ORIGINAL ARTICLE

CONTENTS

The influence of the psychosocial stress on oral health status in the conditions of being in Ukraine during the prolonged state of martial law

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ABSTRACT

Aim: To study the presence of clinical and biochemical correlations between psycho-emotional stress, level of cortisol and periodontal oral health status of the patients in Ukraine during prolonged martial law.

Materials and Methods: The comprehensive clinical and laboratory study covered 49 persons, including 20 patients with Gingivitis (40.8%) and 29 with Periodontitis (59.2%). Biochemical blood test was performed to determine the level of "stress hormone" – cortisol. Patients filled out the questionnaire by the method of V. Zung (low mood-subdepression scale) to determine psycho-emotional state in the conditions of prolonged martial law in Ukraine.

Results: The research results showed that in the conditions of martial law in Ukraine, "stabilization" and "improvement" of the process of patients with Gingivitis was established in 50%, with Periodontitis - only in 41.4% of patients. In 54% of patients, a significant deterioration of clinical indices was established, compared to the indicators before the war. In patients with Periodontitis, PBI index was 1.33 (0.62-1.43) score, which was not statistically significantly different from the initial level ($p>0.05$). Biochemical blood tests revealed an increased level of the hormone cortisol in 18% of patients. According to the method by V. Zung scale of mental states, the majority of patients (87%) showed low mood and emotional instability within the medium level (range 2 and 3). Correlation was identified, according to the Spearman coefficient ($R=0.39$, $p<0.05$), between scale assessments by V.Zung and the blood level of cortisol.

Conclusions: Psycho-emotional stress is one of the leading pathogenetic factors in the deterioration of oral health status and the development of periodontal diseases, especially in people in Ukraine during prolonged martial law. Indicators of method by V. Zung scale of mental states and the level of cortisol are optimal markers of the need to correct the psycho-emotional state. For patients with increased levels of stress and fear, it is necessary to create special treatment-prevention schemes, taking into account greater attention to motivation to maintain the health of the oral cavity, as well as more frequent hygiene procedures.

KEY WORDS: oral health status, periodontium, stress, cortisol, martial law in Ukraine

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INTRODUCTION

Currently, more attention should be paid to the study of indicators of the emotional state and content of feelings of people living in the conditions of prolonged martial law in Ukraine [1]. For more than a year now (February 2022 – February 2023) they experience stressful situations, causing various physical, emotional or mental reactions.

The studies performed show that negative emotional events in the life of a human cause strong negative influence on his or her body, leading to the occurrence or aggravation of specific diseases. There is a connection between negative emotional events in a person's life and changes in the immune system, which leads to the occurrence of a disease. It was established that psycho-emotional stress modulates the immune system through the nervous and endocrine systems. This causes and aggravates many chronic diseases: cardiovascular, endocrine, gastroenterological, pulmonary and rheumatological, as well as conditions of infectious, allergic, autoimmune or neoplastic etiology. Various clinical observations and epidemiological studies point to a correlation between the state of suspense and uncertainty in which the patient is in a stressful situation, and the development and progression of periodontal tissue diseases [2].

Literature has it that stress plays a significant role in the etiology, progression and the outcome of treatment of periodontal diseases, in particular, generalized periodontitis. Distress, anxiety, depression, loneliness, adverse life circumstances cause a deterioration in the general state of human health, facilitating bacterial invasion due to poor oral cavity hygiene and leading to the destruction of periodontal tissues. Prolonged depressive and anxiety states can have the most adverse effect on the degree, severity and course of periodontal

diseases [3]. There is also a connection between the severity of periodontal tissue diseases and the mechanism of behavioral stress, due to the indirect effect of stress on the health of the periodontium through lifestyle changes, such as smoking, alcohol consumption, unhealthy diet and careless oral cavity hygiene [4].

Stress factors cause induced modulation of the immune system, which leads to an increase in the level of adrenocorticoid hormones in the blood, stimulation of chemotaxis and phagocytosis of polymorphonuclear leukocytes, a decrease in the proliferation of lymphocytes, changes in the level of cytokines, changes in blood circulation and regeneration, modification of saliva (saliva pH and IgA secretion) [5].

The key steroid hormones, which are synthesized by the adrenal cortex and whose level increases in stressful situations, include cortisol. Cortisol hormone is one of the main human hormones that influences the vital activity of the body, proper functioning of organs and systems, our mood, the level of aggression, loyalty [6]. Cortisol helps the body timely recover in order to adequately resist negative influences, such as physical injuries, strong fear, tension, pain, fatigue, lack of sleep, constant emotional overload and stress. Cortisol is called the "stress hormone"; when its balance is disturbed, a person may experience quite strong physical and emotional sensations that deteriorate the quality of life [7].

AIM

The aim is to study the presence of clinical and biochemical correlations between psycho-emotional stress and periodontal condition of the patients staying in Ukraine during prolonged martial law.

MATERIALS AND METHODS

In January-February, 2021, 61 young persons in the age of 18-35 years applied to the Dental Medical Center of NMU named after O.O. Bogomolets for examination and treatment. The study covered 49 persons, including 22 men (44.9%) and 27 women (55.1%). Examined patients were divided into two clinical groups, dependent on the diagnosis: group I consisted of 20 (40.8%) patients with Gingivitis: dental biofilm-induced; group II included 29 (59.2%) patients with stage I Periodontitis. Before the beginning of examination and treatment, voluntary informed consent was obtained from all the patients in accordance with the protocol. Those patients underwent a comprehensive clinical, radiological and laboratory examination; a treatment and prevention scheme was developed for them in accordance with the protocols (depending on the established diagnosis), recommendations were issued, and they were entered into the dispensary register.

