https://doi.org/10.32394/pe/191558

Aiman Onerova, Ardak Yeslyamgaliyeva

PREVALENCE OF INFLAMMATORY PERIODONTAL DISEASES

Department of Prosthetic and Pediatric Dentistry, Astana Medical University, Kazakhstan

ABSTRACT

INTRODUCTION. Determining the prevalence of inflammatory periodontal diseases makes it possible to determine the age group most prone to them, which will help to implement correct treatment and prevention measures for persons of this group, aimed at increasing the level of individual and public health of the Republic of Kazakhstan.
PURPOSE. The purpose of the study was to determine the prevalence of inflammatory periodontal diseases among the population of the city of Astana according to several criteria and to compare data on the statistics of periodontitis incidence from the world and Kazakhstan.
MATERIAL AND METHODS. The research was conducted using the methods of clinical examinations and statistical data processing. The study involved 642 people aged 18 to 80 years who, within twelve months, applied to dental institutions in Astana and were checked according to the inclusion and exclusion criteria.
RESULTS. Clinical studies included determining the level of oral hygiene using the simplified oral hygiene index OHI-S and determining the condition of periodontal tissue using the community periodontal index of treatment needs CPITN. The research was conducted in five age groups: 18-25, 26-35, 36-50, 51-65, and 66-80 years. It was found that the highest prevalence of various forms of gingivitis and periodontitis was observed in the 66-80 age group – 99% and 69%, respectively. The general distribution in all groups indicated a directly proportional relationship between the frequency of detection of inflammatory periodontal diseases and the age of the participants.
CONCLUSIONS. A comparison of data on the incidence of periodontal disease in the world and in Kazakhstan showed a 3.52% lower incidence rate in Kazakhstan compared to the world average. The use of regular and timely preventive and treatment measures for the population group most prone to inflammatory periodontal diseases will make it possible to improve the level of public health.

Keywords: *oral hygiene, bleeding gums, calculus, dental plaque, gingivitis*

INTRODUCTION

Determining the level of public health in international practice is carried out with the help of complex demographic indicators of birth and mortality, average life expectancy, indicators of disability and the general level of physical development (1). Each of these indicators is affected by the level of disease prevalence, which, depending on the scale of coverage, is fixed at the local, regional, state, or global level (2). Therefore, one of the main tasks of the healthcare sectors of each country is the constant monitoring of the prevalence of diseases to ensure a stable epidemiological state. Determining the prevalence of inflammatory periodontal diseases will make it possible to identify the population group most prone to them, which allows the development of correct preventive and therapeutic measures in order to improve the level of public health in Kazakhstan. Several main problems were formed in this study. The first was the selection of criteria for determining the prevalence of inflammatory periodontal diseases, the second was the lack of international unified methods for determining the prevalence of these diseases, the third was the lack of statistics on the incidence of various forms of periodontitis in the world and in Kazakhstan.

In their study, Ruzuddinov et al. conducted an assessment of the dental health of the adult population of Kazakhstan with the aim of improving removable prosthetics (3). The results of the dental examination of the urban and rural population included the detection of such forms of dental disease as carious lesions, periodontal diseases and defects of the dentition, which were characterized by complete or partial absence of teeth on the upper, lower or both jaws. Since the main attention in this study was directed to the defects of the dentition, in order to identify the need for the

improvement of replacement prosthetics, the problem of choosing criteria for determining the prevalence of carious lesions and periodontal diseases was not solved.

Daminova and Makhkamova estimated the prevalence of inflammatory diseases of the hard and soft tissues of the oral cavity in persons engaged in contact sports (4). To determine the prevalence of these diseases, the dental status of 64 subjects was determined, and a survey was conducted based on a specialized card, which included the identification of the presence or absence of maxillofacial region injuries and the experience of using protective caps. Given the specificity of the task set by the authors, which was to reveal the relationship between diseases of the oral cavity and the presence of injuries received as a result of engaging in contact sports, the use of the proposed criteria for general population studies to detect the prevalence of periodontal diseases is incorrect.

The generally accepted method of diagnosis remains effective during clinical examination, but raises doubts about the correctness of its application for conducting population studies. Gündoğar et al. conducted a cross-sectional study to determine the levels of cytokines, chemokines, and growth factors in gingival crevicular fluid in patients with periodontal disease and in healthy individuals (5). According to the results of the study, the levels of interleukin, interferon g-induced protein 10, macrophage chemotactic protein 1 and vascular endothelial growth factor were significantly higher than in healthy individuals, which makes it possible to use these peptides and proteins as markers of periodontal diseases. Jumayev et al. conducted a study to determine the predictors of the development of chronic gingivitis in children of Turkmenistan (6). The authors found that exceeding the critical number of such pathogens as *Porphyromonas gingivalis, Prevotella intermedia, Treponema denticola, Prevotella oralis, Fusobacterium nucleatum* affects the development of chronic catarrhal gingivitis and is a predictor of the occurrence of an inflammatory process in the periodontal tissue. The results of the conducted studies have significant practical value, however, for their use in population studies, a final check must be carried out for the development of specific diagnostic tests.

Nortaev et al. in the study of the prevalence of periodontal disease among workers in the chemical industry provided the global general statistics of these diseases, but the indicators of the countries of the world and Central Asian countries were not given separately (7). Thus, the results obtained for comparing data on the prevalence of periodontitis in the world and in Kazakhstan are currently insufficient.

