

# Prevalence and structure of periodontal diseases in the Ukrainian population based on the AAP/EFP 2017 classification

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## ABSTRACT

**Aim:** To determine the prevalence and structure of periodontal diseases among the population of Ukraine using the AAP/EFP 2017 Classification.

**Materials and Methods:** A retrospective analysis of electronic outpatient medical charts of dental patients aged 25 to 75 years was conducted; the patients were divided into 3 groups depending on age. According to the data contained in the charts, each patient was diagnosed according to the AAP/EFP 2017 Classification. Statistical methods were used to determine the associations between age, gender and periodontal tissue condition, prevalence of inflammation, stage and grade of periodontitis.

**Results:** There were 12.8% of patients with intact periodontal tissues, 54.4% of patients were diagnosed with gingivitis, and 32.8% of patients were diagnosed with periodontitis. The most common diagnosis among patients with periodontitis was generalized periodontitis of stage II, grade B (25.9%). Statistically significant relationships were found between age and the presence of periodontal pathology, its prevalence, stage and grade of periodontitis. In addition, associations between gender and the condition of periodontal tissues and the stage of periodontitis were found.

**Conclusions:** In patients of different age groups and genders, gingivitis was the most common diagnosis, and generalized moderate form prevailed in the structure of periodontitis. Age and gender affect the risk of occurrence and clinical course of periodontal diseases. The use of AAP/EFP 2017 Classification in clinical practice provides an individualized approach to treatment planning for patients with various periodontal tissue lesions.

**KEY WORDS:** risk factors, periodontitis, epidemiology, gingivitis, age distribution, AAP/EFP 2017 Classification

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## INTRODUCTION

Periodontal tissue pathologies remain an important group of diseases that significantly affect the quality of life of patients of all age groups. There are numerous classifications that attempt to systematize all possible variants of periodontal lesions according to various criteria, including the severity of the clinical course, prevalence, pathomorphological features, etc. At the same time, the inconsistency of these criteria in different classifications leads to inconsistent results of epidemiological studies and a lack of clear understanding of the global burden of disease and the need for treatment of such patients [1].

In Ukraine, the classification of periodontal tissue diseases by M. F. Danilevsky is widely used [2, 3]. The main peculiarity of this classification is the differentiation of such diseases as localized periodontitis, generalized periodontitis and periodontosis into distinct nosological forms. This classification did not consider the intensity of periodontitis progression, and the criteria for determining the severity were the depth of

periodontal pockets, which varied significantly from patient to patient depending on the severity of gingival edema, and radiographic bone resorption, which could also be assessed ambiguously, considering the angle of the radiographic tube relative to the film or the radiovisiograph sensor, the skills of the radiologist, the level of interpretation of radiographs by the dentist.

However, since 1999, the Armitage classification of inflammatory periodontal diseases has been widely used worldwide, which included four forms: necrotizing, chronic, aggressive, and periodontitis as a manifestation of systemic diseases, each of which had localized and generalized forms, while such a disease as periodontosis was not distinguished at all [4]. Most of the discussions were devoted to the differential diagnosis of aggressive and chronic forms of pathology, as there were no clear, reliable criteria. In addition, the course of the diseases could change over time, which, consequently, changed the diagnosis and required a change in treatment strategy. The use of these unclear criteria in clinical and scientific work made it difficult to

apply this classification, which led to the development and implementation of a new one.

Currently, the international community recognizes the classification of Periodontal and Peri-implant Diseases and Conditions, approved at the consensus congress of the American Academy of Periodontology (AAP) and the European Federation of Periodontology (EFP) in 2017 (AAP/EFP 2017 Classification) [4, 5]. During its approval, the absence of significant differences in the pathophysiology of aggressive and chronic forms of periodontitis was recognized, a gradation of stages and grades of periodontal tissue damage was proposed, clear criteria for diagnosing periodontal diseases and healthy periodontal condition were given, and the condition of peri-implant tissues was first considered [4].