Oral health status examination of the patients included diagnostics of the key indicators of the oral cavity state and periodontal screening with determination of clinical indices. The intensity of dental caries was assessed using the CFE index. The hygienic condition of the oral cavity was assessed using the oral cavity hygiene index OHI-S (Green-Vermillion index) and approximal plaque index – API (Lange). Periodontal examination included determination of the PMA index (C. Parma), periodontal screening and registration (PSR), probing pocket depth (PPD), loss of the clinical attachment level (CAL), presence of recession, nature of exudate. Probing was performed with a periodontal probe at six points around each tooth. Gum bleeding was determined by the papillary bleeding index (PBI, H.R. Muhlemann). The results of all examinations and measurements were entered in the periodontal card of the patient.

The condition of the teeth, bone tissue of the alveolar process, and jaws was assessed using orthopantomography and the data of targeted contact intraoral radiographs.

The diagnosis of periodontal diseases was established according to the new classification of periodontal and peri-implant diseases and conditions of the World Working Group, sponsored by the American Academy of Periodontology (AAP) and the European Federation of Periodontology (EFP) in 2017.

To assess the physiological level of stress resistance, a laboratory biochemical blood test was performed to determine the "stress hormone", cortisol – a marker of the endocrine system for the protection of the psycho-emotional sphere from negative influences.

In 2022-2023, patients underwent control examinations in the near and distant observation periods. It should be noted that in 2023, before the start of the comprehensive follow-up clinical and laboratory examination, all patients filled out a questionnaire to determine their psycho-emotional state in the conditions of prolonged martial law in Ukraine. This questionnaire was specially developed for the differentiated diagnostics of depressive and similar conditions by the method of V. Zung (Low mood-subdepression Scale (LMSS)) [8].

The statistical analysis of the obtained data was carried out on a PC using Microsoft Excel 2021, StatSoft Statistica 12 software. For the samples, the conformity of the empirical distributions to the normal law (Gaussian distribution) was assessed according to the Kolmogorov-Smirnov and Shapiro-Wilk criteria, being the basis for selection of

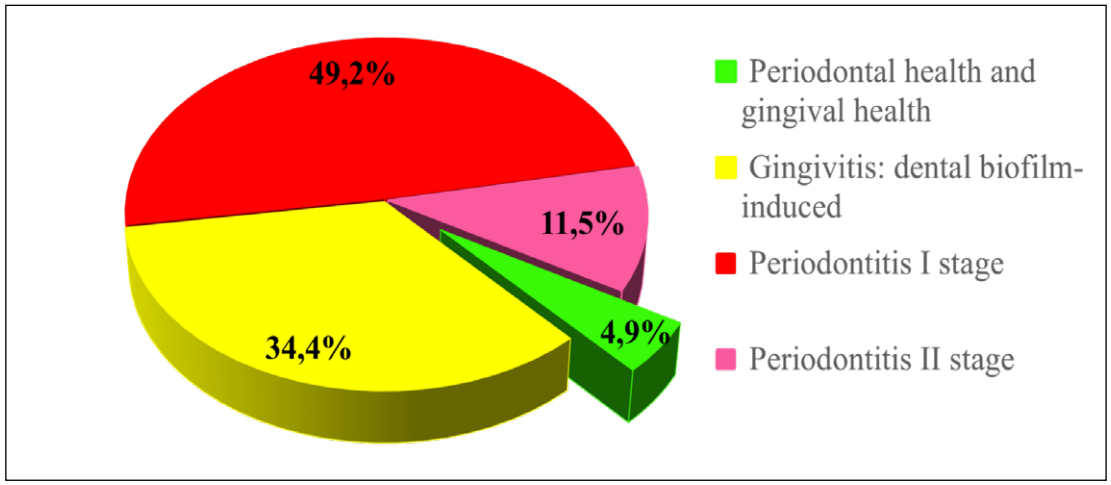

Fig. 1. Prevalence of periodontal diseases in young people in Ukraine.

Table 1. State of Periodontal oral health status in patients with Gingivitis and Periodontitis

Index	Group I, M±m, Me (Q_I-Q_{III})		Group II, M±m, Me (Q_I-Q_{III})	
	2021, initial state	2022, control, before the war	2021, initial state	2022, control, before the war
OHI-S, score	1.98±0.1	0.73±0.1; *p<0.05*	2.67±0.07	1.25±0.07; p<0.05
API, %	96.6 (90.0-100)	54.8 (46.5-56.5); p<0.05	100 (96.8-100)	56.3 (53.1-63.3); p<0.05
PMA, %	27.4 (20.4-38.2)	10.4 (9.5-11.9); p<0.05	41.4 (30.0-48.9)	13.5 (12.2-14.4); p<0.05
PBI, score	1.02 (0.81-1.22)	0.31 (0.26-0.35); p<0.05	1.47 (1.29-1.60)	0.43 (0.33-0.47); p<0.05
PPD, mm	1.81 (1.63-2.0)	1.03 (1.00-1.07); p<0.05	3.05 (2.64-3.17)	2.00 (1.75-2.13); p<0.05
PSR, code	1.50 (1.08-1.83)	0.67 (0.67-0.83); p<0.05	2.17 (1.83-2.33)	1.17 (0.83-1.33); p<0.05

Notes: p – indicator of probability of differences, compared to the initial data.

the statistical criteria: Student's t-test, analysis of variance (ANOVA), analysis of variance according to Friedman's test, Mann-Whitney U-test, Wilcoxon's test, Spearman's correlation coefficient. In the work, the studied values are presented in the form of the mean value of the variant M, the standard error of the mean value m, the median value of the median Me and the interquartile range QI-QIII.