The purpose of this study was to determine the prevalence of inflammatory periodontal diseases according to several criteria and to compare data on the incidence of periodontitis in Kazakhstan and the world. The research hypothesis: the prevalence of inflammatory periodontal diseases increases with age among the population of Astana, Kazakhstan. It aligns with the study's purpose and reflects the common understanding in periodontal research that age is a significant factor in the development and progression of periodontal diseases.

MATERIAL AND METHOD

Clinical examinations included physical and laboratory examinations. Conducting a physical examination consisted in the collection of anamnesis and examination of patients who applied to various dental institutions of the city of Astana for twelve months. The selection of Astana as the study site was determined by the fact that as a capital, the city offers a unique demographic representation, attracting residents from various regions and socioeconomic backgrounds. This provides a diverse population sample. The city's significance as the capital also means that findings from this study could have broader implications for national oral health policies. The variety of the dental institutions in the study was determined by the attempt to capture a broad spectrum of the population and various treatment approaches. The geographic distribution of these institutions within the city was also taken into account to ensure coverage of different city districts and socioeconomic areas.

Formation of the sample was carried out by means of a survey on compliance with the inclusion and exclusion criteria. The inclusion criteria were as follows: age from 18 to 80 years and absence of contraindications to the examination. Exclusion criteria were met by participants who: due to an unstable state of health required urgent medical care, underwent antibiotic therapy or other drug therapy, underwent dental prophylaxis during the last six months before the start of the study, had a confirmed pregnancy. The sample formed in this way included 642 people, who were divided into 5 groups by age. The age and gender distribution are shown in Table 1.

The age group classifications used in this study were intentionally created to preserve useful and statistically significant cohorts while capturing the evolution of periodontal diseases over various life stages. The five age groups represent significant stages in adulthood that could be associated with various risk factors and oral hygiene practices. This classification offers large enough sample numbers within each category for statistically significant comparisons, and it also permits a detailed examination of the potential changes in periodontal disease prevalence and severity throughout adulthood. These age ranges also correspond to typical

Table 1. Age and gender composition of research participants

Group	Age of participants	Total number of patients	Number of women	Number of men
1	18-25 years old	240	106 (44%)	134 (56%)
2	26-35 years old	112	60 (53%)	52 (47%)
3	36-50 years old	122	50 (41%)	72 (59%)
4	51-65 years old	90	40 (44%)	50 (56%)
5	66-80 years old	60	40 (67%)	20 (33%)

Source: compiled by the authors

cohorts utilized in epidemiological investigations, which makes it easier to draw parallels with other periodontal health research.

Clinical indices were used as an assessment tool during oral examinations to evaluate oral hygiene status. The simplified oral hygiene index OHI-S Greene-Vermillion (1964) was used to determine the level of oral hygiene (8). The method of its determination consisted in staining the vestibular surfaces of teeth – 16, 11, 26, 31 – and the lingual surfaces of teeth – 36, 46 – with an iodine-containing solution and determining plaque and calculus on their surfaces. The OHI-S index was calculated according to the formula:

$$\text{OHI S} = \frac{\sum dp}{n} + \frac{\sum t}{n}, \quad (1)$$

where: Σ – the sum of values; dp – dental plaque; t – tartar; n – the number of examined teeth (usually 6).

The interpretation of the obtained values is given in Table 2.

Table 2. Interpretation of OHI-S index values

Index value	Evaluation of the index	Assessment of oral hygiene
0-0.6	Low	Good
0.7-1.6	Average	Satisfactory
1.7-2.5	High	Unsatisfactory
More than 2.6	Very high	Bad

Source: compiled by the authors.

The condition of the periodontal tissue was determined by calculating the CPITN index of the need for treatment of periodontal diseases (9). To determine the index, tooth rows are divided into sextants – frontal and two lateral, in each of which the periodontal condition of the tooth with the most severe clinical condition is recorded. Attention is drawn to the following clinical symptoms: bleeding gums, tartar, pocket depth. For the examination, a periodontal probe is used, with divisions at the level of 3.5 and 5.5 mm to fix the depth of the pocket. The amount of necessary medical measures depends on the evaluation of the obtained results (Table 3).

The selection of OHI-S and CPITN was based on their well-established reliability and widespread use in epidemiological research on periodontal health. The OHI-S provides a quantitative assessment of oral hygiene status by evaluating dental plaque and calculus accumulation. The CPITN offers a comprehensive evaluation of periodontal status and treatment needs. Together, these indices allow for a multifaceted analysis of oral health, linking hygiene practices with periodontal outcomes. Their standardized nature facilitates comparisons with other studies worldwide, enhancing the global relevance of the findings. Statistical processing of the obtained data was carried out using the Microsoft Excel application package and IBM SPSS 23 software for statistical data analysis. Patients or their legal representatives' consent to conduct the examination was obtained.

Table 3. Evaluation of the results of the periodontal examination and the amount of necessary treatment measures

Examination results	Score in points	Scope of treatment measures
Clinically healthy periodontium	0	No treatment is required
Bleeding during probing	1	Improvement of oral hygiene
Periodontal pocket up to 3 mm, bleeding, subgingival calculus	2	Removal of tartar and improvement of oral hygiene
Periodontal pocket 3.5-5.5 mm	3	
Periodontal pocket more than 6 mm	4	Treatment of periodontal disease by surgical methods

Source: compiled by the authors

RESULTS

When studying the prevalence of inflammatory periodontal diseases, attention was paid to those criteria and methods of determination that provided numerical indicators of this prevalence for the correctness of

comparing its values in the studied groups of patients. For this purpose, the OHI-S Greene-Vermillion simplified oral hygiene index and CPITN periodontal disease treatment need index were used in the study. These indices are used in dental research all over the world and have a clear evaluation system, which facilitates ease of use for comparative studies (10-12).

