ANALYSIS OF THE BALANCE OF MICROFLORA AND PLAQUE IN THE GROWTH AND PROCESS OF MINERALIZATION IN CHRONIC GENERALIZED PERIODONTITIS

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Abstract. This article provides information on the fact that the structures of the oral cavity of military personnel in extreme climatic conditions cause significant physiological and biochemical changes, the protective mechanisms of dental tissues and oral mucosa weaken, and mineral metabolism is disturbed.

Keywords. High or low temperatures, drought, wind, sudden changes in humidity, caries, gingivitis, periodontitis, chronic generalized periodontitis.

СУРУНКАЛИ ГЕНЕРАЛЛАШГАН ПАРОДОНТИТДА ОҒИЗ БЎШЛИҒИДАГИ МИКРОФЛОРА МУВОЗАНАТИНИНГ БУЗИЛИШИ ВА МИНЕРАЛ АЛМАШИНУВ ЖАРАЁНЛАРИГА ТАЪСИРИНИНГ ТАҲЛИЛИ

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Аннотация. Ушбу мақолада ҳарбий хизматчиларнинг экстремал иқлим шароитида оғиз бўшлиғи тузилмалари сезиларли физиологик ва биохимик ўзгаришларга сабаб бўлиши, тиш тўқималари ва оғиз шиллиқ қавати муҳофаза механизмлари сусайиши, минерал алмашинув бузилиши тўғрисида маълумотлар келтирилган.

Калит сўзлар: юқори ёки паст ҳарорат, қурғоқчилик, шамол, намликнинг кескин ўзгариши, кариес, гингивит, пародонтоз, сурункали генераллашган пародонтит.

АНАЛИЗ БАЛАНСА МИКРОФЛОРЫ В ПОЛОСТИ РТА И ЕГО ВЛИЯНИЕ НА ПРОЦЕССЫ МИНЕРАЛИЗАЦИИ ПРИ ХРОНИЧЕСКОМ ГЕНЕРАЛИЗОВАННОМ ПАРОДОНТИТЕ

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Аннотация. В данной статье представлена информация о том, что структуры полости рта военнослужащих в экстремальных климатических условиях вызывают значительные физиологические и биохимические изменения, ослабевают защитные механизмы зубных тканей и слизистой оболочки полости рта, а также нарушается минеральный обмен.

Ключевые слова: высокие или низкие температуры, засуха, ветер, резкие изменения влажности, кариес, гингивит, пародонтит, хронический генерализованный пародонтит.

Relevance. Nowadays, protecting the health of military personnel and maintaining their high level of combat readiness is considered one of the main factors in ensuring state security and defense capability, and extreme climatic conditions - very high or low temperatures, drought, wind, sharp changes in humidity, and fluctuations in atmospheric pressure - cause significant physiological and biochemical changes in the human body, including in the structures of the oral cavity. Under the influence of such factors, the protective mechanisms of dental tissues and the oral mucosa weaken, mineral metabolism is disrupted, and the microbiological environment is disturbed. This leads to the accelerated development of dental diseases such as caries, gingivitis, periodontitis, and periodontosis. Therefore, clinical and theoretical studies of dental diseases in military personnel serving in extreme climatic conditions and the improvement of their secondary prevention are very urgent. The implementation of this research allows to maintain the health of military personnel, to effectively organize preventive treatment and to extend the service capacity [1,5].

In our republic, special attention is paid to scientific research aimed at improving the treatment of oral mucosal diseases, including oral mucosal diseases and their complications, in military personnel serving in extreme climatic conditions. Of particular importance in this regard are the identification of the clinical and functional features of the specific course of symptoms associated with oral diseases in modern dentistry, the assessment of the role of dental and physiotherapeutic measures in the complex treatment process, the development of a comprehensive step-by-step approach plan that takes into account the somatic condition of military personnel, the proposal of treatment and prevention methods based on the functional disorders of the oral cavity organs of military personnel serving in extreme climatic conditions; and the improvement of the development of methods for assessing the effectiveness of treatment [2,7,10].