RESULTS

DEMOGRAPHIC AND CLINICAL DATA

In January-February, 2021, 61 young persons in the age of 18-35 years applied to the Dental Medical Center of NMU named after O.O. Bogomolets for examination and treatment: 24 (39.3%) – men, and 37 (60.7%) – women. The prevalence of periodontal diseases among young patients was as follows: 3 persons (4.9%) – Periodontal and Gingival health; 21 persons (34.4%) – Gingivitis: dental biofilm-induced; 30 persons (49.2%) – Periodontitis stage I; 7 persons (11.5%) – Periodontitis stage II (Fig. 1).

Out of 61 persons, the research covered 49 persons: 22 male (44.9%) and 27 female (55.1%). Patients were divided into two clinical groups, dependent on the diagnosis: group I consisted of 20 (40.8%) patients with Gingivitis: dental biofilm-induced; group II included 29 (59.2%) patients with stage I Periodontitis.

Following a biochemical blood test among 49 patients at the beginning of clinical examination for the level of cortisol hormone in 2021, indicators within the physiological norm were detected in 48 patients (97.9%). Only in 1 patient (2.1%), an insignificant increase in its level was detected. By its clinical diagnosis patient belonged to group II with Periodontitis stage I.

PERIODONTAL ORAL HEALTH STATUS

Periodontal oral health status in 49 patients in the respective clinical groups with dental biofilm-induced Gingivitis (group I) and stage I Periodontitis (group II) in January-February 2021 (initial state) and January-February 2022, that is, after 1 year of observation but before the introduction of martial law in Ukraine, is described in Table 1.

During the control examination of patients with Gingivitis in group I in 2022, OHI-S index on average equaled 0.73±0.1 points, which corresponded to satisfactory hygiene (p<0.05). API index on average equaled

Table 2. Clinical efficiency of treatment of patients with Gingivitis and Periodontitis after a remote observation period (2 years in total and 1 year of war)

	Treatment results						Total	
	Stabilization		Unchanged		Progression			
	abs.	%	abs.	%	abs.	%	abs.	%
Clinical group I	10	50	3	15	7	35	20	100
Clinical group II	12	41.4	5	17.2	12	41.4	29	100
Total	22	44.9	8	16.3	19	38.8	49	100

Table 3. State of Periodontal oral health status in patients with Gingivitis and Periodontitis after a remote observation period (2 years in total and 1 year of war)

Index	Group I, M±m, Me (Q_I-Q_{III})			Group II, M±m, Me (Q_I-Q_{III})		
	2021, initial state	2022, control, before the war	2023, control, after 1 year of war	2021, initial state	2022, control, before the war	2023, control, after 1 year of war
OHI-S, score	1.98±0.1	0.73±0.1; p<0.05	1.25±0.15; p<0.05	2.67±0.07	1.25±0.07; p<0.05	2.10±0.13; p<0.05
API, %	96.6 (90.0-100)	54.8 (46.5-56.5); p<0.05	93.4 (85.7-100); p>*0.05*	100 (96.8-100)	56.3 (53.1-63.3); p<0.05	100 (96.7-100); p>*0.05*
PMA, %	27.4 (20.4-38.2)	10.4 (9.5-11.9); p<0.05	17.7 (14.0-31.3); p<0.05	41.4 (30.0-48.9)	13.5 (12.2-14.4); p<0.05	31.1 (19.5-37.5); p>*0.05*
PBI, score	1.02 (0.81-1.22)	0.31 (0.26-0.35); p<0.05	0.59 (0.39-1.07); p<0.05	1.47 (1.29-1.60)	0.43 (0.33-0.47); p<0.05	1.33 (0.62-1.43); p>*0.05*
PPD, mm	1.81 (1.63-2.0)	1.03 (1.00-1.07); p<0.05	1.37 (1.13-1.95); p<0.05	3.05 (2.64-3.17)	2.00 (1.75-2.13); p<0.05	2.82 (2.07-3.05); p>*0.05*
PSR, code	1.50 (1.08-1.83)	0.67 (0.67-0.83); p<0.05	0.83 (0.67-1.50); p<0.05	2.17 (1.83-2.33)	1.17 (0.83-1.33); p<0.05	1.83 (1.33-1.83); p<0.05

Notes: p – indicator of probability of differences, compared to the initial data.

54.8 (46.5-56.5)%, which corresponded to satisfactory interdental hygiene (p<0.05). PMA index on average equaled 10.4 (9.5-11.9)%, which corresponded to the light degree of inflammation (p<0.05). PBI index on average equaled 0.31 (0.26-0.35) points (p<0.05). Periodontal indicator of probing pocket depth (PPD) on average equaled 1.03 (1.00-1.07) mm (p<0.05). PSR code on average equaled 0.67 (0.67-0.83) (p<0.05).

In group II patients with stage I Periodontitis, OHI-S index on average equaled 1.25±0.07 points, which corresponded to satisfactory hygiene (p<0.05). API index on average equaled 56.3 (53.1-63.3)%, which corresponded to satisfactory interdental hygiene (p<0.05). PMA index on average equaled 13.5 (12.2-14.4)%, which corresponded to the light degree of inflammation (p<0.05). PBI index on average equaled 0.43 (0.33-0.47) points (p<0.05). PPD index on average equaled 2.00 (1.75-2.13) mm (p<0.05). PSR code on average equaled 1.17 (0.83-1.33) (p<0.05).