After determining the level of oral hygiene according to the simplified OHI-S index in each study participant (formula 1), the average value of this index was calculated for each age group (Table 4).

Table 4. Average values of the OHI-S index in the studied groups

Age group	OHI-S index
Group 1 (18-25 years old)	1.9
Group 2 (26-35 years old)	2.5
Group 3 (36-50 years old)	2.6
Group 4 (51-65 years old)	3
Group 5 (66-80 years old)	3.2

Source: compiled by the authors

Using the interpretation of the results of the OHI-S index (Table 2), it can be noted that patients of groups 1, 2 and 3 have a high score of the index, which corresponds to an unsatisfactory assessment of oral hygiene, and patients of groups 4 and 5 have a very high score of the index, indicating for a poor hygiene rating. The best indicators were found in the age group of 18-25 years, and in each subsequent data the indicators worsened compared to the previous one, which indicated a decrease in the assessment of oral hygiene depending on the increase in the age of the study participants. This distribution may indicate a relationship between age and oral hygiene. It is also worth paying attention to the difference in the index between the groups. The difference between the first and second groups was 0.6, between the second and third – 0.1, between the third and fourth – 0.4, and between the fourth and fifth – 0.2. The greatest discrepancy was observed between the first and second, as well as between the third and fourth groups. Such an observation may indicate the presence of relative age thresholds, which are characterized by a noticeable decrease in the level of oral hygiene. In this study, these thresholds are found at the age of 25-35 years and 50-65 years. In order to test this hypothesis, it is worth checking the persons of these age categories, dividing them additionally into several more age groups, using, for example, a step of 5 years, and to increase the reliability of the results, use several indicators of oral hygiene, and as a control group, it is recommended to choose participants with no complaints about dental problems in the anamnesis.

To determine the state of the periodontal tissue, the CPITN index of the need for the treatment of periodontal diseases was calculated. The division of tooth rows into sextants made it possible to identify the number of affected sextants of each patient and to statistically determine the average number of sextants per person in each of the studied groups (Table 5).

Table 5. The average number of affected sextants per person in the studied groups

Age group	Average number of affected sextants per person
Group 1 (18-25 years old)	2
Group 2 (26-35 years old)	2.4
Group 3 (36-50 years old)	3
Group 4 (51-65 years old)	3.6
Group 5 (66-80 years old)	3.6

Source: compiled by the authors

As in the case of determining the oral hygiene index, the indicators obtained during the calculation of the average number of affected sextants per person deteriorate according to the increase in the age of the study participants. However, in groups 4 and 5, these indicators have equal values, which indicates the same volume of affected periodontal tissues in their participants.

Using the evaluation of the results of the periodontal examination and the amount of necessary treatment measures (Table 3), it can be noted that no clinically healthy periodontium was found in any of the groups. The results of the examinations of groups 1 and 2 indicated the presence of a periodontal pocket up to 3 mm, subgingival calculus and bleeding gums in a certain part of the patients. The scope of treatment measures, in this case, includes the removal of tartar, improvement and further monitoring of oral hygiene. The results of the examination of group 3 revealed a periodontal pocket of 3.5-5.5 mm in the study participants, the proposed treatment measures are similar to the measures of groups 1 and 2. The assessment of groups 4 and 5 indicates that a certain part of their participants had the same study results as in the participants of the third group, and in the other part, a periodontal pocket of more than 6 mm was found, which in this case involves complex treatment of the periodontium, including the use of surgical methods (13,14).

When examining sextants, attention was paid to clinical symptoms, which include: bleeding gums, tartar, and pocket depth. The average number of sextants with detected symptoms is shown in Table 6.

Table 6. The average number of sextants with detected symptoms of periodontal tissue damage in the studied groups

Age group	Bleeding gums	Tartar	Pocket 4-5 mm	Pocket 6 mm or more
Group 1 (18-25 years old)	1.21	0.6	0	0
Group 2 (26-35 years old)	2.6	1.08	0.05	0
Group 3 (36-50 years old)	2.7	1.8	0.3	0
Group 4 (51-65 years old)	2.65	1.87	0.37	0.21
Group 5 (66-80 years old)	1.31	1.7	0.65	0.3

Source: compiled by the authors

The highest average number of sextants with the detected symptom of bleeding gums was found in the third, fourth and second groups, the lowest in the first and fifth. The detection of calculus was most often observed in the fourth, third and fifth groups, least often in the first and second. A periodontal pocket of 4-5 mm was detected most often in the fifth group and least often – in the second. In the first group it was not found at all. A pocket with a depth of 6 mm was probed only in the fifth and fourth groups, while in groups 1, 2 and 3 it was absent. The fewest symptoms were recorded in the first group, the most in the fifth and fourth.

Taking into account the results of the CPITN index of the need for treatment of periodontal diseases (Tables 5, 6), recommendations for treatment and preventive measures of each of the studied groups were formed. Instructions for improving oral hygiene must be given to 100% of patients in the fourth and fifth groups, 96% in the third group, 70% in the second and 35% in the first; dental prophylaxis is recommended for 97% of patients in the fifth group, 85% in the fourth group, 63% in the third group, 53% in the second group, and 48% in the first group; complex treatment, depending on the presence of detected symptoms, must be given to patients of the fifth, fourth and third groups.

