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RESEARCH ARTICLE

Self-Reported Systemic Diseases and Periodontal Status: A Cross-Sectional Study from Turkey

*Özlem Daltaban, DDS, PhD** and *Zhala Vatankha Sain, DDS*

Department of Periodontology, Akdeniz University, Turkey

***Corresponding author:** *Özlem Daltaban, DDS, PhD, Department of Periodontology, Faculty of Dentistry, Akdeniz University, Dumlupinar Bulvarı, Campus, Antalya, PO Box: 07058, Turkey, Tel: +90-242-3106995, Fax: +90-242-310-6967*

Abstract

Background: Individuals applying for periodontal treatment often have systemic diseases that can adversely affect the periodontal disease course and treatment response.

Objectives: To determine the prevalence and types of systemic disease in patients referred for periodontal treatment living in Turkey, and to investigate the association between systemic disease and periodontal status, according to the new classification of periodontal disease (2017).

Methods: A total of 800 randomly selected dental files were evaluated among patients who had attended the periodontology department of a university hospital between January 2021 and January 2022. Demographic data (age and gender), self-reported medical history, smoking habits, daily tooth-brushing frequency, periodontal status, and the number of missing teeth were recorded. Full-mouth periodontal examinations were undertaken, and the patients were classified according to the American Association of Periodontology/European Federation of Periodontology 2017 case definitions.

Results: The prevalence of systemic disease was 48% among the study participants. Hypertension (HT), diabetes, and cardiovascular diseases (CVD) were the most common systemic diseases identified. Periodontitis was present in 32% of the study population. When periodontitis patients were classified according to their stages; 42% had severe (stageIII\IV) periodontitis, 35% moderate (stage II), and 23% mild (stage I). The prevalence of systemic disease increased according to the severity of periodontal disease ($p = 0.000$). A significant correlation was also present between the presence of systemic disease and missing teeth ($r = 0.120$, $p = 0.001$). On logistic regression analysis, self-reported diabetes (OR = 3.12, 95% CI: 1.90-5.12), HT (OR = 2.49, 95% CI: 1.68-3.68) and CVD (OR = 1.73, 95% CI: 1.01-2.96), age (OR = 1.05, 95% CI: 1.03-1.06), low tooth brushing habits (OR = 2.63, 95% CI: 1.81-3.83) and tobacco use (OR = 1.92, 95% CI: 1.33-2.78) were identified as significant predictors of periodontitis.

Conclusions: The present study results suggest an association between self-reported systemic diseases, as well as tobacco use, and periodontal disease severity.

Keywords

Systemic diseases, Periodontitis, Diabetes, Hypertension, Periodontal disease

Introduction

Periodontal disease is a common public health problem, affecting approximately half of the adult population worldwide [1]. The disease often begins as gingivitis, a reversible inflammatory process involving only the gingiva and, if left untreated, can progress to irreversible periodontitis. Periodontitis is characterized by chronic destruction of the tooth-supporting structures, as a result of a complex interplay between the host's immune system and polymicrobial biofilm [1].

Numerous clinical and epidemiological studies have focused on identifying specific risk factors and indicators that make an individual more susceptible to periodontal disease. Current evidence suggests that the presence of certain systemic diseases [2-5], smoking [6], stress [7], and aging [8] can influence periodontal disease progression and severity.

Studies have reported an association between periodontal disease and a wide range of systemic diseases including hypertension [9] (HT), rheumatoid arthritis [4], cardiovascular disorders [5] (CVD), diabetes mellitus [2], and respiratory infections [4]. The possible biologic mechanisms mediating the link between periodontal and systemic diseases include systemic

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inflammation, microbial dysbiosis, and altered immune response [4,9]. In addition, periodontal diseases can also affect the pathogenesis and course of various systemic diseases by triggering a series of chronic inflammatory events [3].

The presence of severe periodontal disease increases the risk of multiple tooth loss and edentulism, which can negatively affect people's quality of life from functional and psychological perspectives [1]. Moreover, the economic burden resulting from the management of both periodontal and systemic diseases underlines the need for implementing strategies to prevent their initiation and progression. In this context, the new periodontal classification system provides a multidimensional framework for risk assessment and personalized treatment protocols, especially for periodontitis patients [10]. Currently, there is limited information regarding the systemic profile in patients with periodontal disease with respect to this new periodontal case definition. Thus, this study aimed to determine the prevalence and types of systemic diseases in patients referred for periodontal treatment, and to investigate the association between systemic disease and periodontal status, according to the new classification of periodontal disease.