In our country, targeted and practical measures are being taken to reform the healthcare system and bring it into line with global requirements, including measures to develop effective ways of early diagnosis, improvement of the effectiveness of complex treatment and prevention of dental diseases in military personnel serving in

extreme climatic conditions. In this regard, in Part 4, Goal 56 of the 7 priority areas specified in the Strategy for the Development of New Uzbekistan for 2022-2026, tasks such as “implementation of complex measures aimed at protecting the health of the population, increasing the potential of medical workers and implementing the program for the development of the healthcare system for 2022-2023” are set. In this regard, it is indicated that the implementation of the practice of improving the treatment of diseases of the oral mucosa and dental diseases in military personnel serving in extreme climatic conditions is considered one of the relevant scientific directions [3,7].

Extreme climatic conditions have been studied in various areas of medicine as one of the important factors affecting human health, including the structures of the oral cavity. A number of scientific works by domestic and foreign scientists have analyzed the influence of climatic and geographical factors on physiological, biochemical and immunological mechanisms, including the disruption of the balance of microflora in the oral cavity and the processes of mineral metabolism (Abdullaev D.B., 2021; Gribovskaya M.O., 2023).

However, the existing scientific sources do not fully explain how the working and living conditions of military personnel, combined with the effects of extreme climatic conditions, affect the occurrence of dental diseases (Sharipova G.I. et al., 2023).

Most studies have been conducted on the general population, and the special conditions of military service - physical exertion, nutritional characteristics, water supply, stress factors, and sanitary and hygienic conditions - have been studied less. Therefore, there is a need for a deep analysis of the pathogenetic mechanisms of dental diseases in military personnel under the influence of extreme climatic conditions, and on this basis, to scientifically improve the secondary prevention system.

The purpose of the study is to determine the mechanisms of development (pathogenetic) of chronic generalized periodontitis in military personnel serving in extreme climatic conditions and to improve the secondary prevention system aimed at their prevention.

Tasks of the research:

analysis of prevalence, structure and clinical characteristics of dental diseases in military personnel serving in extreme climatic conditions;

study and analysis of cyto-morphological changes in gum tissue in chronic generalized periodontitis caused by extreme climate;

development of a system of secondary preventive measures suitable for extreme climatic conditions in chronic generalized periodontitis among military personnel;

development of scientifically based recommendations for introduction into the practice of dental service in the military.

The object of the study was 150 patients from the dental department of the central polyclinic under the Central Military Clinical Hospital of the Ministry of Defense of the Republic of Uzbekistan.

The subject of the study was the assessment of the data of anamnestic, clinical, laboratory and dental examinations and analyzes of military personnel suffering from chronic generalized periodontitis in extreme climatic conditions, who received a course of complex dental treatment in combination with symptomatic drugs as a treatment.

Research methods. The study used anamnestic data, clinical, questionnaire, laboratory and statistical (t-Student and Pearson criteria) methods.

The scientific novelty of the study is as follows:

For the first time, the prevalence, clinical manifestations and development characteristics of dental diseases, including chronic generalized periodontitis, among military personnel serving in extreme climatic conditions have been comprehensively studied;

For the first time, cyto-morphological changes in gum tissues under the influence of extreme climatic factors (large temperature differences, humidity, wind, radiation, atmospheric pressure, etc.) have been deeply analyzed, and the biological connection between climatic stress and metabolic adaptation mechanisms in the development of chronic generalized periodontitis has been scientifically proven;

A new system of secondary prevention aimed at protecting the dental health of military personnel serving in extreme climatic conditions has been developed and its effectiveness has been tested in clinical conditions;

Scientifically based recommendations adapted to climatic conditions have been developed for use in military dental practice, which has created an opportunity to reduce the incidence of dental diseases in military personnel and improve preventive work.

The primary goal of treating inflammatory periodontal diseases is to eliminate pathogens and eliminate the negative consequences of their impact on periodontal tissues, as pathological changes in periodontal tissues occur when microorganisms are activated against a background of decreased resistance [2].

Eliminating periodontopathogenic factors and stopping the inflammatory process is a primary goal. Once achieved, it is possible to proceed to the next stages of treatment, namely, eliminating periodontal pockets, stabilizing dental arches, normalizing trophism and homeostasis, and restoring the protective functions of periodontal tissues and hemomicrocirculation [3].

With timely treatment of periodontal diseases, it is possible to achieve stable remission, which can be maintained for a considerable period of time, with the correct treatment and rehabilitation approach. Thorough removal of dental plaque is the key to effective periodontal treatment [12].