In the context of mass migration of the population, it is important to match the accepted nosological forms of diseases among dentists from different countries in order to unify diagnostic criteria and approaches to the treatment and prevention of such pathologies. In addition, the use of a standardized classification of diseases contributes to the development of international scientific research on epidemiological indicators, specific clinical features of the course, effectiveness of various methods of treatment and prevention of periodontal pathology.

Currently, there are no prevalence rates of different stages and grades of periodontitis in the population of Ukraine according to the AAP/EFP 2017 Classification. Thus, the introduction of a modern classification of periodontal diseases in the country will allow to integrate the domestic field of periodontology into the global context, to supplement epidemiological knowledge on the prevalence of periodontal diseases in the region and to compare the effectiveness of the use of different criteria for classifying diseases.

## AIM

To determine the prevalence and structure of periodontal diseases among patients of different age groups, considering gender differences and using the AAP/EFP 2017 Classification.

## MATERIALS AND METHODS

A retrospective analysis of 3200 electronic dental charts of patients aged 25 to 75 years (1510 men and 1690 women) who visited the periodontal department of the Municipal Non-Profit Enterprise "City Dental Clinic" in Rivne, Ukraine, during 2024 was conducted. The selected patient charts were organized using the Cliniccards software, which contains tabs for periodontal chart

and periodontal screening test with a description of the patient's periodontal status. Inclusion criteria were a detailed description of the patient's history, including existing systemic diseases, a correctly completed periodontal chart, the presence of at least four pairs of antagonist teeth. The study did not include medical records of people with complete absence of teeth, patients whose dentition was restored using implants, charts with incomplete periodontal examination results and in the absence of X-ray results.

The analyzed outpatient charts were divided into 3 groups depending on the age of the patients. Group I included medical records of 929 patients (404 men and 525 women) aged 25 to 44 years, Group II included 1632 patients (821 men and 811 women) aged 45 to 60 years, and Group III included 639 patients (285 men and 354 women) aged 61 to 75 years. In each periodontal chart, the clinical attachment loss, probing depths, and the number of areas with bleeding on probing were determined. We also studied the degree of radiological bone resorption, the furcation involvement, mobility and number of teeth, the need for comprehensive dental rehabilitation due to occlusal plane deformities, alveolar process defects, and other factors that required the involvement of related professionals to treat patients and determine the stage of periodontitis. Smoking and diabetes mellitus were considered modifying factors that influenced the grade of periodontitis progression. These parameters were entered into a Microsoft Excel spreadsheet for further analysis.

Based on the data obtained from the medical records, each patient was diagnosed according to the AAP/EFP 2017 Classification. The results were presented in absolute numbers and percentages for each age group of patients, considering their gender differences. Pearson's chi-squared test was used to determine the relationship between gender, age of patients and the nosological form, prevalence, stage and grade of the disease. Statistical processing of the results was performed using STATISTICA 12 (StatSoft Inc., USA). The relationship was considered statistically significant at  $p < 0.05$ .

## ETHICS

This work complies with the principles of the Declaration of Helsinki.

## RESULTS

According to the analyzed patient charts, the following data were obtained on the prevalence of periodontal diseases and conditions in patients of different age groups (Table 1).

**Table 1.** Prevalence of periodontal diseases and conditions among Ukrainian residents of different ages and genders

| Condition of periodontal tissues | Group I    |            | Group II   |            | Group III  |            | Total      |            |
|----------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|                                  | 1          | 2          | 1          | 2          | 1          | 2          | 1          | 2          |
| Healthy periodontium             | 129 (31.9) | 97 (18.5)  | 98 (11.9)  | 59 (7.3)   | 16 (5.6)   | 9 (2.6)    | 243 (16.1) | 165 (9.8)  |
| Gingivitis                       | 158 (39.1) | 299 (56.9) | 573 (69.8) | 594 (73.2) | 80 (28.1)  | 38 (10.7)  | 811 (53.7) | 931 (55.1) |
| Periodontitis                    | 117 (29.0) | 129 (24.6) | 150 (18.3) | 158 (19.5) | 189 (66.3) | 307 (86.7) | 456 (30.2) | 594 (35.1) |
| Total                            | 404 (100)  | 525 (100)  | 821 (100)  | 811 (100)  | 285 (100)  | 354 (100)  | 1510 (100) | 1690 (100) |