After conducting physical and laboratory examinations of each study participant, the total percentage of diseases with various forms of gingivitis and periodontitis in each study group was calculated using statistical data processing (Table 7).

Table 7. Total percentage of gingivitis and periodontitis in the studied groups

Age group	Various forms of gingivitis have been identified	Various forms of periodontitis have been identified
Group 1 (18-25 years old)	47%	10%
Group 2 (26-35 years old)	63%	14%
Group 3 (36-50 years old)	70%	35%
Group 4 (51-65 years old)	87%	67%
Group 5 (66-80 years old)	99%	69%

Source: compiled by the authors

In the oldest age group, the presence of various forms of gingivitis was detected in almost every studied participant, while in the youngest – less than half. In other groups, the increase in the number of cases of detection of this disease coincided with the increase in the age of the group participants. The same regularity was observed in the case of detection of different forms of periodontal disease. It should be noted that in the first and second groups, the difference in the percentage of detected cases of the disease was insignificant, as in the fourth and fifth groups, and already in the third group it was 2.5 times greater than in the second, and in the fourth almost twice as much as in the third. This observation may indicate the presence of certain age intervals, during which periodontal tissues may deteriorate, which leads to various forms of periodontitis.

Summarizing the results of the study, it can be noted that the most inflammatory periodontal diseases (gingivitis and periodontitis) are common among people in the age group from 66 to 80 years. Thus, it is worth considering the most effective preventive and curative measures to improve the dental health indicators of persons belonging to this age group. It is also worth paying attention to the age group from 51 to 65 years old, as the prevalence of these diseases in them can be traced to more than half of people.

To understand the objective state of periodontal disease in the republic, it is worth considering the data on the incidence of various forms of periodontitis in the world and comparing them with the data of Kazakhstan. For this purpose, the World Health Organization (WHO) Global Oral Health Report 2022 was used (15). According to its results, the prevalence of severe periodontal diseases, the main of which is periodontitis, was 18.82% in 2019. The distribution of prevalence by region was as follows: European region – 17.89%, African region – 22.80%, Eastern Mediterranean – 17.37%, American region – 18.89%,

Southeast Asia – 20.77%, Western Pacific region – 16.28%. For the correctness of the comparison of the prevalence of periodontal diseases in Kazakhstan and the world, the percentage indicators of several countries of each region were selected, which were added to the WHO report (Table 8).

Comparing the indicators of the prevalence of periodontal diseases in Kazakhstan (16) and in other countries of the world (17-34), it can be noted that the incidence rate in Kazakhstan is 2.59% lower than the level of the region it is a part of, and 3.52% is lower than the world average. Among the presented countries, in terms of the prevalence of this disease, Kazakhstan is at the level of the United States of America, Nepal and Algeria, ahead of Egypt, Saudi Arabia, Sri Lanka and Australia, and inferior to Ukraine, Lithuania, France, Gabon, Kenya, Qatar, Mexico, Haiti, Thailand, New Zealand, Japan.

The conducted comparison did not reveal any dependence between severe periodontal diseases in persons older than 15 years and the geographical position of the countries, as well as their social, economic and scientific levels. This is partly explained by the main risk factors, the impact of which on the citizens of each country does not depend on the standard of living and the development of the health sector in them, namely: the use of tobacco products and alcohol, the consumption of sugar, including beet, cane, refined and confectionery products with its addition.

Analysing the relationship between the prevalence of severe periodontal diseases and the prevalence of tobacco use, no direct relationship was found. For example, in countries with the same prevalence of tobacco use – Saudi Arabia (14.2%), New Zealand (14.2%) and Australia (14%), the statistical indicator of periodontal disease is 10.8%, 21, 6% and 14.5%, respectively. The correspondence of these indicators is not observed even in the countries with the highest and lowest prevalence of tobacco use. Thus, in Haiti, where it is 7.9%, periodontal disease is found in 18.2% of the population, and in France, where the prevalence of smoking is 33.6%, periodontal diseases are determined in 16.2%. However, the absence of an

Table 8. Prevalence of severe periodontal diseases in the countries of the world by regional distribution and quantitative indicators of risk factors for oral cavity diseases

Region	Country	Prevalence of severe periodontal diseases among persons older than 15 years (%)	Prevalence of current tobacco use among persons older than 15 years (%)	Prevalence of alcohol consumption per capita among persons older than 15 years (l of alcohol/year)	Availability of sugar per capita (g/day)
European region	Kazakhstan	15.3	23.5	5	69.1
	Ukraine	18.9	26.2	8.3	91.3
	Lithuania	21.3	32.3	12.8	93.9
	France	16.2	33.6	12.2	97.5
African region	Algeria	15.9	21	0.6	75.1
	Gabon	27	-	8.1	47
	Kenya	20.6	11.5	2.2	47.3
Eastern Mediterranean region	Egypt	14.2	24.4	0.1	70.9
	Qatar	18.2	12	1.5	-
	Saudi Arabia	10.8	14.2	-	82.9
America region	United States	15.7	23.4	10	90.7
	Mexico	22.7	13.4	5.1	93.9
	Haiti	18.2	7.9	3	64.2
Southeast Asia	Thailand	19.1	22.5	8.5	117.3
	Nepal	14.8	31.5	0.6	18.5
	Sri Lanka	11.2	22.3	2.9	75.6
Western-Pacific region	New Zealand	21.6	14.2	10.7	131.7
	Australia	14.5	14	10.4	100.7
	Japan	20.6	20.5	10.1	44.2

Note: the distribution of countries by region was carried out according to the definition of WHO
Source: compiled on the basis of the 2022 WHO reports on the state of oral health in each country (16-34)

obvious relationship between tobacco use and the level of periodontal health does not prove the absence of its influence in general. Its action damages the respiratory, cardiovascular, nervous and other systems of the body, which leads to deterioration of health in general and the health of the oral cavity in particular.