In February-March, 2023, that is, after 2 years of observation and 1 year of life of Ukrainians in the in the conditioned of prolonged martial law in Ukraine, control examination and analysis of data of the patients in the study groups were performed. Their data have shown that in group I with Gingivitis, "stabilization" of the process was observed in 50% of patients; the process in periodontal tissues remained "unchanged" in 15%; 35% of patients met the criteria of "progression". In group II with stage I Periodontitis, "stabilization" of the process was observed in 41.4% of patients; the process in periodontal tissues remained "unchanged" in 17.2%; 41.4% of patients met "progression" criteria (Table 2).

Therefore, the results of clinical and laboratory examination have shown that out of 49 patients with periodontal diseases, positive results and stabilization of the pathological processes were achieved only by 22 patients, that is, in 44.9% of cases. This is a very low treatment efficiency indicator, which may be attributed to the extremely difficult psycho-emotional, physical and financial standing of the Ukrainian population during the war in Ukraine.

Periodontal oral health status in patients of two clinical groups with Gingivitis and Periodontitis, stage I, in 2023, that is, after 1 years of martial law in Ukraine, is described in Table 3.

The dynamic of most patients in both clinical groups with Gingivitis and Periodontitis stage I after 2 years of observation and one year of war in Ukraine has

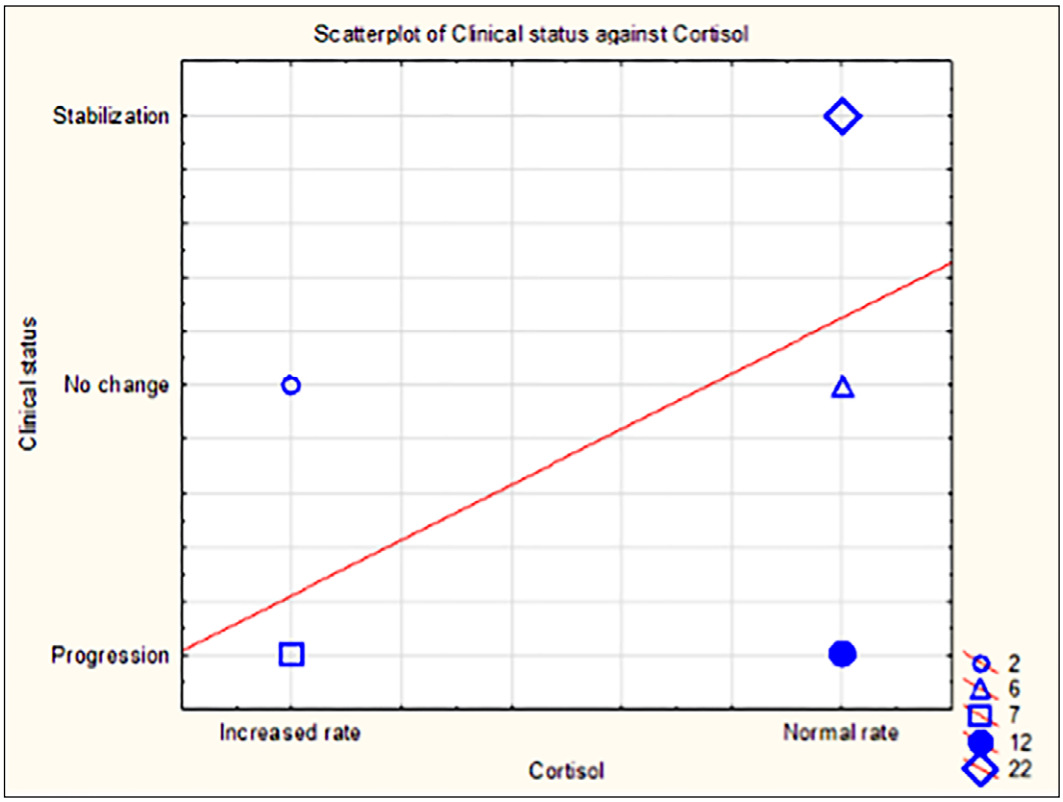

Fig. 2. Scatterplot of indicator of Clinical status against level of Cortisol.

shown a significant deterioration of the indices of hygiene, PMA inflammation, PBI bleeding, periodontal indicators of PPD and PSR, as compared to the data of follow-up control after 1 year of observation, before the introduction of martial law, in almost 55% of patients, compared to the initial examination data. Only 45% of patients demonstrated positive dynamics after a long observation period.

In group I of patients with Gingivitis OHI-S index in 2023 (that is after 1 year of war) on average equaled 1.25±0.15 points, which corresponded to satisfactory hygiene, while remaining 35.9% lower, compared to the initial level ($p<0.05$). API index deteriorated substantially, on average equaling 93.4 (85.7-100)%, which corresponded to unsatisfactory interdental hygiene, and did not statistically differ from the initial level ($p>0.05$). PMA index also declined, on average equaling 17.7 (14.0-31.3)%, which corresponded to the light degree of inflammation, while remaining 35.4% lower, compared to the initial level ($p<0.05$). PBI index on average equaled 0.59 (0.39-1.07) points, remaining 42.1% lower, compared to the initial level ($p<0.05$). Periodontal indicator PPD on average equaled 1.37 (1.13-1.95) mm, while remaining 24.3% lower, compared to the initial level ($p<0.05$). PSR code on average equaled 0.83 (0.67-1.50), remaining 44.6% lower, compared to the initial level ($p<0.05$).