Professional scaling, which plays a key role in the treatment of periodontal disease, involves preliminary irrigation of the oral cavity with antiseptics, local application or injection anesthesia, direct scaling with antiseptic irrigation, grinding, preliminary and final polishing of tooth surfaces, and final irrigation with antiseptics [8].

Local treatment is given considerable importance, as is the individual selection of hygiene products, such as therapeutic and prophylactic toothpastes, elixirs, or rinses. To achieve positive results, therapeutic and prophylactic procedures performed by the dentist must be combined with the active cooperation of the patient [7].

Modern toothpastes contain potent ingredients that can be considered therapeutic and prophylactic agents capable of eliminating the causes of dental diseases or reducing their negative effects. The use of such toothpastes leads to the normalization of free radical levels in oral fluid, which enhances the effectiveness of disease prevention measures. Biologically active components of toothpastes, such as trace elements, phosphates, calcium, and plant extracts, penetrate the hard tissues of the teeth and the oral mucosa, increasing their resistance to pathological external influences. They stimulate the synthesis of sulfated mucopolysaccharides in the periodontium, activate reparative processes, and enhance the therapeutic effect of other factors [5].

Long-term experimental research and clinical observations explain the preventive value of oral hygiene by factors such as regular plaque removal, the positive effects of active toothpaste components, and improved blood circulation due to gum massage [14].

The use of drugs with pronounced antimicrobial activity, such as chlorhexidine bigluconate, triclosan, hexetidine, biosol, and metronidazole in toothpastes, not only increases anti-inflammatory effectiveness but also affects saprophytic microorganisms in the mouth, leading to the development of dysbiosis and provoking the development of resistance of pathogenic microflora to these components. Ultimately, this will negatively affect both the tissues and organs of the mouth, as well as the overall health of the individual [9].

Long-term use of oral hygiene products containing chlorhexidine bigluconate leads to discoloration of teeth and dryness of the mucous membrane. Therefore, it is advisable to recommend limiting the use of toothpastes or rinses containing strong antiseptics to the period of active treatment of inflammatory periodontal diseases, followed by their replacement with products that do not contain such drugs [4]. The natural ingredients found in oral hygiene products, even when absorbed into bloodstreams through the mucous membrane, do not cause adverse effects, as confirmed by numerous studies. These personal hygiene products appeal to many patients due to their naturalness. They are recommended for use in inflammatory periodontal diseases [7].

Laboratory studies have shown that aspen bark extract activates reparative and metabolic processes, improves periodontal tissue trophism, normalizes platelet aggregation and disaggregation, and increases oral tissue resistance. Moreover, the use of products containing aqueous aspen bark extract has yielded significant positive results, with the complex of amino acids, vitamins, and macro- and microelements found in aspen bark playing a significant role in these processes, rather than antioxidants [9].

The DAI was calculated using the formula: DAI = Sum of criterion scores / number of criteria × 5 (where 5 is the number of parameters for each criterion). DAI interpretation: 0.81–1.0 points – very severe condition; 0.61–0.80 points – severe condition; 0.41–0.60 points – satisfactory condition; 0.21–0.40 points – good condition; 0–0.2 points – very good condition.

The antihalitosis efficacy of the studied products was determined using the formula: Efficacy (%) = [(Ido – Ipost) x 100] / Ipre, where Ido is the IADU value at the initial examination; Ipost is the IADU value after three months of using the studied product.

IADU interpretation: 0.0–20.0% – very low deodorizing efficacy; 20.1–40.0% – low oral deodorizing efficacy; 40.1–50.0% – moderate oral deodorizing efficacy; 50.1–60.0% – good oral deodorizing efficacy; 60.1–80.0% – high oral deodorizing efficacy; 80.1–100.0% – very high oral deodorizing efficacy [5].

Determination of the pH level of gingival fluid The pH level of gingival fluid was assessed using strips of universal indicator paper "SPECIAL INDICATOR PAPER" [3]. For this purpose, they were immersed in the periodontal pocket near the central or lateral incisors of the maxilla, before performing the PGR and during control examinations.