Note: 1 – number of men, abs. (%), 2 – number of women, abs. (%)

Source: compiled by the authors of this study

**Table 2.** Distribution of periodontitis stages among Ukrainian residents of different ages and genders

| Stage of periodontitis | Group I   |           | Group II  |           | Group III |            | Total      |            |
|------------------------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
|                        | 1         | 2         | 1         | 2         | 1         | 2          | 1          | 2          |
| I                      | 35 (29.9) | 45 (34.9) | 15 (10.0) | 24 (15.2) | 9 (4.8)   | 25 (8.1)   | 59 (12.9)  | 94 (15.8)  |
| II                     | 58 (49.6) | 65 (50.4) | 68 (45.3) | 79 (50.0) | 66 (34.9) | 138 (44.9) | 192 (42.1) | 282 (47.5) |
| III                    | 18 (15.4) | 13 (10.1) | 45 (30.0) | 39 (24.7) | 76 (40.2) | 107 (34.9) | 139 (30.5) | 159 (26.8) |
| IV                     | 6 (5.1)   | 6 (4.6)   | 22 (14.7) | 16 (10.1) | 38 (20.1) | 37 (12.1)  | 66 (14.5)  | 59 (9.9)   |
| Total                  | 117 (100) | 129 (100) | 150 (100) | 158 (100) | 189 (100) | 307 (100)  | 456 (100)  | 594 (100)  |

Note: 1 – number of men, abs. (%), 2 – number of women, abs. (%)

Source: compiled by the authors of this study

**Table 3.** Distribution of periodontitis grades among Ukrainian residents of different ages and genders

| Grade of periodontitis | Group I   |           | Group II  |            | Group III  |            | Total      |            |
|------------------------|-----------|-----------|-----------|------------|------------|------------|------------|------------|
|                        | 1         | 2         | 1         | 2          | 1          | 2          | 1          | 2          |
| A                      | 12 (10.3) | 16 (12.4) | 8 (5.3)   | 11 (7.0)   | 4 (2.1)    | 12 (3.9)   | 24 (5.3)   | 39 (6.6)   |
| B                      | 76 (65.0) | 90 (69.8) | 90 (60.0) | 103 (65.2) | 104 (55.0) | 184 (59.9) | 270 (59.2) | 377 (63.5) |
| C                      | 29 (24.7) | 23 (17.8) | 52 (34.7) | 44 (27.8)  | 81 (42.9)  | 111 (36.2) | 162 (35.5) | 178 (29.9) |
| Total                  | 117 (100) | 129 (100) | 150 (100) | 158 (100)  | 189 (100)  | 307 (100)  | 456 (100)  | 594 (100)  |

Note: 1 – number of men, abs. (%), 2 – number of women, abs. (%)

Source: compiled by the authors of this study

In total, 408 outpatient charts (12.8% of the total number of charts analyzed) with intact periodontal tissues, 1742 charts of patients (54.4%) diagnosed with gingivitis, and 1050 charts of patients (32.8%) diagnosed with periodontitis were analyzed. The largest number of patients without periodontal pathology, namely 31.9% of men (of the number of men in the group) and 18.5% of women, was recorded in age group I, while in group III the proportion of such patients was minimal, 5.6% and 2.6%, respectively. According to periodontal charts, gingivitis was diagnosed more often in patients of group II, in 69.8% of men and 73.2% of women, and was diagnosed much less often in patients of the corresponding sex of age group III, in 28.1% and 10.7%. The opposite situation was observed regarding the prevalence of periodontitis, the number of patients with this disease was the lowest in age group II with 18.3% of men and 19.5% of women, and the highest in the older age group with 66.3% and 86.7%, respectively. A statistically significant association was found between

the condition of periodontal tissues and age ( $\chi^2=147.7$ ;  $p<0.001$ ) and gender of patients ( $\chi^2=24.5$ ;  $p<0.001$ ).