A comparison of the prevalence of alcohol consumption and the prevalence of periodontal diseases also did not reveal an obvious connection between them. This can be traced to the example of Kenya and Japan, where the prevalence of periodontal disease is the same at 20.6%, and the prevalence of alcohol use per capita in Japan is 4.5 times higher than in Kenya. The lowest prevalence of alcohol consumption was found in Egypt (0.1 l/year), the highest in Lithuania (12.8 l/year), and the rate of periodontal disease in them is 14.2% and 21.3%, respectively, which indicates on the absence of a linear or any other obvious relationship between these indicators. At the same time, excessive alcohol consumption can affect metabolic processes in the body, lead to cardiovascular diseases, diabetes and cognitive disorders, which are risk factors for periodontal disease complications.

Sugar consumption per capita also did not have a direct effect on the rate of periodontal disease. Thus, in New Zealand, the prevalence rate of periodontal diseases is 1% higher than the similar rate in Japan (21.6% and 20.6%, respectively), on the other hand, the rate of sugar availability per capita in New Zealand is three times higher than this Japanese rate (131.7 g/day and 44.2 g/day, respectively). The absence of an obvious relationship between periodontal diseases and the supply of sugar per capita does not exclude the risks caused by its excessive consumption, which are expressed in causing an increase in the number of pathogenic bacteria in the oral cavity and provoking obesity, which greatly complicates the course of periodontal diseases (35).

The use of tobacco products, the abuse of alcohol and sugar are risk factors that can significantly worsen the condition of the oral cavity, including the loss of teeth. Preservation of the dental health of the population is an important step in improving the level of public health as a whole, therefore, actions are currently being taken to reduce these risks. The steps introduced by the governments and relevant bodies in each of the countries to reduce the negative impact of the use of tobacco and alcohol products is the introduction of an excise tax on these products. A similar decision is being considered regarding the excessive consumption of sugar – currently, proposals have been made to establish an excise tax or a special rate on sweetened beverages (15).

Taking into account the obtained results of the study, it can be assumed that the majority of cases of inflammatory periodontal diseases, on the basis of which the general level of prevalence of these diseases in the republic is formed, falls on the elderly. Accordingly, it can be concluded that efforts to improve treatment and preventive measures should be largely directed to persons of this age group, but additionally provide high-quality dental services to persons of younger age groups in order to avoid deterioration of the condition of the oral cavity in old age.

DISCUSSION

Statistics on the spread of periodontal diseases indicate that this problem is relevant all over the world. Determining the most disease-prone population group is the task of both international health organizations and the medical branches of each country. A significant contribution to this process is made by research conducted by scientists both at the state level and at the level of a certain administrative or geographical area.

Jiao et al. conducted a study to determine the prevalence and severity of periodontitis in mainland China (36). It was attended by 13,459 people aged 35 to 74, divided into three age groups. The total frequency of periodontitis cases in patients of the youngest group was 52.8%, the middle group was 69.3%, the oldest group was 64.6%, and the frequency of severe periodontitis was 10.6%, 37.3% and 43.5% in three age groups, respectively. This distribution indicated a directly proportional relationship between the severity of the disease and the age of the patients. Also, in the study conducted by the authors, correspondence was established between the severity of periodontitis and the presence of smoking experience, both in the present and in the past. There was no significant gender difference in the severity of the disease. One can agree with the results of the conducted study, as they also indicate a relationship between periodontal disease and the patient's age, however, for a more objective analysis, it would be worthwhile to consider younger age groups as well, and in the older group to expand the sample to include patients older than 74 years or enter an additional age group.

The prevalence of periodontitis among the population of Norway was studied by Stødle et al. (37). 4863 people over the age of 19 took part in the study. The prevalence of periodontitis was determined by the amount of bone tissue loss, which was determined by clinical examination and X-ray. Clinically registered indicators of periodontitis were observed in 72.4% of the studied persons, the increase in the prevalence of the disease was observed after the age of 40, and the presence of its severe forms – after the age of 60. The distribution of periodontitis carried out by the authors by stages and degrees of the disease was as

follows: I stage was observed in 13.8% of patients, II – in 41.1%, III – in 15.3%, IV – in 2.3%; degree A was observed in 5.7% of patients, B – in 60.2%, C – in 6.2%. Agreeing with the conclusions of the authors regarding the relationship between the age of patients and the prevalence of periodontitis, it is worth noting that they coincide with the results of this study. At the same time, attention should be paid to the fact recorded by the authors regarding the increase in the prevalence of the disease after the age of 40, which in a certain way coincides with the observation of this study, which records an increase in the number of cases of various forms of periodontitis in persons aged 36-50 years, compared to younger groups (Table 7).