Among patients with Periodontitis stage I in group II, OHI-S index after 1 year of war deteriorated substantially and on average equaled 2.10±0.13 points, which corresponded to unsatisfactory hygiene, while remaining 21.3% lower, compared to the initial level ($p<0.05$). API index also sharply declined, on average equaling 100 (96.7-100)%, which corresponded to unsatisfactory interdental hygiene, and did not substantially differ from the initial level ($p>0.05$). PMA index sharply declined, too, on average equaling 31.1 (19.5-37.5)%, which corresponded to average inflammation, and did not statistically differ from the initial level ($p>0.05$) either. PBI index on average equaled 1.33 (0.62-1.43) points, and also did not statistically differ from the initial level ($p>0.05$). Periodontal PPD indicator on average equaled 2.82 (2.07-3.05) mm, and did not statistically differ from the initial level ($p>0.05$). PSR code on average equaled 1.83 (1.33-1.83), while remaining 15,7% lower, compared to the initial level ($p<0.05$).

Evaluation of the biochemical marker of stress of the cortisol hormone was carried out before the clinical and laboratory examination of patients of both groups in 2023, that is, 2 years after the first visit. The biochemical blood test showed a slight increase in the level of cortisol in 9 out of 49 patients, making 18.4%. Noteworthy, exactly these 9 patients during the control examination in 2023 were diagnosed with the clinical state of "unchanged" or "progression" of the pathological process in the periodontal tissues: 2 patients of clinical group I with Gingivitis had «progression»; 2 patients of clinical group II with Periodontitis stage I had an «unchanged»

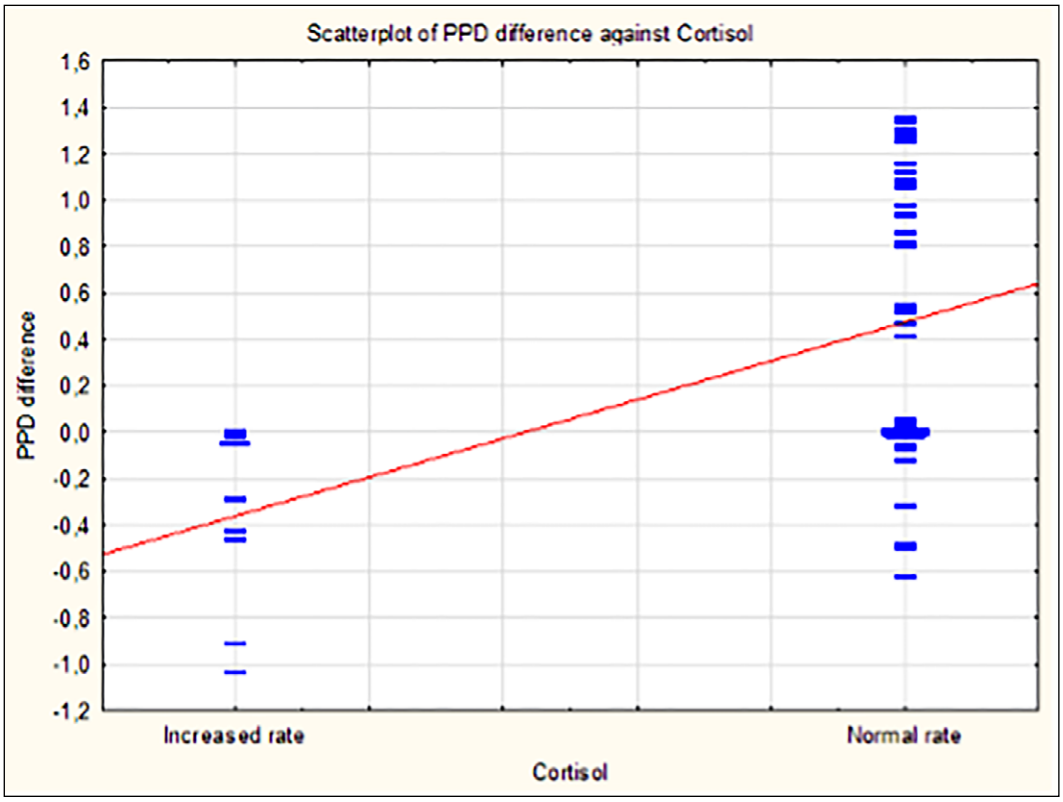

Fig. 3. Scatterplot of PPD difference against level of Cortisol.

condition, and 5 patients of clinical group II with Periodontitis stage I had «progression».

Statistical analysis revealed a weak correlation, according to the Spearman correlation coefficient (R=0.36, p<0.05), between the periodontal oral health status in patients with Gingivitis and Periodontitis in 2023 and the elevated level of cortisol in their blood (Fig. 2). It also established a weak correlation, according to the Spearman correlation coefficient (R=0.45, p<0.05), between the indicator of changes in the periodontal PPD index in the dynamics of treatment and the elevated level of blood cortisol (Fig. 3).

PSYCHOLOGICAL ASSESSMENT

Extreme living conditions, martial law and combat factors in Ukraine, in which the Ukrainian population appeared at the beginning of 2022, exert rather strong influence on the psycho-emotional sphere and the quality of life of a human. The intensity of perception of combat stress depends on the interaction of two main factors: the power and length of influence of combat factors on the mind, and the specific individual response to the effect of these factors.