Materials and Methods

Study design

The present retrospective study was conducted in full accordance with the Declaration of Helsinki of 1975 (as revised in 2013) and approved by the Ethics Committee of the Medical Faculty of Akdeniz University (KAEK-344\11.05.2022).

This cross-sectional gender-matched study included records of patients diagnosed with periodontal disease at the department of Periodontics, Faculty of Dentistry, Akdeniz University, from 1st January 2021 to 1st January 2022. As a standard protocol of our clinic, all patients who attended for periodontal treatment undergo a detailed interview about their information on current medical and dental histories, followed by a routine periodontal examination, and these data are recorded on patients' standardized charts. Study inclusion criteria were: 1) Adult patients (>18 years old) and 2) Charts with complete information about study variables. Approximately 900 charts were evaluated for inclusion criteria, and when a randomly selected chart achieved the full inclusion criteria, that chart's data were recorded in a computer database file. Thirty-six patients were excluded due to age limitation, forty-two incomplete medical history, and twenty-two missing data.

Sample size estimation

The study sample size was determined by power calculation [11] considering multiple regression; the anticipated effect size (f2 = 0.15), the statistical power level (β = 0.95), the number of predictors (n = 16), and the probability level (α = 0.05) indicated that the minimum sample size needed in the present study was 204 participants. To increase the generalizability and minimize the error, a larger sample size of 800 (400 matched pairs for gender) was taken.

Data extraction

Patient's information regarding age, gender, self-reported medical history, smoking habits (present or absent) and the number of cigarettes smoked per day, daily tooth-brushing frequency (as brushing their teeth ≤ once/day and ≥ twice/day), periodontal status and the number of missing teeth were collected. The systemic diseases were classified into 15 categories as follows; cardiovascular diseases (CVD) (congenital heart defects, mitral valve prolapse, congenital and valvular defects, angina, atherosclerotic disease, and bypass surgery), diabetes. hypertension (HT), thyroid disease, gastrointestinal disease, musculoskeletal disease, infectious disease (hepatitis B and acquired immune deficiency syndrome), liver disease, kidney disease, respiratory disease, anemia, neoplasm, osteoporosis, psychological disease and allergy.

Case definition of periodontal disease

Diagnostic criteria and clinical case definitions for periodontal disease (gingivitis and periodontitis) were based on the Classification of Periodontal and Peri-Implant Diseases and Conditions of the 2017 World Workshop [12]. In brief, the following periodontal parameters were evaluated by two trained investigators (ÖD and ZVS) around six sites (mesiobuccal, mesiolingual, distobuccal, buccal, lingual, and distolingual) in all teeth present using William's periodontal probe; probing pocket depth (PPD), plaque index [13], bleeding on probing (BOP) [14], clinical attachment loss (CAL), and radiographic bone loss (RBL). Patients were diagnosed with gingivitis if they had PPD of ≤ 3 mm and BOP at ≥ 10% [12]. Further, all gingivitis patients were sub-categorized as gingivitis on an intact and reduced periodontium. Periodontitis patients were diagnosed if they have more than two detectable interproximal CAL, and sub-categorized as having stage; mild (stage I) periodontitis (CAL = 1-2 mm with RBL affecting < 15% of root length) moderate (stage II) periodontitis (CAL = 3-4 mm with RBL affecting 15-33% of root length), and severe periodontitis (stages III and IV) (CAL ≥ 5 mm with RBL extending to the middle or apical third of the root) [10].

Statistical analysis

Data were analyzed using using a statistical software (IBM SPSS Statistics, Version 23.0, Armonk, NY, USA). Descriptive statistics were calculated including percentages and numbers for categorical variables and means and standard deviations for continuous variables. The normality of data was evaluated by

Kolmogorov-Smirnov test. The differences of categorical variables in different subgroups were analysed using Chi-square test, and continuous variables with Mann Whitney U test or Kruskal-Wallis test. Spearman's rank correlation coefficient (rho) was used to assess correlations between variables. To determine the risk of occurrence of periodontitis (0 = non-periodontitis (gingivitis), 1 = periodontitis) with the presence of the different risk factors was evaluated by the binary logistic regression analysis. Multinominal logistic regression analysis was also performed to determine the severity of periodontitis (as mild, moderate and severe) as a dependent variable, and the parameters that reached statistical significance with the univariate analysis. Mild periodonitis was selected as a reference category for the comparisons with moderate and severe groups. For all the logistic regression models, odds ratios (OR) and 95% confidence intervals (CI) were calculated. P value was considered statistically significant if less than 0.05.