The epidemiological situation associated with the prevalence of periodontal diseases has an impact not only on the medical and social sectors, but also causes a significant economic burden on the financial sector of each country. An assessment of the direct and indirect economic burden of periodontitis in the United States and Europe was conducted by Botelho et al. (38). Economic data from the United States and 32 European countries were used in the study to estimate the cost of periodontitis for the economies of the countries. An assessment of total costs for health care, stomatology, and periodontology was carried out. According to research results, in 2018, total costs in the United States amounted to 154.06 billion dollars, of which direct costs accounted for 3.49 and indirect costs for 150.57; in Europe, total costs amounted to 158.64 billion euros, direct – 2.52, indirect – 156.12. These evaluations showed the presence of a significant economic burden from periodontal diseases, the greater amount of which falls on indirect costs associated with the consequences of this disease, expressed in the loss of productivity, the appearance of caries, as well as complete or partial loss of teeth. Agreeing with the authors of the study regarding the significant economic burden caused by periodontal disease, it is worth citing the economic statistics of costs for dental care in Kazakhstan. According to a 2019 WHO report, the total cost of dental care was 61 million dollars, and the total cost of lost productivity caused by the five major oral diseases was $695 million dollars (16).

Improving public health and, accordingly, reducing the economic burden caused by the prevalence of periodontal disease depends on effective preventive and therapeutic measures aimed at solving this epidemiological problem. In their work, Scannapieco and Gershovich dealt with the issue of the prevention of periodontal diseases (39). The authors investigated traditional and new methods of disease prevention, as well as considered the problems that prevent their implementation. As traditionally established and scientifically proven preventive measures, scientists cite ensuring oral hygiene by cleaning teeth and implants and reducing risk factors (smoking). Examples of new prevention ideas include the use of probiotics, antioxidants, vaccines, and the introduction of alternative chemopreparations with increased effectiveness. The main problem in the implementation of measures to prevent the spread of oral cavity diseases is the condition of their regular compliance, which, despite the simplicity and accessibility of implementation, is difficult to control at the level of both individual and public health.

Modern concepts of treatment of periodontitis were studied by Kwon et al. (40). The authors see the key to successful treatment in dentists' understanding of pathogenesis, aetiology, risk factors, favourable factors and compliance of therapeutic measures with established treatment protocols. For the initial non-surgical therapy, scientists include oral care at home, and regular examination in dental institutions, which involves removing tartar and planning the roots in order to smooth their surface to prevent further accumulation of tartar and bacteria. The use of resective surgical therapy is used for areas with active periodontitis. After surgical treatment, periodontological supportive therapy and regular follow-up are mandatory, which ensure the success of the treatment and prevent tooth loss. Agreeing with the conclusions of both studies (39,40), it is worth noting that regular and timely measures for the prevention of periodontal diseases will significantly reduce the burden on the medical and economic sectors and significantly increase the level of public health of the state.

When choosing preventive and therapeutic measures for periodontal diseases, it is worth paying attention to a number of diseases that are additional risk factors for their occurrence. Genco and Sanz investigated the clinical and social consequences of periodontal diseases (41). In their work, they collected evidence on the existence of a connection between periodontitis and diseases of the cardiovascular system, diabetes, respiratory diseases, rheumatoid arthritis, some types of cancer, obesity, and other metabolic diseases, as well as cognitive disorders, including Alzheimer's disease. Zhao et al. studied the relationship between obesity, bone loss and periodontitis (42). The authors explain this connection with metabolic disorders of bone tissue, as one of the consequences of obesity, which manifests itself in the oral cavity with an increased risk of developing periodontitis. The study was based on relevant laboratory reports with descriptions of biological relationships between bone remodelling caused by obesity and periodontal diseases due to the development of concomitant processes of hyperinflammation, microbial dysbiosis, and immune dysregulation. Also, the potential mechanism of

alveolar bone loss, which is one of the manifestations of clinical changes in periodontal tissue caused by obesity, was studied, and practical considerations regarding the treatment of periodontitis in patients of this category were expressed.

The importance of prevention and timely and high-quality treatment of periodontal diseases is explained, in addition to severe dental consequences, by the formation of negative factors that affect the development and clinical course of certain serious diseases. A study by Li et al. found evidence that periodontitis exacerbates and contributes to the progression of chronic kidney disease through oral flora, cytokines, and oxidative stress (43). The evidence presented by the scientists confirms the presence of the influence of periodontal inflammation along with the increase of inflammatory mediators in the blood serum on atherosclerosis of the kidneys, the deterioration of their function and the development of the terminal stage of renal failure. The review highlights potentially pathogenic factors of chronic kidney disease, such as: bacteria, pro-inflammatory mediators, and oxidative stress. Agreeing with the results of the above studies (41-43), it can be concluded that the development of inflammatory periodontal diseases can be both a risk factor for certain diseases, and independently be susceptible to the influence of the relevant pathological conditions of the body.

The prevalence of inflammatory periodontal diseases worldwide is a problem not only for the health care industry, but also for the economy of each country. Its solution consists in the formation of preventive and curative measures, taking into account all risk factors specific to these diseases. Taking into account the results of the conducted research, which revealed the dependence between the presence of inflammatory periodontal diseases and the age of patients, and the cited studies of other authors, it is possible to form risk groups for these diseases, which include the elderly, people with cardiovascular diseases systems, diabetes, rheumatoid arthritis, obesity and cognitive disorders. Therefore, during a dental examination, special attention should be paid to patients of the older age group and persons with a medical history of one or more of the listed diseases, in order to eliminate the threat of the development and exacerbation of periodontitis and the influence of periodontitis itself on the exacerbation of existing diseases with the help of correct treatment and preventive measures pathological conditions.