Microbiological Study: Bacteriological methods were used to examine the effect of the developed gel composition (GC) on the biological properties of microorganisms, namely their viability, adhesiveness, and biofilm-forming properties. The following cultures were used: Streptococcus sanguinis, Streptococcus mitis, Streptococcus oralis, Streptococcus salivarius, Staphylococcus aureus, Enterococcus faecalis, Klebsiella pneumoniae, Pseudomonas aeruginosa, and Acinetobacter baumannii. The choice of microbial cultures was determined by the fact that Streptococcus sanguinis, Streptococcus mitis, Streptococcus oralis, and Streptococcus salivarius are directly involved in the formation of microbial biofilm on the tooth surface and are primary colonizers [65], Staphylococcus aureus and Enterococcus faecalis serve as markers of a certain stage of inflammatory processes in the periodontium, and Klebsiella pneumoniae, Pseudomonas aeruginosa, and Acinetobacter baumannii possess virulence markers as co-pathogens in periodontitis [1, 4].

The antibacterial properties of the gel composition were studied by preparing a

suspension of 24-hour bacterial cultures in a saline solution at a concentration of 1x108 CFU/ml. HA was added to the test tubes containing the microorganisms. To compare the results, chlorhexidine gel was added to other test tubes containing similar microorganisms, and test tubes were left without the test agents (control). They were then placed in an incubator for 30 minutes at 37°C. Ten microliters of each test tube were then seeded onto Petri dishes containing nutrient agar. Blood agar was used for streptococci, and meat-peptone agar was used for other bacterial species. The microbial cultures were placed in an incubator for 24 hours at the same temperature, after which the colonies were counted and the arithmetic mean was calculated.

Blagonravova's buccal epithelial cells were pre-washed to remove indigenous microorganisms in saline at pH 7.2–7.4 (35 g) for 10 minutes and then transferred to 0.5 ml test tubes. A bacterial suspension (0.5 ml suspension – 3x108 CFU/ml S. sanguinis), HA, and chlorhexidine bigluconate gel were then added. One tube was left without the test agents for natural colonization (control). After vigorous shaking, the tubes were placed in a thermostat, and smears were prepared for Gram staining.

The adhesion index was calculated using the formula: IA = AKB50/50E, where IA is the adhesion index, AKB50 is the number of bacterial cells attached to 50 epithelial cells, and 50E is the number of 50 epithelial cells studied [7].

To study the antibiofilm properties of GC, periodontal pocket contents were collected using sterile paper points prior to PGR in the lateral and anterior regions of the oral cavity on the upper and lower jaws and placed in sterile test tubes with nutrient medium. Pure cultures were identified using MALDI-TOF mass spectrometric analysis[6].

A phenotypic biofilm formation test was performed as follows: a bacterial suspension containing 1 x 105 CFU/ml of the S. anginosus strain was prepared in Mueller-Hinton broth. A 200 µl aliquot was then applied to two glass slides. The gel to be tested was then applied to one slide, while the other slide served as a control. The slides in Petri dishes were placed in an incubator at 37°C for 48 hours. The resulting biofilm was then fixed with a 4% paraformaldehyde solution at 4°C for 20 minutes. The solution was removed and stained with Dapi dye (1:1000), which was washed off with saline after 30 minutes. Microscopic examination was performed using an Axio Scope A1 fluorescence microscope (Zeiss) at 630x magnification and a professional AxioCam HRc Rev3 stationary digital camera. Biofilm density was determined by bacterial fluorescence in the field of view on a hyaluronic acid-coated slide and compared to a control slide [9].

Conclusion. 1. Based on the assessment of clinical, morphological and biochemical characteristics of chronic generalized periodontitis in military personnel serving in extreme climatic conditions, the diagnostic criteria were improved.

2. By identifying the cyto-morphological changes that occur in milk tissues

under the influence of extreme climate, the possibilities of early detection of the stages of the development of the disease were developed, and based on the climatic, hygienic and physiological characteristics of military personnel, a special adaptive oriented secondary prevention system was created.

3. The developed prophylactic system was tested in clinical conditions and its practical effectiveness was confirmed - the incidence of recurrence of the disease was reduced and the morphofunctional state of gum tissue improved.

4. Scientifically based methodological recommendations and practical instructions were developed for use in military dental service practice. These recommendations serve to improve the sanitary-hygiene work in military units and increase the effectiveness of preventive dental care.

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