In the outpatient charts of all age groups, generalized periodontal lesions were more often recorded. In particular, localized gingivitis was diagnosed in only 389 patients (22.3% of the number of patients with gingivitis), and generalized gingivitis in 1353 patients (77.7%). A similar pattern was observed in patients with periodontitis: localized lesions were diagnosed in 346 patients (32.9%), and generalized lesions in 704 patients (67.1%). A significant relationship was found between the prevalence of the inflammatory process and the age of patients ( $\chi^2=6.7$ ;  $p<0.001$ ), but not significant with respect to gender ( $\chi^2=1.3$ ;  $p>0.05$ ).

Based on the results of the analysis of periodontal charts and radiographs of patients with periodontitis, the stage and grade of the disease were determined for each person (Table 2, Table 3).

According to the criteria of AAP/EFP 2017 Classification, stage I periodontitis was recorded in 153 patients

(14.6% of the number of patients with periodontitis), stage II was recorded in 474 patients (45.1%), stage III in 298 patients (28.4%), and stage IV in 125 patients (11.9%). The proportion of patients diagnosed with stages II and III periodontitis increased with age, reaching a maximum in the older age group, while the prevalence of cases of stage I periodontitis predictably decreased with age. Thus, a significant correlation ( $\chi^2=127.8$ ;  $p<0.001$ ) was found between the age of patients and the stage of periodontitis. Although the most common stage of the disease in patients of both sexes was stage II, men of all age groups were more likely to have more severe stages of the disease than women, in particular, stage III periodontitis was diagnosed in 30.5% of men and 26.8% of women, and stage IV in 14.5% of men and 9.9% of women. The sex of the patients whose charts were analyzed also had a statistically significant ( $\chi^2=8.8$ ;  $p<0.05$ ) effect on the stage of the disease.

Grade A of periodontitis progression was diagnosed in the smallest number of patients, namely 63 patients (6.0%), grade B was recorded much more often, in 647 patients (61.7%), and grade C was recorded in 340 patients (32.3%). The proportion of patients with grade B periodontitis was similar in all age groups, but with age, the number of patients with grade A decreased significantly and the number of patients with grade C increased. According to the results of statistical analysis, a significant ( $\chi^2=36.6$ ;  $p<0.001$ ) association between patient age and periodontitis grade was determined. Both men and women of all groups more often had grade B disease progression, but men were diagnosed with grade C more often than women. At the same time, the relationship between gender and the grade of periodontitis was not significant ( $\chi^2=3.9$ ;  $p>0.05$ ).

The most common diagnosis in patients of all age groups was generalized periodontitis of stage II, grade B, which was diagnosed in 272 patients (25.9% of the number of patients with periodontitis). The number of patients with generalized periodontitis of stage III, grade C was much lower, 206 patients (19.6%). In the electronic charts of Ukrainian residents with localized periodontitis, stage II, grade B of the disease was also more often recorded, namely in 193 patients (18.3%). The analysis revealed no cases of stage I, grade C and stage IV, grade A periodontitis, both for localized and generalized forms.

## DISCUSSION

The prevalence of periodontal diseases is gradually increasing and today this group of pathologies ranks sixth in the world [6]. Epidemiological indicators of periodontal disease vary significantly from country to

country, with the highest rates in Asia and the lowest in South Africa and Oceania [7]. According to a national study in the United States of America, the prevalence of periodontitis among adults was 93.1%, which was almost three times higher than the results obtained in our study [8]. According to the results of a systematic review of the literature in Latin America, reporting rates of gingivitis range from 28.0% to 96.2%, and periodontitis from 16.3% to 59.3% in residents of different ages and genders [9]. In a clinical study conducted in Kazakhstan, researchers found the prevalence of periodontitis to be 69.0%, with a significant association between patient age and periodontal tissue condition [10].