Results

The general characteristics of all patients, divided according to gender, are presented in Table 1. The mean age of the females and males was statistically similar

Table 1: The general characteristics of all patients and divided according to gender.

Parameters	Total	Male	Female	p
Total population	800	400	400	-
Age (mean ± SD) in years	43.05 ± 14.44	43.89 ± 14.09	42.21 ± 14.75	0.101*
Periodontal diagnosis (%)				**0.019****
Gingivitis	544 (68)	256 (64)	288 (72)	
Periodontitis	256 (32)	144 (36)	112 (28)	
Tobacco use (%)				**0.000****
No	473 (59.1)	196 (49)	277 (69.2)	
Yes	327 (40.9)	204 (51)	123 (30.8)	
Presence of systemic disease (%)				**0.002****
No	415 (51.9)	230 (57.5)	185 (46.3)	
Yes	385 (48.1)	170 (42.5)	215 (53.8)	
Hypertension (%)				**0.003****
No	571 (71.4)	266 (66.5)	305 (76.3)	
Yes	229 (28.6)	134 (33.5)	95 (23.8)	
Cardiovascular disease (%)				0.344**
No	696 (87.0)	343 (85.8)	353 (88.3)	
Yes	104 (13.0)	57 (14.2)	47 (11.8)	
Diabetes (%)				0.533**
No	693 (86.6)	350 (87.5)	343 (86.6)	
Yes	107 (13.4)	50 (12.5)	57 (14.3)	
Thyroid disease (%)				**0.000****
No	728 (91.0)	386 (96.5)	342 (85.5)	
Yes	72 (9.0)	14 (3.5)	58 (14.5)	
Gastrointestinal disease (%)				**0.000****
No	729 (91.1)	381 (95.2)	348 (87.7)	
Yes	71 (8.9)	19 (4.8)	52 (13.0)	
Musculoskeletal disease (%)				0.139**
No	783 (97.9)	395 (98.8)	388 (97.0)	
Yes	17 (2.1)	5 (1.2)	12 (3.0)	
Infectious disease (%)				**0.018****
Hepatitis B (%)				
No	768 (96.0)	377 (94.2)	391 (97.7)	
Yes	32 (4.0)	23 (5.8)	9 (2.3)	
AIDS (%)				
No	797 (99.6)	397 (99.3)	400 (100)	
Yes	3 (0.4)	3 (0.7)	0 (0.0)	

Liver disease (%)				0.685**
No	775 (96.9)	389 (97.3)	386 (96.5)	
Yes	25 (3.1)	11 (2.7)	14 (3.5)	
Kidney disorders (%)				0.678**
No	776 (97.0)	389 (97.3)	387 (96.8)	
Yes	24 (3.0)	11 (2.7)	13 (3.2)	
Respiratorydiseases (%)				**0.028****
No	735 (91.9)	376 (94.0)	359 (89.8)	
Yes	65 (8.1)	24 (6.0)	41 (10.3)	
Anemia (%)				**0.001****
No	761 (95.1)	391 (97.8)	370 (92.5)	
Yes	39 (4.9)	9 (2.3)	30 (7.5)	
Neoplasm (%)				0.176***
No	786 (98.3)	396 (99.0)	390 (97.5)	
Yes	14 (1.8)	4 (1.0)	10 (2.5)	
Osteoporosis (%)				**0.000*****
No	749 (93.6)	399 (99.8)	350 (87.5)	
Yes	51 (6.3)	1 (0.3)	50 (12.5)	
Psychological disease (%)				**0.01****
No	738 (92.3)	379 (94.8)	359 (89.8)	
Yes	62 (7.8)	21 (5.3)	41 (10.3)	
Allergy (%)				0.347**
No	757 (94.6)	382 (95.5)	375 (93.8)	
Yes	43 (5.4)	18 (4.5)	25 (6.3)	

*Mann Whitney U test; **Chi-square test with significant differences identified in bold (p value ≤ 0.05)

Table 2: Age distribution by categories.

