55,00±11,12	8	17,39±5,59*	7	9,21±3,32*
CCG, (n=22)	6	30,00±10,25	11	23,91±6,29	5	6,58±2,84**
LP, (n=5)	–	–	1	2,17±2,15	4	5,26±2,56
GP initial – I degree, (n=42)	3	15,00±7,98	10	21,74±6,08	29	38,16±5,57
GP II degree, (n=36)	1	5,00±4,87	16	34,78±7,02*	19	25,00±4,97**
GP III degree, (n=11)	–	–	–	–	11	14,47±4,04

Note: * $p<0,01$, ** $p<0,05$ – a significant difference in values in relation to the data for patients with PTSD of 0-30 points

The prevalence of GP II degree was lowest in military personnel of the Armed Forces of Ukraine who did not have PTSD (5.00±4.87%), which was 6.9 times lower than in patients with subthreshold PTSD symptoms and 5.0 times lower than in patients with PTSD, $p<0.01$. It is worth noting that GP III degree in military personnel of the Armed Forces of Ukraine was only verified in the presence of PTSD, with 14.47±4.04% of patients affected.

In conclusion, the data suggests that PTSD in military personnel of the Armed Forces of Ukraine may intensify periodontal tissue diseases. This is evidenced by a higher frequency of advanced forms of GP (19.74±4.50 % of patients with PTSD vs. 5.00±4.87 % of patients without PTSD, $p<0.01$) and a lower frequency of inflammatory diseases of periodontal tissues, $p<0.05$.

The study analyzed stress resistance in 116 military personnel of the Armed Forces of Ukraine with inflammatory and dystrophic-inflammatory diseases of periodontal tissues, using the Holmes-Rahe method (Social Readjustment Rating Scale – SRRS), and examined the relationship with age (Fig. 1).

The study revealed that military personnel aged 27-37 in the Armed Forces of Ukraine who had periodontal tissue diseases exhibited low stress resistance (0-150

points), with only 2.28% of patients showing high stress resistance (150-200 points) ($p<0.01$). At the same time, 50.0±7.53 % of patients exhibited threshold stress resistance (200-300 points), while 47.72±7.52 % of patients had low stress resistance (300-400 points), $p<0.01$.

The clinical interview of military personnel aged 38-48 revealed that 2.45 % of respondents exhibited a very high level of stress resistance, while 4.88±1.36 % had a high level of stress resistance, $p>0.05$. At the same time, a significantly higher number of patients were found to have threshold and low stress resistance compared to those with very high stress resistance: 51.22±7.80 % and 41.45±7.69 %, respectively, $p<0.01$.

During the survey of military personnel with periodontal tissue diseases aged 49-60 years, it was observed that the percentage of individuals with high and very high stress resistance had increased compared to previous age groups, up to 12.90±6.0 % and 16.13±6.60 %, respectively, $p>0.05$, $p_1, p_2<0.01$. At the same time, the percentage of individuals with low and threshold stress resistance decreased in the age range of 49-60 years. The percentage was 32.26±8.39 % ($p>0.05$) and 38.71±8.74 %, $p<0.05$, $p_1, p_2>0.05$ respectively.