At the beginning of 2023, before the follow-up clinical and laboratory examination, all patients were interviewed (V.Zung) to identify their psycho-emotional state in the conditions of prolonged martial law in Ukraine.

By the Zung (low mood-subdepression scale), the average value of the index of depression equals 61.2±0.91 points. In most patients – 32 out of 49 patients, making 65.3% – a substantial deterioration of the spirit and emotional instability (range 3) were detected. Only in 4 patients, making 8.2%, no deterioration of the spirit (range 1) was observed. In 11 patients, making 22.4%, a slight but clear deterioration of the spirit was observed (range 2). Unfortunately, 3 patients, making 6.1%, demonstrated deep depression and suspense (range 4).

Distribution of 49 patients in both clinical groups with Gingivitis and Periodontitis by the range of scale assessments according to the V.Zung method dependent on periodontal oral health clinical status in 2023 – «stabilization», «unchanged» and «progression» – is shown on Fig. 4. The condition of «stabilization» was observed in 22 patients, in that, 4 patients – range 1 according to the V.Zung method, 6 patients – range 2, 12 – range 3, 0 patients – range 4. The «unchanged» condition was observed in 8 patients, in that, 0 patients – range 1, 2 patients – range 2, 5 patients – range 3, 1 patient – range 4. The condition of «progression» was observed in 19 patients, in that, 0 patients – range 1, 3 patients – range 2, 14 patients – range 3, 2 patients – range 4 (Fig. 4).

Distribution of patients in both clinical groups by the range of scale assessments according to the V.Zung method.

Statistical analysis revealed a weak correlation, according to the Spearman correlation coefficient (R=0.40, p<0.05), between the periodontal oral health status in

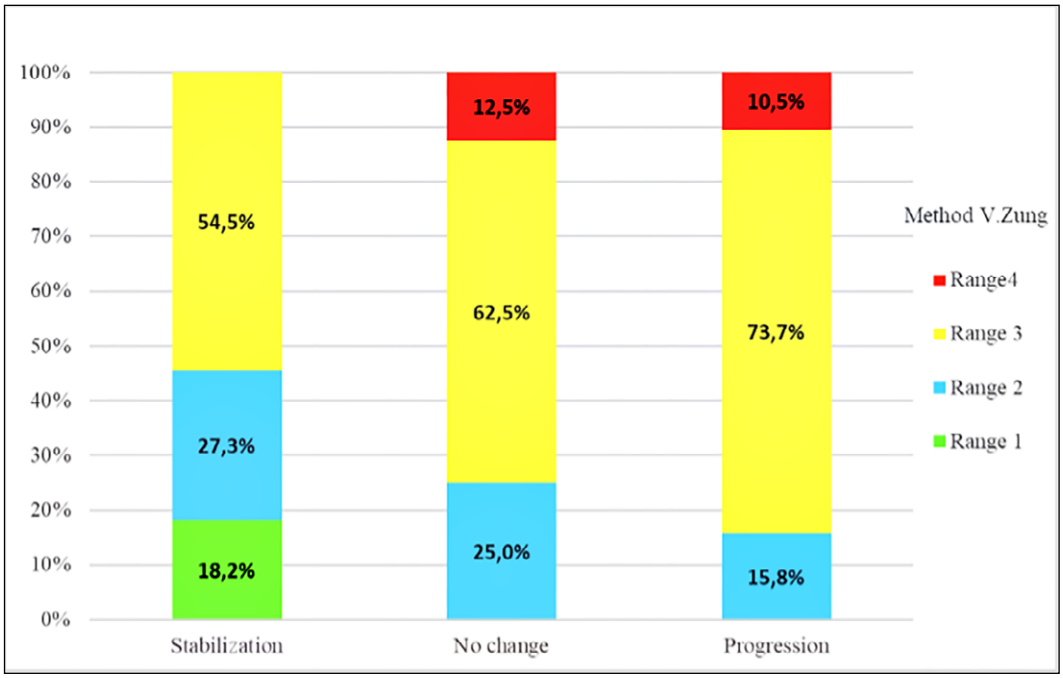

Fig. 4. Distribution of patients in both clinical groups by the range of scale assessments according to the V. Zung method.

patients with Gingivitis and Periodontitis in 2023 and the scale assessments of adverse mental conditions according to V.Zung (Fig. 5).

Correlation of weak strength was identified, according to the Spearman correlation coefficient (R=0.39, p<0.05), between scale assessments of adverse mental conditions according to V.Zung and the blood level of cortisol (Fig. 6).

Weak correlation was identified, according to the Spearman correlation coefficient (R=0.36, p<0.05), between scale assessments of adverse mental conditions according to V.Zung and the change of the periodontal index PPD in the dynamics of treatment (Fig. 7).

DISCUSSION

The possible correlation between psychological stress and generalized periodontitis was covered in a number of clinical studies. It was suggested that stress might play an important role in the development and severity of periodontal diseases [9]. It was established that individuals who experienced stress were more prone to the development and progression of periodontal diseases than subjects without stress [10, 11]. Our study identified correlations between scale assessments of adverse mental conditions according to V.Zung and periodontal oral health status in both observation groups, using the Spearman correlation coefficient (R=0.36, p<0.05).

Over the past decade, it has become more obvious that stress can negatively affect the health of the oral cavity, which can lead to increased plaque and gum inflammation [12].

Ravishankar et al. (2014) discovered that psychological stress can disrupt the lifestyle and hygienic condition of the oral cavity. Poor hygiene of the oral cavity due to stress can contribute to the accumulation of dental plaque and, over time, occurrence of gingivitis and periodontitis [13]. We observed a similar situation in our study: the indices of OHI-S and ARI significantly worsened in both groups after the beginning of the war.