	Age			Chi-Square	Correlation	
	Young 18-35 years n (%)	**Middle 36-49 years n (%)**	**Old ≥ 50 years n (%)**	**p**	**rho**	**p**
Study population	251 (31.4)	261 (32.6)	288 (36.0)	-	-	-
Gender				0.277	-0.047	0.187
Male	115 (28.8)	136 (34)	149 (37.3)			
Female	136 (34)	125 (31.3)	139 (34.8)			
Tobacoo use	117 (35.8)	121 (37)	89 (27.2)	0.000	0.135	0.000
Presence of systemic disease	71 (18.4)	128 (33.2)	186 (48.3)	0.000	0.296	0.000**
Periodontal status				0.000	0.345	0.000**
Gingivitis	231 (42.5)	163 (30)	150 (27.6)			
Periodontitis	20 (7.8)	98 (38.3)	138 (53.9)			

**p < 0.01

(p = 0.101). Of the 800 subjects, 40.9% were smokers with a high percentage of male smokers than females (p = 0.000). When concerning the self-reported systemic diseases; 48.1% of the study population reported having at least one systemic disease, with females more likely to be affected (p = 0.002). The most common systemic diseases reported were HT (28.6%), followed by diabetes (13.4%) and CVD (13%). Systemic diseases found to be significantly more prevalent in females included thyroid disease, gastrointestinal diseases (predominantly ulcers), respiratory diseases (asthma), osteoporosis, anemia and psychological disease. On the other hand, HT, and infectious diseases were more prevalent in males.

The median age of patients with systemic diseases was significantly higher compared to patients without the disease (47.60 ± 13.70 *vs.* 38.99 ± 14.03, p = 0.000). Moreover, the frequency of systemic disease increased with increasing age (r = 0.296, p = 0.000) (Table 2).

The results of the relationship between the frequency of systemic diseases and the severity of periodontal disease are presented in Table 3. The prevalence of gingivitis and periodontitis were 68% and 32% respectively. The mean age of the periodontitis patients was statistically higher than the gingivitis group (p = 0.000) and the prevalence of periodontitis severity increased with age (p = 0.000). Of the gingivitis patients, 77.1% were gingivitis on the intact periodontium, and 22.9% on the reduced periodontium. When

Table 3: Population characteristics compared between periodontal status groups.