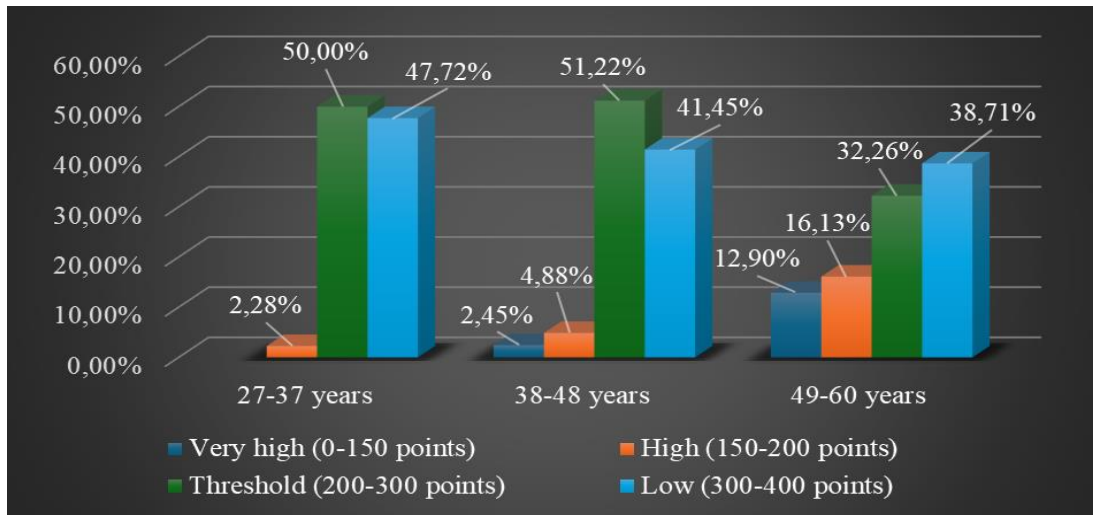


Figure 1 – Quantitative (age) distribution of military personnel with periodontal tissue diseases depending on their stress resistance

The age distribution of military personnel with periodontal tissue diseases, as determined by the Spielberger-Hanin anxiety scale, is presented in Figure 2. The data shows an increase in the percentage of patients with low anxiety (0-30 points) from 2.45±0.41 % in patients aged 38-48 years to 12.90±6.00 % in patients aged 49-60 years (p>0.05). At the same time, 2.28 % of military personnel aged 27-37 years exhibited moderate anxiety (31-45 points),

which was 2.1 times higher than the data for patients aged 38-49 years (p>0.05) and 7.1 times higher in the older age group (p<0.05). It is important to note that a high level of anxiety (46-55 points) was observed in most patients, regardless of their age. This was found in 97.72±2.25 % of patients aged 27-37 years and decreased to 70.96±2.15 % (p<0.01, p₁<0.05) in the age range of 49-60 years.

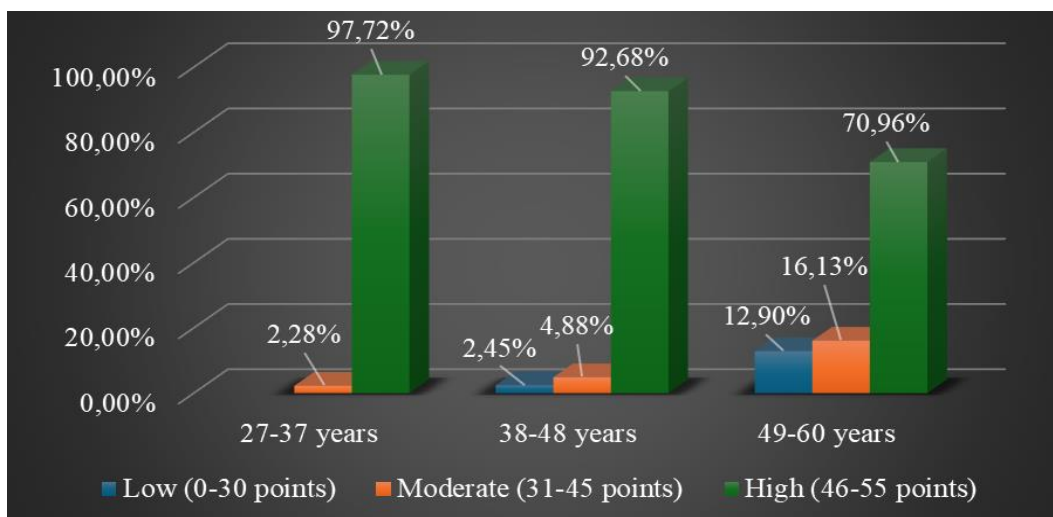


Figure 2 – Age distribution of military personnel with periodontal tissue diseases depending on their reactive anxiety

The study found that military personnel with periodontal tissue diseases had a high prevalence of anxiety, with 88.79±2.93 % of respondents exhibiting this trait (p, p₁<0.01). Low and moderate anxiety were present in only 4.31±1.18 % and 6.90±2.35 % of patients, respectively (p>0.05).

