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Study of the age, gender, and specific location of vertical bone defects in patients diagnosed with periodontitis

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Abstract

Periodontitis is a prevalent inflammatory disease characterized by progressive clinical attachment loss and alveolar bone loss. The main goal of this research is to examine how age and gender affect the development of the periodontal diseases. The secondary objective of this study is to determine whether there is a correlation between the development of a vertical bone defect and its location in the oral cavity. This study included 30 non-smoking, systemically healthy patients (aged 30-65 years) diagnosed with Stage III or Stage IV periodontitis. A total of 48 vertical bone defects were registered using comprehensive clinical and radiographic examinations. Data on patient age, gender, and the specific location of each defect were statistically analysed.
In the present study, no significant difference was found in the percentage distribution between women and men. The highest concentration of patients was in the 40-55 age group. Given the small pool of studied participants more detailed prospective studies are required to determine the role of age and gender as modifying factors in the development of the periodontal diseases.
When it comes to where vertical bone defects are most often found, it can be concluded that their more frequent development in the distal areas of the dental arches, and in particular in the areas of the approximal tooth surfaces. The clear predisposition for defects in the mentioned areas suggests these they are at higher risk and require specific clinical attention for prevention and management, particularly in patients over 40.

Keywords: Periodontitis, Vertical bone defects, Gender, Age, Periodontal disease

Introduction

Periodontitis is an extremely common inflammatory disease that affects all periodontal components and leads to their destruction. It is characterized by progressive loss of clinical attachment level and supporting bone (1, 2).

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Despite huge advances in dental treatment, periodontitis remains one of the most serious public health problems due to its extremely high prevalence and its impact on oral health-related quality of life (3, 4, 5).
Although it is recognized that periodontal disease may be avoided, individuals typically seek dental treatment only when the illness has progressed since it is typically asymptomatic in its early stages (6, 7).
The onset and progression of gingivitis to periodontitis is influenced by systemic and local factors. Local factors include natural and iatrogenic plaque retention factors, while systemic factors include certain systemic diseases and conditions, the use of certain medications, smoking, gender, age, hereditary factors, etc. (8).
Nowadays, periodontal diseases are diagnosed through a proper medical history, a thorough clinical examination, an intraoral examination, and, last but not least, an X-ray examination.
The clinical indicators for periodontal disease that are taken into account are changes in the color, volume, shape, and consistency of the gums, plaque index, gingival index, probing depth, marginal gingiva level, clinical attachment level, presence of furcation defects, and tooth mobility (9). With regard to X-ray examinations used in modern periodontology, it should be noted that specialists are increasingly relying on CBCT examinations due to their many advantages over 2D radiographs (10, 11).
Today, it is clear that the most common cause of alveolar bone resorption is progressive periodontitis. It is essential that every dental practitioner be able to determine the pattern of bone resorption—vertical or horizontal (12).
According to the currently accepted classification of periodontal and peri-implant conditions and diseases from 2017, the pattern of alveolar bone resorption is essential for determining the stages of the disease. Periodontitis with established horizontal bone resorption is classified as stage I and stage II. In the presence of vertical bone resorption and furcation defects, periodontitis is classified as stage III and stage IV (13).

Aim

The prime objective of this study is to investigate gender and age as factors influencing the progression of periodontal disease, particularly the development of vertical bone defects. The secondary objective of this study is to determine whether there is a correlation between the development of a vertical bone defect and its location in the oral cavity.

Material and Methods

The Medical University of Varna's Research Ethics Committee's procedural rules were followed in this study. The study was conducted in 2022-2023 at the University Medical-Dental Center at the Faculty of Dental Medicine, Medical University-Varna.
Each patient participating in the study signed an informed consent form. Smokers and patients who were not in perfect general health were not allowed to participate in this study.

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A detailed medical history was taken from all patients included in the study, and a thorough clinical extraoral and intraoral examination was performed. An X-ray examination was scheduled immediately before the start of periodontal treatment. All patients included in the study were diagnosed with periodontitis, stage 3 or stage 4.

Results

This study included 30 patients with a total of 48 vertical bone defects. The patients were of both sexes, aged between 30 and 65 years, admitted to the UMDC, Faculty of Dental Medicine, MU-Varna with data on progressive periodontitis.

In order to avoid various factors related to the gender and age of patients that may modify periodontal disease, smokers and patients with a history of poor health were not included in the study.

Table 1 presents data related to the gender and age of patients, as well as information about the location of the registered vertical bone defects in each of the participants.