CONCLUSIONS

To achieve the goal of the study, the prevalence of inflammatory periodontal diseases by age was determined using the OHI-S Greene-Vermillion simplified oral hygiene index and the periodontal disease treatment need index CPITN. The research was conducted in five age groups: 18-25 years, 26-35, 36-50, 51-65, 66-80. The results of the study supported the research hypothesis. It was found that these diseases (gingivitis and periodontitis) were most common in the group of patients aged 66-80 years. A clear trend of increasing disease prevalence with age was observed across all groups, revealing a directly proportional relationship between age and the development of these diseases. The practical significance of the conducted work was revealed in the determination of the population group most vulnerable to inflammatory periodontal diseases in order to focus attention on the need to improve the effectiveness of treatment and preventive measures for persons of this age group in order to improve the level of public health.

A comparison of WHO statistics on the incidence of periodontal disease in Kazakhstan and the world revealed that the prevalence of diseases in Kazakhstan is 15.3%, which is 3.52% lower than the global level. This provides a useful benchmark for assessing Kazakhstan's oral health status in a global context. The result of familiarization with the results of similar works and works that highlight other aspects of this topic was the conclusion about the relevance of the problem of the prevalence of periodontal diseases throughout the world, which is expressed by the level of burden on the medical and economic sectors of all countries, and about additional risk factors for the development of periodontitis, which are systemic diseases. Thus, using the results of this study and taking into account the additional risk factors identified in the process of understanding the topic, as recommendation it was proposed to take into account the risk factors of inflammatory periodontal diseases, which include the elderly age of patients or the presence of one or more systemic diseases, when carrying out treatment and preventive measures, which cause deterioration of periodontal tissue.

One of the important directions for further research on this topic can be considered the influence of eating habits on the periodontal condition, in order to identify food products that can have a negative effect on the condition of the oral cavity in general and periodontal tissue in particular. For a more comprehensive study of this direction, it is worth using the data of dietary and biochemical studies, which indicate the benefits and nutritional value of each of the products.

REFERENCES

1. Tamayo M, Besoaín A, Rebolledo J. Social determinants of health and disability: updating the model for determination. Gac San. 2018;32(1): 96–100.

2. Fernández-Feijoo J, Garea-Gorís R, Fernández-Varela M, Tomás-Carmona I, Diniz-Freitas M, Limeres-Posse J. Prevalence of systemic diseases among patients requesting dental consultation in the public and private systems. Med Oral Patol Oral Cir Bucal. 2012;17(1):e89–e93.
3. Ruzuddinov N, Ruzuddinov S, Shayakhmetova MK, Ruzuddinov T, Kamiyeva NA. Evaluation of dental health of the adult population of Kazakhstan and solutions for improving removable prosthetics. J Popul Ther Clin Pharmacol. 2022;29(3):73–9.
4. Daminova NR, Makhkamova OA. Assessment of the prevalence of inflammatory diseases of the hard and soft tissues of the oral cavity in contact sport athletes. Am J Interdiscip Res Dev. 2022;7:147–51.
5. Gündoğar H, Üstün K, Şenyurt SZ, Özdemir EÇ, Sezer U, Erciyas K. Gingival crevicular fluid levels of cytokine, chemokine, and growth factors in patients with periodontitis or gingivitis and periodontally healthy subjects: A cross-sectional multiplex study. Cent Eur J Immunol. 2021;46(4):474–80.
6. Jumayev HD, Vysotina IB, Amanov B, Armedova OG, Lukina NL. Parodontogenes of dentogingival sulcus – Predictors of development of chronic catarrhal gingivitis in children with dental and maxillary anomalies. Bull Probl Biol Med. 2020;4(158):333–8.
7. Nortaev AB, Usmanov RD, Berdiev OV. Periodontal disease and its complications in 21-30-year-old chemical paint workers. J Oral Med Craniofac Res. 2023;Special Issue:21.
8. Dan AD, Ghergic DL. Assessment of oral health education with the simplified oral hygiene index in military students – A comparative study. Oral Health Prev Dent. 2021;19(1):425–31.
9. Verrusio C, Iorio-Siciliano V, Blasi A, Leuci S, Adamo D, Nicolò M. The effect of orthodontic treatment on periodontal tissue inflammation: A systematic review. Quintessence Int. 2018;49(1):69–77.
10. Zharmagambetova A, Tuleutayeva S, Akhmetova S, Zharmagambetov A. Microbiological aspects of the orthodontic treatment. Georgian Med News. 2017;264:39–43.
11. Pawar M, Kasuhal D, Kakti A, Alshammari F, Alshammari MF, Dixit S, et al. Manual and powered toothbrushing effectiveness on autistic children's oral hygiene status. J Pharm Bioallied Sci. 2022;14(Suppl 1):S837–S840.
12. Moorthy L, Dixit UB, Kole RC, Gajre MP. Dietary sugar exposure and oral health status in children with autism spectrum disorder: A case-control study. J Autism Dev Disord. 2022;52(6):2523–34.
13. Kurmanalina MA, Taganyazova AA, Sumanova AM, Shabanbayeva ZA, Isaeva GK, Maratova DZh. Magnification in contemporary dental practice: The case of Kazakhstan. J Int Dent Med Res. 2022;15(1):287–90.
14. Nibali L, Koidou VP, Nieri M, Barbato L, Pagliaro U, Cairo F. Regenerative surgery versus access flap for the treatment of intra-bony periodontal defects: A systematic review and meta-analysis. J Clin Periodontol. 2020;47(S22):320–51.
15. Global oral health status report 2022. World Health Organization. 2022. URL: https://www.who.int/team/noncommunicable-diseases/global-status-report-on-oral-health-2022 (Accessed: 1 June 2024).
16. Oral health country profile. Kazakhstan. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-kaz-2022-country-profile.pdf?sfvrsn=566f8463_7&download=true (Accessed: 1 June 2024).
17. Oral health country profile. Ukraine. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-ukr-2022-country-profile.pdf?sfvrsn=275bef62_7&download=true (Accessed: 2 June 2024).
18. Oral health country profile. Lithuania. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-ltu-2022-country-profile.pdf?sfvrsn=d508a932_6&download=true (Accessed: 2 June 2024).
19. Oral health country profile. France. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-fra-2022-country-profile.pdf?sfvrsn=c79a2253_7&download=true (Accessed: 30 May 2024).
20. Oral health country profile. Algeria. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-dza-2022-country-profile.pdf?sfvrsn=a5d1ff45_7&download=true (Accessed: 1 June 2024).
21. Oral health country profile. Gabon. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-gab-2022-country-profile.pdf?sfvrsn=cba77df_7&download=true (Accessed: 1 June 2024).
22. Oral health country profile. Kenya. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-ken-2022-country-profile.pdf?sfvrsn=c9aa5055_9&download=true (Accessed: 30 May 2024).
23. Oral health country profile. Egypt. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-