The research conducted among military personnel of the Armed Forces of Ukraine with periodontal tissue diseases resulted in the formation of four groups for further clinical and laboratory studies:

Group I – very high stress resistance with a low level of reactive anxiety;

Group II – a high degree of stress resistance with a low level of reactive anxiety;

Group III – threshold level of stress resistance with a moderate level of reactive anxiety;

Group IV – a low degree of stress resistance and a high level of reactive anxiety.

The study analyzed the structure of periodontal tissues in patients based on their psycho-emotional state as reflected by the formed groups.

The study revealed that military personnel with high stress resistance and low levels of reactive anxiety (groups I and II) had a higher prevalence of inflammatory lesions in their periodontal tissues (Fig. 3). The prevalence of CCG ranged from 60.0 % in patients of the first group to 37.50 % in patients of the second group. Meanwhile, the frequency of LP decreased from 40.0 % in group I to 37.50 % in group II ($p>0.05$). It is worth

noting that patients in group I did not exhibit dystrophic-inflammatory lesions of periodontal tissues, while 25.0% of patients in group 2 were diagnosed with initial - I-degree GP ($p<0.01$).

Meanwhile, patients in group III, who have a threshold level of stress resistance and moderate reactive anxiety, and group IV, who have a low level of stress resistance and high reactive anxiety, exhibited a more developed structure of periodontal tissue diseases. This was characterized by a prevalence of dystrophic-inflammatory diseases over inflammatory diseases of periodontal tissues. Thus, among patients in these subgroups, 16.98 % of those in group III and 14.00 % of those in group IV were diagnosed with CCG. This is 3.1 times lower than the average prevalence of CCG in patients of groups I and II ($p<0.05$).

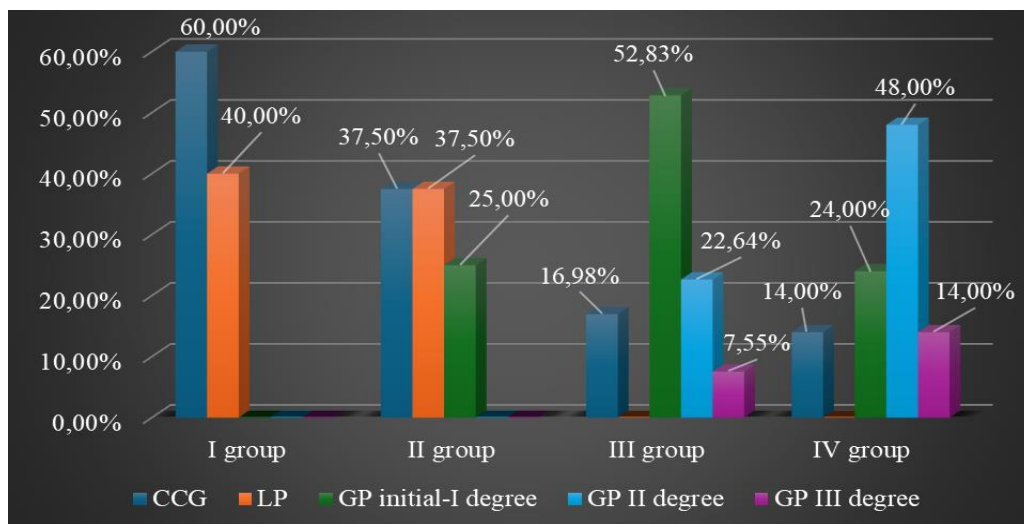


Figure 3 - Structure of periodontal tissue diseases in military personnel depending on their psycho-emotional state

The prevalence of generalized periodontitis initial – I degree was 2.2 times higher in patients of group III compared to those in group IV (52.83 % vs. 24.0 %, $p<0.05$). It is important to note that patients in group IV had a significantly higher frequency of advanced GP diagnoses, specifically, grade II GP was diagnosed 2.1 times more often ($p<0.05$) and grade III GP was present in 14.0% of patients in group IV ($p<0.01$).

Therefore, for further studies, were selected patients with CCG and GP of initial - II degree taking into account their psychoemotional state (Table 3), which allowed to conduct a scoring assessment of the level of stress resistance and reactive anxiety in 22 patients (22.0 %) with CCG and 42 patients (42.0 %) with GP of initial – I degree and 36 patients (36.0 %) with GP of II degree.