Generalized periodontitis of stage II, grade B was diagnosed more often in patients of all age groups, which is consistent with other results of similar studies [4, 8]. Based on the results of a similar retrospective analysis of outpatient charts of patients over 18 years of age, researchers found that the most common variant of generalized periodontitis was stage II (65.0%) and grade B (63.0%). In general, in this study, as well as in our study, stage II, grade B of generalized periodontitis was the most common diagnosis (32.0%), slightly less common were stage III, grade C of generalized periodontitis (23.0%) and stage IV, grade C of periodontitis (18.0%) [11]. In another study, patients with an average age of 45.5 years were more likely to have stage I (42.0%) and stage IV (28.0%) generalized periodontitis [12]. During a clinical examination of Portuguese residents with an average age of 49 years, stage III (51.2%) and stage IV (30.4%) of periodontitis were predominantly recorded, as well as the prevalence of generalized forms (66.5%) over localized forms (33.5%) [13].

Numerous studies are available in which the authors concluded that more severe forms of periodontitis are more common in men [12-14]. In contrast to our results, another study on the epidemiologic indicators of periodontal lesions found no statistically significant differences between the prevalence of periodontal pathology and the sex of patients of different age groups [15]. Such differences in indicators can be explained by different research methodology, failure to consider a number of regional factors, including access to dental care, income level, genetic predisposition of representatives of different ethnic groups to the development of periodontal diseases, etc.

Periodontal diseases have significant variability in clinical manifestations, etiologic factors of development and sensitivity to treatment, which leads to the existence of various classification systems for these pathologies [5]. The introduction of a unified and at the same time convenient for clinical practice classification will increase the relevance of epidemiological and clinical

studies. The AAP/EFP 2017 Classification systematizes all possible forms of periodontal pathology according to clear criteria that are understandable to both clinicians and researchers. The classification includes not only criteria of disease severity, such as loss of epithelial attachment and probing depth, but also factors that increase treatment complexity, namely tooth loss, occlusion disorders, and furcation involvement. These parameters help determine the competencies of specialists required for patient rehabilitation. Importantly, they also allow clinicians to predict the duration and cost of treatment already at the stage of initial diagnosis.

An important feature of the AAP/EFP classification is the introduction of a system of periodontitis grades that reflects the intensity of disease progression and possible response to treatment. Consideration of modifying factors, such as tobacco smoking and the concentration of glycosylated hemoglobin (HbA1c) in the patients' serum, allows to create individualized treatment plans for individuals and provide a reasonable prognosis for the success of rehabilitation.

Future research should focus on the development and implementation of improved treatment protocols for patients depending on the stage and grade of periodontitis development. In addition, it is necessary to

consider other pathogenetic mechanisms of pathology, in particular the impact of certain generalized somatic diseases, stress and behavioral patterns of patients on the clinical course of periodontitis.

## CONCLUSIONS

The results of a retrospective analysis of outpatient records of patients of different age groups and sexes revealed that the prevalence of gingivitis was 54.4%, that of periodontitis was 32.8%, and only 12.8% of patients had a healthy periodontal condition. Among patients of all age groups with periodontitis, the generalized form of stage II, grade B of this disease was more often diagnosed, namely in 25.9% of patients. A significant relationship was revealed between the age of patients and the condition of periodontal tissues, the prevalence of the inflammatory process, the stage and grade of periodontal disease. An association was also found between the sex of patients and the likelihood of developing periodontal disease. Consequently, applying the modern classification during routine clinical visits will allow to develop differentiated approaches to the treatment of patients, taking into account the pathogenetic peculiarities of periodontitis.

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## CONFLICT OF INTEREST

The Author declare no conflict of interest

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