	Gingivitis	Periodontitis				
	n (%)	Total n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	p-value
Study population	544 (68)	256 (32)	59 (23)	90 (35)	107 (42)	-
Age (mean ± SD in years)	39.65 ± 14.65	50.54 ± 11.04	46.86 ± 12.01	52.12 ± 10.68	50.78 ± 10.93	**0.000***
Gender						**0.017****
Male	256 (64.0)	144 (36)	27 (6.8)	50 (12.5)	67 (16.8)	
Female	288 (72.0)	112 (28)	32 (8.0)	42 (10.5)	38 (9.5)	
Tobacco use (%)						**0.001****
No	340 (62.5)	133 (52.0)	39 (66.1)	47 (52.2)	47 (43.9)	
Yes	204 (37.5)	123 (48.0)	20 (33.9)	43 (47.8)	60 (56.1)	
Number of cigaretes smoke per day (mean ± SD)	5.31 ± 8.04	7.25 ± 9.71	6.02 ± 9.07	7.20 ± 9.82	7.97 ± 9.98	**0.002***
Missing teeth (mean ± SD)	4.01 ± 3.80	4.94 ± 4.47	4.41 ± 4.51	4.49 ± 3.98	5.52 ± 4.80	**0.003***
Tooth brushing habbit (%)						**0.000****
≤ Once/day	170 (32)	193 (75.4)	40 (67.8)	65 (72.2)	87 (81.3)	
≥ Twice/day	370 (68)	65 (24.6)	19 (32.2)	25 (27.8)	20 (18.7)	
Presence of systemic disease (%)						**0.000****
No	334 (61.4)	81 (31.6)	24 (40.7)	30 (33.3)	27 (25.2)	
Yes	210 (38.6)	175 (68.4)	35 (59.3)	60 (66.7)	80 (74.8)	
Hypertension (%)						**0.000****
No	445 (81.8)	126 (49.2)	37 (62.7)	51 (56.7)	38 (35.5)	
Yes	99 (18.2)	130 (50.8)	22 (37.3)	39 (43.3)	69 (64.5)	
Cardiovascular disease (%)						**0.02****
No	485 (89.2)	211 (82.4)	51 (86.4)	76 (84.4)	84 (78.5)	
Yes	59 (10.8)	45 (17.6)	8 (13.6)	14 (15.6)	23 (21.5)	
Diabetes (%)						**0.000****
No	505 (92.8)	189 (73.8)	52 (88.1)	66 (73.3)	70 (65.4)	
Yes	39 (7.2)	67 (26.2)	7 (11.9)	24 (26.7)	37 (34.6)	
Thyroid disease (%)						0.880**
No	495 (91.0)	231 (90.2)	54 (91.5)	80 (88.9)	99 (92.5)	
Yes	49 (9.0)	25 (9.8)	5 (8.5)	10 (11.1)	8 (7.5)	
Gastrointestinaldisease (%)						0.941**
No	496 (91.2)	233 (91.0)	54 (91.5)	79 (87.8)	100 (93.5)	
Yes	48 (67.6)	23 (9.0)	5 (8.5)	11 (12.2)	7 (6.5)	
Musculoskelethaldisease (%)						0.817**
No	532 (97.8)	251 (98.0)	59 (100)	88 (97.8)	104 (97.2)	
Yes	12 (2.2)	5 (2.0)	0 (0.0)	2 (2.2)	3 (2.8)	
Infectious Disease (%)						0.55**
Hepatitis B						
No	532 (97.8)	244 (95.3)	58 (100)	83 (92.2)	102 (95.3)	
Yes	12 (2.2)	12 (4.7)	0 (0.0)	7 (7.8)	5 (4.7)	
AIDS						
No	542 (99.7)	255 (99.6)	59 (100)	89 (98.8)	107 (100)	
Yes	2 (0.3)	1 (0.4)	0 (0.0)	1 (0.2)	0 (0.0)	

Liver disease						0.69**
No	531 (97.6)	244 (95.3)	57 (96.6)	83 (92.2)	105 (98.1)	
Yes	13 (2.4)	12 (4.7)	2 (3.4)	7 (7.8)	2 (1.9)	
Kidney disease						0.274**
No	525 (96.5)	251 (98)	58 (98.3)	89 (98.9)	104 (97.2)	
Yes	19 (3.6)	5 (2.0)	1 (1.7)	1 (1.1)	3 (2.8)	
Respiratory disease						0.890**
No	499 (91.7)	236 (92.2)	53 (89.8)	82 (91.1)	101 (94.4)	
Yes	45 (8.3)	20 (7.8)	6 (10.2)	8 (8.9)	6 (5.6)	
Anemia						0.726**
No	516 (94.9)	245 (95.7)	55 (93.2)	88 (97.8)	102 (95.3)	
Yes	28 (5.1)	11 (4.3)	4 (6.8)	2 (2.2)	5 (4.7)	
Neoplasm						1**
No	534 (98.2)	252 (98.4)	58 (98.3)	88 (97.8)	106 (99.1)	
Yes	10 (1.8)	4 (1.6)	1 (1.7)	2 (2.2)	1 (0.9)	
Osteoporosis						0.457**
No	530 (97.4)	247 (96.5)	55 (93.2)	88 (97.8)	104 (97.2)	
Yes	14 (2.6)	9 (3.5)	4 (6.8)	2 (2.2)	3 (2.8)	
Psychological disease						0.777**
No	503 (92.5)	235 (91.8)	54 (91.5)	86 (95.6)	95 (88.8)	
Yes	41 (7.5)	21 (8.2)	5 (8.5)	4 (4.4)	12 (11.2)	
Allergy						0.179**
No	519 (95.4)	238 (93)	53 (89.8)	86 (95.6)	99 (92.5)	
Yes	25 (4.6)	18 (7)	6 (10.2)	4 (4.4)	8 (7.5)	