The assessment of psychoemotional state scores in military personnel with CCG and GP of initial - II

degree showed (Table 4) that stress resistance scores increased significantly from 65.22±1.45 points in patients of group I to 312.80±2.15 points in patients of group IV, $p<0.01$. In military personnel with generalized lesions of periodontal tissues, a similar trend was observed. The score of stress resistance increased from 78.0±1.56 points in patients of group I (GP initial – I degree) to 353.82±2.42 points in patients of group IV ($p<0.01$). Similarly, the score increased from 92.15±1.65 points in patients of group I to 380.29±2.70 points in patients of group IV with GP of II degree ($p<0.01$). The stress resistance score values were lower in patients with CCG compared to those with initial – II GP, indicating better stress resistance. On average, the values were 1.3 times lower in group I, 1.1 times lower in group II, and 1.2 times lower in groups III and IV ($p_1, p_2<0.01$).

Table 3 – Distribution of patients with periodontal tissue diseases depending on stress resistance and reactive anxiety level

Diseases of periodontal tissues	Research groups							
	I group		II group		III group		IV group	
	n	%	n	%	n	%	n	%
CCG, (n=22)	3	13,64	3	13,64	9	40,91	7	31,81
GP initial – I degree, (n=42)	–	–	2	4,76	28	66,67	12	28,57
GP II degree, (n=36)	–	–	–	–	12	33,33	24	66,67
Total, (n=100)	3	3,0	5	5,0	49	49,0	43	43,0

The score for reactive anxiety in military personnel with CCG increased significantly from 15.27±0.24 points in group I to 46.21±0.40 points in group IV subjects ($p<0.01$). The score for reactive anxiety in patients with GP ranged from minimal values in group I

to maximum values in group IV ($p<0.01$). At the same time, the mean score of reactive anxiety was higher in patients without CCG: in groups I and II by 1.2 times, in group III by 1.3 times, and in group IV by 1.1 times ($p_1, p_2<0.01$).

Table 4 – Indicators of psychoemotional state in military personnel with inflammatory and dystrophic-inflammatory diseases of periodontal tissues

Indicators	Periodontal tissue condition	Research groups			
		I group	II group	III group	IV group
Average score by methodology Holmes-Rahe Holmes- Rahe	CCG	65,22±1,45	164,29±1,69 •	215,49±1,80 •	312,86±2,15 •
	GP initial – I degree	78,00±1,56 *	178,26±1,72 •,*	249,80±1,92 •,*	353,82±2,42 •,*
	GP II degree	92,15±1,65 *,†	187,20±1,81 •,*†	274,26±1,98 •,*†	380,29±2,70 •,*†
Average score on the reactive anxiety scale Spielberger-Hanin	CCG	15,27±0,24	17,52±0,26 •	32,15±0,30 •	46,21±0,40 •
	GP initial – I degree	20,11±0,32 *	23,45±0,38 •,*	39,80±0,47 •,*	49,18±0,52 •,*
	GP II degree	26,68±0,44 *,†	29,90±0,50 •,*†	41,20±0,54 •,*†	52,30±0,60 •,*†

Note:

• $p<0,01$ – significant difference of values in relation to the data in group I

* $p_1<0,01$ – significant difference in values in relation to the data in patients with CCG

† $p_2<0,01$ – significant difference in values in relation to the data in patients with GP initial – I degree

CONCLUSIONS / ВИСНОВКИ

The study found a close relationship between the psychoemotional disorders of the subjects and the condition of their periodontal tissues. This relationship

is likely one of the leading factors that determine the intensity and severity of inflammatory and dystrophic-inflammatory diseases of periodontal tissues in this cohort of patients.

PROSPECTS FOR FUTURE RESEARCH / ПЕРСПЕКТИВИ ПОДАЛЬШИХ ДОСЛІДЖЕНЬ

The relationship between psycho-emotional disorders and periodontal tissue health will facilitate biochemical and immunological studies. This will lead to the development of effective treatment and prevention measures for periodontal tissue diseases in the military personnel of the Armed Forces of Ukraine.

AUTHOR CONTRIBUTIONS / ВКЛАД АВТОРІВ

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A –Work concept and design,

B –Data collection and analysis,

C –Responsibility for statistical analysis,

D –Writing the article,

E –Critical review,

F –Final approval of the article.

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