health/oral-health-egy-2022-country-profile.pdf?sfvrsn=e936bbb8_7&download=true (Accessed: 30 May 2024).
24. Oral health country profile. Qatar. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-qat-2022-country-profile.pdf?sfvrsn=c8ae8298_9&download=true (Accessed: 26 May 2024).
25. Oral health country profile. Saudi Arabia. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-sau-2022-country-profile.pdf?sfvrsn=f4ce5c9e_7&download=true (Accessed: 26 May2024).
26. Oralhealthcountryprofile.UnitedStatesofAmerica. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-usa-2022-country-profile.pdf?sfvrsn=501bb226_7&download=true (Accessed: 27 May 2024).
27. Oral health country profile. Mexico. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-mex-2022-country-profile.pdf?sfvrsn=d868d272_6&download=true (Accessed: 28 May 2024).
28. Oral health country profile. Haiti. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-hti-2022-country-profile.pdf?sfvrsn=4e0300f8_10&download=true (Accessed: 26 May 2024).
29. Oral health country profile. Thailand. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-tha-2022-country-profile.pdf?sfvrsn=e72cab7d_7&download=true (Accessed: 28 May 2024).
30. Oral health country profile. Nepal. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-npl-2022-country-profile.pdf?sfvrsn=1e39b720_9&download=true (Accessed: 2 June 2024).
31. Oral health country profile. Sri Lanka. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-lka-2022-country-profile.pdf?sfvrsn=9b8e261a_7&download=true (Accessed: 30 May 2024).
32. Oral health country profile. New Zealand. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-nzl-2022-country-profile.pdf?sfvrsn=485f343f_9&download=true (Accessed: 29 May 2024).
33. Oral health country profile. Australia. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-aus-2022-country-profile.pdf?sfvrsn=920af8d3_5&download=true (Accessed: 29 May 2024).
34. Oral health country profile. Japan. World Health Organization. 2022. URL: https://cdn.who.int/media/docs/default-source/country-profiles/oral-health/oral-health-jpn-2022-country-profile.pdf?sfvrsn=8a16096b_9&download=true (Accessed: 27 May 2024).
35. Boitsaniuk SI, Manashchuk NV, Patskan LO, Chornii NV. Maintenance care in the treatment of periodontal disease. Bull Med Biol Res. 2022;4(2):57–61.
36. Jiao J, Jing W, Si Y, Feng X, Tai B, Hu D, et al. The prevalence and severity of periodontal disease in Mainland China: Data from the Fourth National Oral Health Survey (2015-2016). J Clin Periodontol. 2021;48(2):168–79.
37. Stødle IH, Verket A, Høvik H, Sen A, Koldsland OC. Prevalence of periodontitis based on the 2017 classification in a Norwegian population: The HUNT study. J Clin Periodontol. 2021;48(9):1189–99.
38. Botelho J, Machado V, Leira Y, Proença L, Chambrone L, Mendes JJ. Economic burden of periodontitis in the United States and Europe: An updated estimation. J Periodontol. 2022;93(3):373–9.
39. Scannapieco FA, Gershovich E. The prevention of periodontal disease – An overview. Periodontol 2000. 2020;84(1):9–13.
40. Kwon TH, Lamster IB, Levin L. Current concepts in the management of periodontitis. Int Dent J. 2021;71(6):462–76.
41. Genco RJ, Sanz M. Clinical and public health implications of periodontal and systemic diseases: An overview. Periodontol 2000. 2020;83(1):7–13.
42. Zhao P, Xu A, Leung WK. Obesity, bone loss, and periodontitis: The interlink. Biomolecules. 2022;12(7):865.
43. Li L, Zhang YL, Liu XY, Meng X, Zhao RQ, Ou LL, et al. Periodontitis exacerbates and promotes the progression of chronic kidney disease through oral flora, cytokines, and oxidative stress. Front Microbiol. 2021;12:656372.

Received: 12.03.2024
Accepted for publication: 09.07.2024

Address for correspondence:
Aiman Onerova
Department of Prosthetic and Pediatric Dentistry
Astana Medical University
email: aiman.onerova@yahoo.com