*Mann Whitney U test; **Chi-square test with significant differences identified in bold (p value ≤ 0.05)

periodontitis patients were classified according to the severity of periodontitis (stage); 23% of the patients had mild (stage I) periodontitis, 35% had moderate (stage II), and 42% of patients had severe (stage III and IV), respectively. Periodontitis was more prevalent in males than in females (p = 0.017). The frequency of having at least one systemic disease was higher in the periodontitis patients than in the gingivitis patients (p = 0.000). A significant correlation was also found between the presence of systemic disease and missing teeth (r = 0.120, p = 0.001). The frequency of smoking was higher in the periodontitis group compared to the gingivitis group (p = 0.001). Similarly, the mean number of cigarettes smoked per day in the periodontitis group was significantly higher than in the gingivitis group (p = 0.002). Significant differences were observed between gingivitis and periodontitis patients with regard to toothbrushing habits (p = 0.000). There were also significant differences between the periodontal status and the mean number of missing teeth with the severe periodontitis group having the highest number (p = 0.003).

According to binary logistic regression analysis; age (OR = 1.05, 95% CI: 1.03-1.06), low tooth brushing habit (OR = 2.63, 95% CI: 1.81-3.83) tobacco use (OR = 1.92, 95% CI: 1.33-2.78), the presence of diabetes (OR = 3.12, 95% CI: 1.90-5.12), the presence of HT (OR = 2.49, 95% CI: 1.68-3.68), and the presence of CVD (OR = 1.73, 95% CI: 1.01-2.96) were significant predictors of periodontitis (Table 4). The results of multinominal logistic regression analysis of the severity of periodontitis and systemic diseases are also presented in Table 5. Diabetes, HT, and tobacco use were significantly associated with severe periodontitis, and only diabetes in moderate

Table 4: Logistic regression analysis showing the associations between periodontitis and potential risk factors.

Variables	β	Odds ratio (95% CI)	P value
Age	0.051	1.05 (1.03-1.06)	**0.000**
Gender			
Male	0.001	1.00 (0.69-1.43)	0.995
Female	Reference		
Tooth brushing			
≤ Once/day	0.969	2.63 (1.81-3.83)	0.000
≥ Twice/day	Reference		
Diabetes	1.139	3.12 (1.90-5.12)	**0.000**
Hypertension	0.913	2.49 (1.68-3.68)	**0.000**
CVD	0.552	1.73 (1.01-2.96)	**0.04**
Tobacco use			
Yes	0.654	1.92 (1.33-2.78)	**0.003**
No	Reference		

p-value of regression coefficient (ß); OR: Odds Ratio; CI: Confidence Interval of 95% for odds ratio.

Table 5: Association between periodontitis severity and systemic diseases and tobacco use.

Periodontitis	Parameter	Adjusted Odds ratio (95% CI)	p value
Moderate	Hypertension	1.114 (0.540-2.297)	0.770
	Diabetes	2.898 (1.095-7.669)	0.032
	CVD	1.549 (0.799-3.610)	0.644
	Tobacco use	1.278 (0.452-3.635)	0.082
Severe	Hypertension	2.544 (1.252-5.172)	0.010
	Diabetes	3.523 (1.367-9.078)	0.009
	CVD	1.319 (0.493-3.530)	0.582
	Tobacco use	2.559 (1.304-5.025)	0.006

*Mild periodontitis group was selected as a reference category for the comparisons with moderate and severe periodontitis groups.

OR: Odds Ratio

when compared to mild periodontitis. The logistic regression model was significant (p = 0.001); explained 32% (Nagelkerke R^2) of the variance with a sensitivity 87.7% and specificity 48.8%.

Discussion

The present study is one of the first that provides comprehensive data regarding the relationship between systemic diseases and periodontal conditions in Turkey, using the new classification system of periodontal disease. The most important finding of this study was that nearly half of the patients with periodontal disease had reported having one or more systemic diseases which can be attributed to their association with a public university hospital. This suggestion is supported by the findings of Georgiou, et al. [15], who investigated a group of 1000 Australian periodontal patients and found that patients attending the public system have an increased prevalence of systemic disease compared to those seeking treatment in private practice.