Experimental studies *in vitro* have shown that the elevated level of cortisol in the blood plasma can provoke an inappropriate response of T-helpers to a microbial stressor and contribute to the destruction of the periodontium [14]. Psycho-emotional stress, which was determined by the increase in the level of cortisol in the oral fluid, is believed to be a risk factor in the pathogenesis of periodontal diseases (generalized periodontitis) [15].

Our study has established correlations according to the Spearman correlation coefficient (R=0.36, p<0.05) between the clinical periodontal oral health status in patients with Gingivitis and Periodontitis and their elevated blood level of cortisol. Correlations were also established according to Spearman's correlation coefficient (R=0.39, p<0.05) between V. Zung's scale assessments of adverse mental conditions and the blood level of cortisol. Glucocorticosteroids, in particular, cortisol, suppress immunity, including secretory IgA, IgG and functions of neutrophilic granulocytes. All these factors may be important in the protection of the periodontium from infection of the periodontium by pathogenic microorganisms. Secretory IgA antibodies can protect the periodontium by reducing the initial colonization of periodontium pathogens. IgG antibodies can provide protection through opsonization of periodontium pathogenic microorganisms for

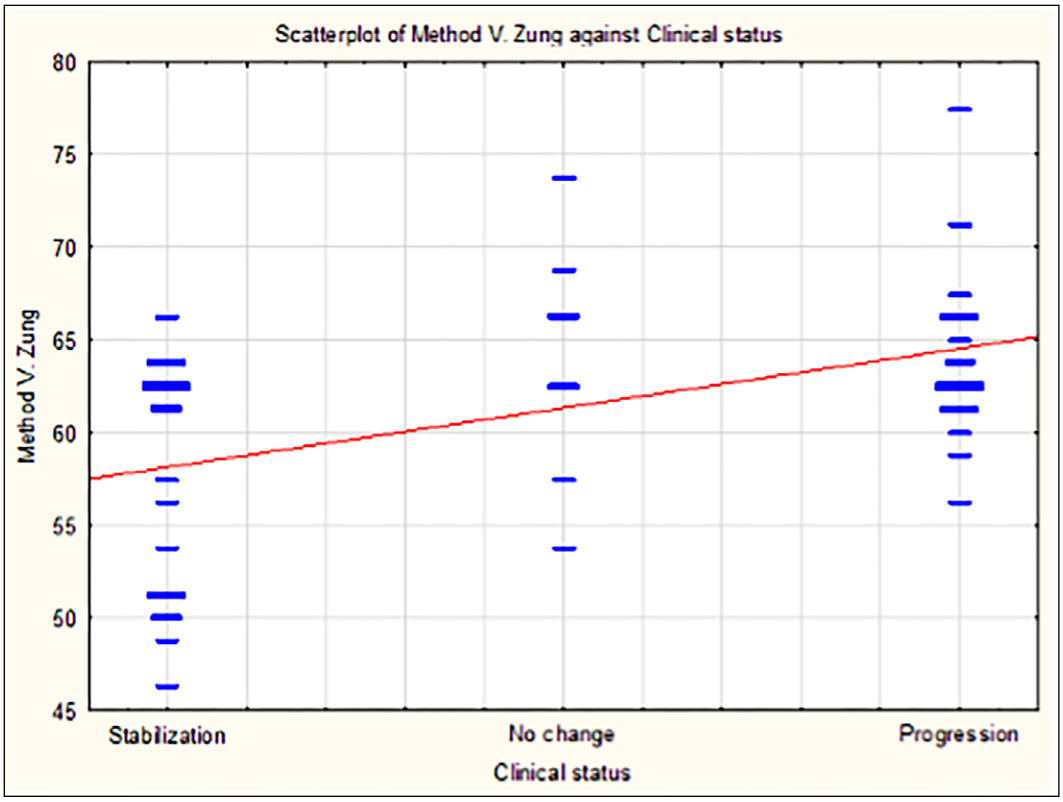

Fig. 5. Scatterplot of rate of Method V. Zung against of indicator of Clinical status.

