METHODS OF ASSESSING THE HYGIENIC CONDITION OF THE ORAL CAVITY IN CHRONIC GENERALIZED PERIODONTITIS CAUSED BY EXTREME CLIMATE

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Abstract. Periodontal diseases of inflammatory origin are considered to be the main dental diseases, as for many decades they have been the most common among other diseases of the maxillofacial region. The Toothpaste Effectiveness Index was used to objectively evaluate toothpastes. This index allows for a more specific evaluation, selection of the most effective products among similar groups, and qualitative assessment, expressed as points for each criterion.

Key words. Periodontium, individual oral hygiene, maladaptive processes, adhesion, sensitivity, bioactive substances.

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, and periodontitis[3].

According to the World Health Organization (WHO), periodontal inflammatory diseases are the second most common after caries and are one of the main causes of tooth loss among the elderly population. According to recent studies, chronic disseminated periodontitis is diagnosed in more than 90% of adults in the CIS countries, including the Republic of Uzbekistan. At the same time, its frequency of detection among adolescents and young people is rapidly increasing, which indicates a large-scale and ongoing epidemic of inflammatory-destructive periodontal diseases [1,6].

The index criteria include an assessment of the presence of active ingredients in toothpastes, consistency, density of the pastes, intended use by age category, an assessment of foaming, the presence of dietary supplements, an assessment of the cleaning ability, the presence of an anti-inflammatory effect based on changes in the PMA index values, the occurrence of allergic reactions, and the taste and smell of the toothpaste. Each criterion corresponds to a code from 0 to 5. The EZPU index was calculated using the following formula:

EZPU index = a1 + ... an / n, where: a1 is the score for the first criterion; a n is the score for the nth criterion; n is the number of criteria used in the index.

Interpretation of the obtained results: 0 points - unsatisfactory toothpaste, unsuitable for use; 1 point - low-quality toothpaste, conditionally suitable for use; 2 points - satisfactory quality toothpaste; 3 points - good quality toothpaste; 4 points - very good quality toothpaste; 5 points – toothpaste of the highest quality [12].

The Mouthwash Effectiveness Index (MEI) allows one to determine quality indicators, classify mouthwashes with different properties and belonging to different types, objectify subjective data and sensations, evaluate the quality of additional hygiene products, and compile their comprehensive assessment. Codes and criteria are distributed similarly to the EHIF index.

The EHIF index was calculated using the following formula: EHIF index = a1 + ... an / n, where: a1 is the score for the first criterion; a n is the score for the nth criterion; n is the number of criteria used in the index.

Interpretation of the obtained results: 0 points - the mouthwash is unsatisfactory, unsuitable for use; 1 point - a low-quality mouthwash, conditionally suitable; 2 points - a satisfactory mouthwash, suitable for use; 3 points - a good-quality mouthwash; 4 points - a very good-quality mouthwash. 5 points – the highest quality mouthwash [9].

Oral Health Index Assessment The study used the OHI-S hygiene index by Greene J., Vermillion J. Greene, J.C. [2] according to a well-known method.

Calculation formula: 40 Index = (summed plaque values / tooth surfaces) + (summed tartar values / tooth surfaces). Interpretation of index values: 1. 0-0.6 – good hygiene; 0.7-1.6 – satisfactory hygiene, 1.7-2.5 – unsatisfactory hygiene, 2.6-3.0 – poor hygiene [3]. The cleaning effectiveness of the studied products was calculated by reducing the digital values of the OHI-S index over the study period.

The calculation was performed using the formula [120]: Eff (%) = [OHI-S(before)–OHI-S(after)] x 100 / OHI-S(before), where OHI-S (before) is the index value at the initial examination, OHI-S (after) is the index value after three months.

The papillary-marginal-alveolar index (PMA) was calculated using a standard methodology. The following codes and criteria were used to evaluate the PMA index: 0 – no inflammation; 1 – inflammation has affected the gingival papilla (P); 2 – inflammation has spread to the marginal gingiva (M); 3 – inflammation has spread to

the attached gingiva (A). The calculation was then performed using the following formula: the sum of the indices for each tooth × 100% / 3 * × number of teeth, where * is the averaging coefficient.

Index value: Limited inflammation – 25%. Marked prevalence and intensity – the index approaches 50%. Further prevalence and increase in intensity – 51% or more [5].

The effectiveness of the anti-inflammatory action of the studied agents was calculated by the reduction of the digital values of the PMA index during the study and was calculated using the following formula [120]: E (%) = [PMA (before) – PMA (after)] x 100 / PMA (before), where PMA (before) is the PMA index value obtained during the initial examination, PMA (after) is the index value after three months. The bleeding index SBI Muhleman H.R., Son S. was carried out using the generally accepted method [7].

Interpretation of the index in points: 0 - no bleeding; 1 - bleeding occurs 30 seconds after the test; 2 - occurs immediately after the test; 3 - occurs during chewing, brushing teeth. The index value is calculated using the formula: SBI = sum of the indicators / 6 (number of teeth) [9].

The effectiveness of the hemostatic effect of the studied agents was calculated by the reduction of the digital values of the SBI index over the study period and calculated using the following formula [120]: E (%) = [SBI (before) - SBI (after)] x 100 / SBI (before), where SBI (before) is the index value at the initial examination, SBI (after) is the index value after three months. To determine the intensity of hypersensitivity of hard dental tissues and its reduction during the use of various rinses, the tooth sensitivity index (TSI) of L.Yu. Orekhova-S.B. Ulitovsky [10].

The index was determined using a well-known method [120], which took into account criteria such as patient complaints of increased tooth sensitivity to external stimuli, their intensity and duration, and factors that provoke pain. Diagnostic tests for tactile and temperature sensitivity were also conducted.

The tooth sensitivity index was calculated using the formula: DS (%) = [(sum of all criteria scores) x 100] / number of criteria.

Index interpretation: 81–100% – very severe condition; 61–80% – severe condition; 41–60% – moderate sensitivity (relatively compensated condition); 21–40% – mild sensitivity; 20% – normal sensitivity.

The effectiveness of the DS of oral hygiene products was calculated using the formula (%) = [(A - B) x 100] / A, where: A – DS index values determined during the initial examination; B – DS index values determined after three months. DS index assessment criteria: 20.0% – very low effectiveness; 20.1–40.0 – low effectiveness; 40.1–60.0 – moderate effectiveness; 60.1–80.0 – high efficiency; 80.1–100.0 – very high efficiency [12].

The deodorizing action index (DAI) [14] was determined using a generally accepted method, which took into account such criteria as patient complaints about an unpleasant odor during breath, conversation, and its intensity.

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 [12].

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[5].

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 [7].

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