Table 1. Registered information about gender, age, tooth location and tooth surface

Patient	Gender	Age	Tooth with existing vertical bone defect	Tooth surface with existing vertical bone defect
1.	♀	42	36	medial
2.	♂	41	47	distal
3.	♂	36	46	medial
			36	medial
			36	distal
4.	♀	52	33	distal
			35	medial
			37	medial
5.	♀	45	46	distal
6.	♀	36	45	medial
7.	♀	50	35	medial
8.	♀	50	23	distal
			46	medial
			46	distal
9.	♀	47	17	medial
10.	♂	47	31	distal
11.	♂	57	23	palatinal
12.	♀	47	46	medial
			33	medial
13.	♀	52	46	medial
			47	medial
			47	distal

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14.	♂	42	36	medial
15.	♂	31	34	distal
16.	♂	35	25	medial
17.	♀	33	14	distal
18.	♀	53	16	medial
19.	♀	53	34	medial
20.	♂	1	45	medial
21.	♀	43	45	distal
			46	distal
22.	♂	45	11	medial
			11	distal
23.	♂	35	12	medial
24.	♂	46	17	medial
			15	medial
			24	medial
25.	♀	63	13	medial
26.	♂	42	44	medial
27.	♀	46	16	medial
			36	distal
			46	distal
28.	♂	44	35	medial
			36	medial
29.	♀	45	46	distal
30.	♂	42	48	medial
			44	medial
			43	medial

Figure 1 shows graphical representations of the distribution of patients by age (Figure 1A) and gender (Figure 1B). By age, most patients are distributed in the 35 to 55 age groups. By gender, there is no significant difference between the distribution of women and men diagnosed with stage 3 or stage 4 periodontitis.

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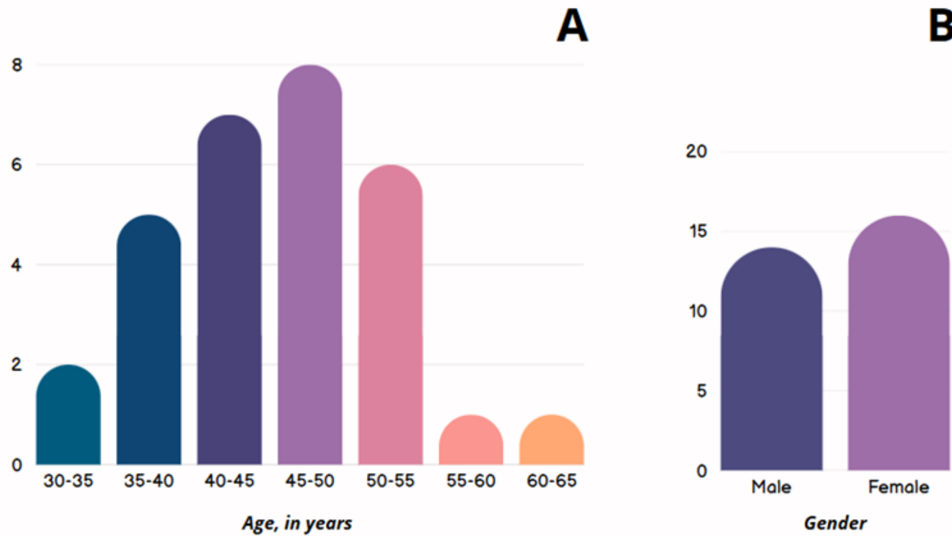

Figure 1. Distribution of patients by age (A) and gender (B)

Figure 2 shows graphical representations of the distribution of the 48 vertical bone defects recorded by jaw (Figure 2A) and by affected tooth type (Figure 2B). It is evident that vertical bone defects in the lower jaw are twice as numerous as those located in the upper jaw. Regarding the distribution of teeth affected by vertical bone defects, the highest percentage is observed in molars (50%), followed by premolars (29%) and front teeth (21%).

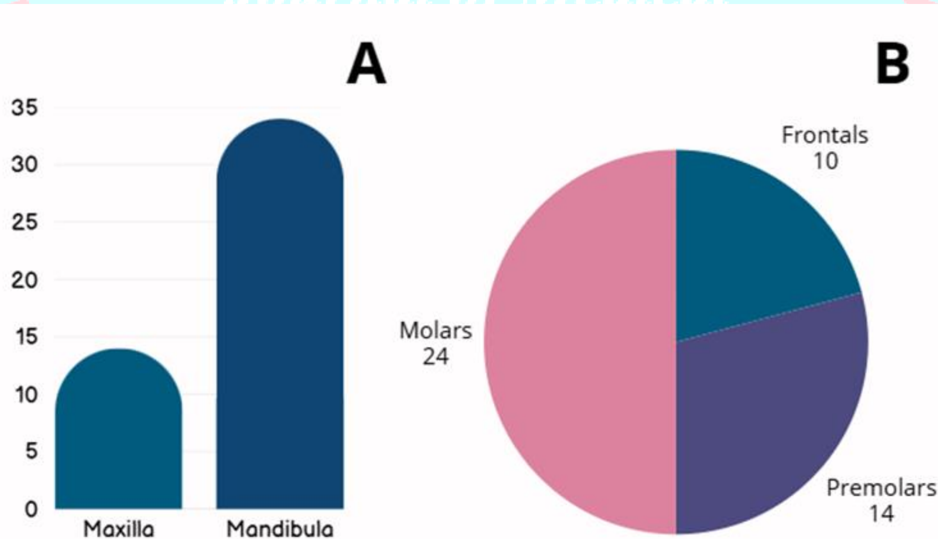

Figure 2. Distribution of vertical bone defects recorded by jaw(A) and affected tooth type(B)

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Detailed information about the affected teeth with open vertical bone defects is presented in Table 2. A higher percentage of frequency is observed in the sixth teeth of the lower jaw.