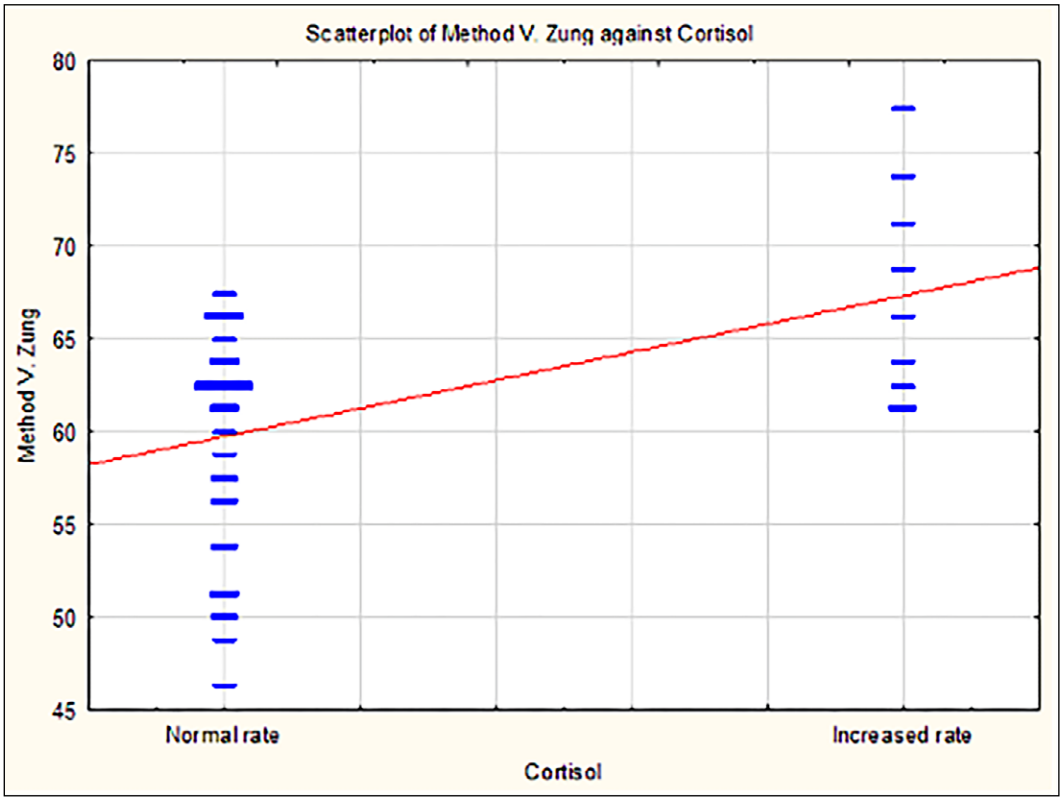

Fig. 6. Scatterplot of rate of Method V.Zung against level of Cortisol.

phagocytosis and their destruction by neutrophils. This leads to an increased susceptibility to infection of periodontal tissues, which, in turn, leads to the development of destruction of the periodontium and generalized periodontitis.

CONCLUSIONS

The our research results have shown that psycho-emotional stress is a factor that contributes to the pathogenesis of periodontal diseases and an increase in the level of cortisol in blood serum.

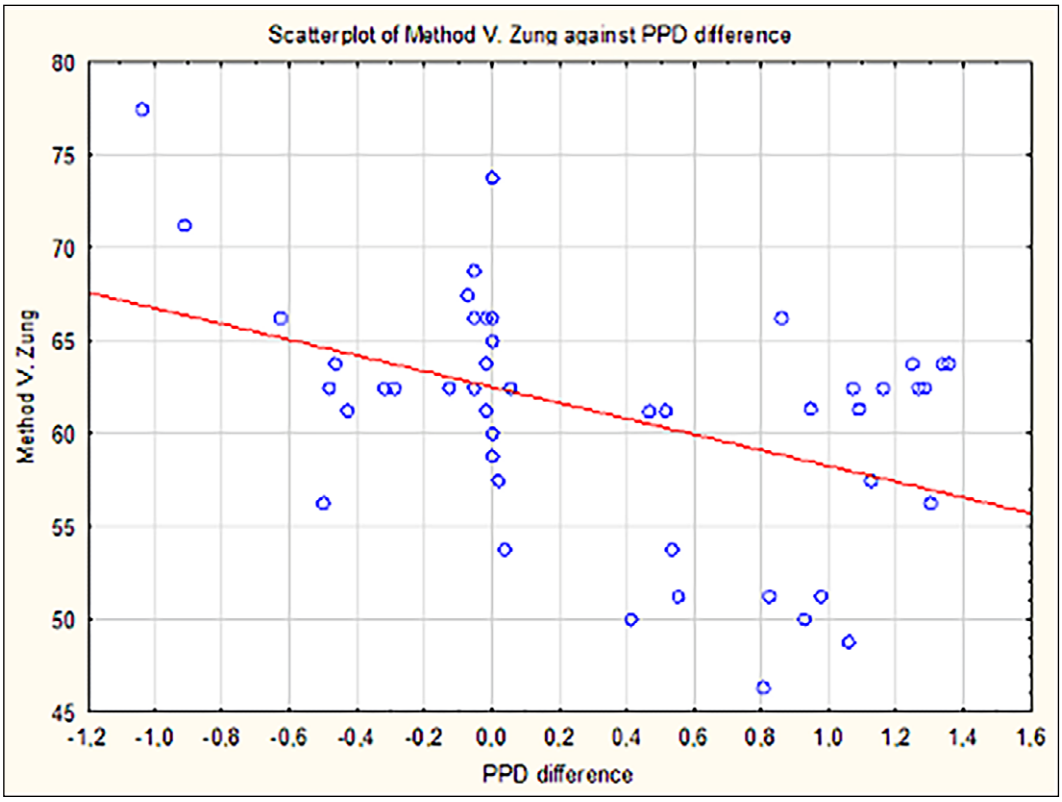

Fig. 7. Scatterplot of rate of Method V.Zung against PPD difference.

Stress also negatively influences the health of the periodontium through behavioral and lifestyle changes, increasing careless attitude to the oral cavity hygiene. It also influences the health of the periodontium through a direct biological effect, mediated by a change in the state of saliva, changes in the blood circulation of the gums and an effect on the body's immune response.

The obtained by us results give reason to consider it necessary to receive a consultation and, if required, treatment from a related specialist: an endocrinologist for the purpose of correcting the imbalance of the hormonal state and a psychologist (neuropathologist) for the purpose of normalizing and improving the psycho-emotional state of patients with increased indicators of stress and fear.

Considering the results of the research, it is important that dentists take into account stress factors as risks of periodontal diseases, their severity and reduction of the efficiency of treatment. Patients with chronic stress should be regularly reminded to maintain the health of periodontal tissues through constant motivation and an increase in the number of oral cavity hygiene procedures.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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