Table 2. Distribution of affected teeth with open vertical bone defects

№	*Amount*	*Percent (%)*	*Valid percent*	*Cumulative percent*
11	2	4.17%	4.17%	4.17%
12	1	2.08%	2.08%	6.25%
13	1	2.08%	2.08%	8.33%
14	1	2.08%	2.08%	10.42%
15	1	2.08%	2.08%	12.50%
16	2	4.17%	4.17%	16.67%
17	2	4.17%	4.17%	20.83%
23	2	4.17%	4.17%	25.00%
24	1	2.08%	2.08%	27.08%
25	1	2.08%	2.08%	29.17%
31	1	2.08%	2.08%	31.25%
33	2	4.17%	4.17%	35.42%
34	2	4.17%	4.17%	39.58%
35	3	6.25%	6.25%	45.83%
36	6	12.50%	12.50%	58.33%
37	1	2.08%	2.08%	60.42%
43	1	2.08%	2.08%	62.50%
44	2	4.17%	4.17%	66.67%
45	3	6.25%	6.25%	72.92%
46	9	18.75%	18.75%	91.67%
47	3	6.25%	6.25%	97.92%
48	1	2.08%	2.08%	100.00%
Total	**48**	**100.00%**	**100.00%**	

Discussion

Less work has been done in periodontal epidemiology to assess public health initiatives aimed at risk mitigation or lowering the prevalence of such periodontal diseases, as well as to survey or monitor groups that may be more susceptible to moderate or severe disease, than in dental public

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health activities focused on dental caries. Furthermore, nothing is known about the majority of nations' current national estimates of periodontal disease (14).

It is well recognized that gender may influence the onset and course of several illnesses. Determining if there are gender disparities in the onset and course of periodontitis is crucial for both (15, 16, 17, 18). In the present study, no significant difference was found in the percentage distribution between women and men diagnosed with stage 3 and stage 4 periodontitis. Even after controlling for environmental and behavioral variables like smoking and poor dental hygiene, epidemiologic studies offer solid proof that males are more likely than women to acquire harmful periodontal disease. However, it is unclear if sex-specific immune function variations offer a believable biological explanation for a sexual dimorphism in vulnerability to damaging periodontal disease (15, 19). In response to this query, Shiau and Reynolds (2010) suggested that sexual dimorphism in vulnerability to destructive periodontal disease may be caused by distinct gene regulation, particularly in genes that are sensitive to sex hormones (19, 20).

Regarding the distribution of cases according to patient age, the present study shows that the largest percentage is represented by the 45-50 age group, followed by the 40-45 and 50-55 age groups, which leads us to conclude that patients between the ages of 40 and 55 are at the highest risk of developing these types of periodontal diseases.

There are disparities in periodontal disease between age groups, and as people age, the disease's severity rises. Epidemiological research revealed that the elderly had the highest frequency of chronic periodontitis (82%), followed by adults (73%), and adolescents (59%) (21). The authors of other studies have reached identical conclusions, with results regarding the prevalence of periodontal disease showing that its frequency increases with the age of patients (3, 22).

As the world's population ages and more people retain their natural teeth as a result of a notable decline in tooth loss among the elderly, the frequency of periodontal disease is predicted to rise globally in the years to come (23).

Regarding the distribution of registered vertical bone defects, it is clear that defects found in the lower jaw are twice as numerous as those in the upper jaw. Similar results have been obtained in other studies (22, 24). A detailed examination of the affected teeth shows that molars are the most commonly compromised teeth with vertical bone defects, followed by premolars and front teeth. Identical results were obtained in a 2020 study, in which the authors found that the distal mandibular areas are most at risk for the development of vertical bone defects (25). Another study from 2017, which aimed to assess the prevalence of infra-molar defects through clinical and radiographic examinations, concluded that vertical defects are most common in the molar region (26).

Lastly, more detailed prospective studies are required to determine the role of age and gender as modifying factors in the development of the periodontal diseases.

When it comes to where vertical bone defects are most often found, it can be concluded that their more frequent development in the distal areas of the dental arches, and in particular in the areas of the approximal tooth surfaces, is most likely due to the difficulty patients have in mechanically cleaning dental plaque.

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Conclusion

The percentage distribution between men and women did not differ significantly in the present study. The age group of 40 to 55 had the largest concentration of patients. More thorough prospective studies are needed to ascertain the role of gender and age as modifying factors in the development of periodontal diseases, given the small sample size. It can be inferred that the distal regions of the dental arches, and specifically the regions of the approximal tooth surfaces, are where vertical bone defects are most frequently found. They are at a higher risk and need special clinical attention for prevention and management, especially in patients over 40, given the obvious predisposition for defects in the aforementioned areas.

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