The most frequently self-reported systemic diseases of the study population were hypertension, diabetes, and CVD, which also reflect the most prevalent chronic diseases in Turkey [16]. These results are in agreement with previous studies on this topic [17,18]. But, the findings differ from the data of a Western Australian tertiary institution study where CVD, allergy, and mental health disorders were the most common diseases determined [19]. The differences may be due to the different study designs and differences in race, and socioeconomic status of the study populations.

In the present study, patients with systemic diseases had a significantly higher median age when compared to the group without systemic disease, and the frequency of systemic diseases increased significantly from 18.4 percent in the young age group to 48.3 percent in the old age group (Table 2). The current results are in accordance with recent studies reporting that the prevalence of systemic disease increases with increasing age [15,20]. It has been reported that age-related organ deterioration is a biological process and this may lead to the development of many health disorders [21].

The present study has identified that 32% of the study population had periodontitis with a high prevalence of severe periodontitis (stage III and IV) and a male gender predominance (Table 3). According to the 2017 case definitions, the prevalence of mild periodontitis was 23%, moderate 35%, and severe 42%. Due to the novelty of the classification, studies using this case definition are limited. But this result is similar to an epidemiological study carried out on a population in the north of Portugal in 2022 [22]. Moreover, a cross-sectional study published by Chatzopoulos, et al. [23] also observed gender-related discrepancies in 262 older subjects from Greece, with more periodontal treatment needs for males compared to females.

Another important finding of this study was that the periodontal disease severity was found to increase with the presence of systemic disease (Table 3). Moreover, there was a significant positive correlation between the number of missing teeth and the presence of systemic disease (p = 0.001). In line with the present results, Madi, et al. [24] also reported that the risk of both alveolar bone and tooth loss was statistically higher in periodontitis patients with systemic diseases including HT and diabetes. On the other hand, Sperr, et al. [25] reported that periodontitis severity was not significantly associated with systemic diseases. The main reason for the difference from that study may be related to the study design, and different periodontal disease classifications.

Results of the present study showed that self-reported HT, diabetes, and CVD, tobacco use, age, and low tooth brushing habits were significantly associated with periodontitis (Table 4). Evidence from epidemiologic studies showed that the prevalence and severity of periodontal disease tend to increase with the age of patients, which has been attributed to the cumulative effect of time [8]. It is also well known that periodontal health depends on proper oral hygiene habits and a meta-analysis from observational studies reported that fair to poor oral hygiene habits increase the risk of periodontitis by two- to five-fold [26].

In the present study, self-reported diabetes was significantly associated with periodontitis (OR = 3.12, 95% CI: 1.90-5.12), and individuals who reported diabetes were 3.5 times more likely to have severe periodontitis than mild (Table 5). Chatzopoulos, et al. [27] also reported that self-reported diabetes was significantly associated with severe bone loss than mild in older adults (OR = 1.8, 95% CI: 1.2-2.7). Periodontitis is defined as the sixth complication of diabetes, and epidemiological studies have confirmed that patients with diabetes have a three to four-fold increased risk

of periodontitis [2]. Conversely, periodontal disease can also affect glycemic control and increase the risk for diabetic complications [3]. This bidirectional relationship between two diseases has been explained by the high levels of systemic markers of inflammation, the accumulation of advanced glycation end products, and the altered immune-inflammatory responses [2,3]. Accordingly, metabolic control of diabetes through glycosylated hemoglobin (HbA1c) levels has been added to the new classification of periodontal disease as a degree modifier to predict the risk of future progression of periodontitis [10]. Therefore, collaborations between periodontologists and medical professionals are essential in patients with diabetes. These patients should be informed about the risk of periodontal disease, and receive long-term preventive periodontal treatment to maintain optimal plaque control and prevent the risk of further periodontal disease progression.

Existing evidence from case-control studies indicates an association between HT and periodontal disease [9,28] in consistence with the current study findings that HT was strongly associated with periodontitis (OR = 2.49, 95% CI: 1.68-3.68) (Table 4). Clinical and experimental studies suggest that the association between periodontal disease and the cardiovascular system could be mediated through endothelial dysfunction, oxidative stress, increasing levels of systemic inflammation, and proinflammatory cytokines/or altered microbial composition of the dental biofilm [9,28,29]. Moreover, both CVD and periodontal disease share common risk factors that may also explain this link, such as tobacco use, stress, aging, and socioeconomic factors [9]. The results of this study also suggests that having HT was 2.5-fold more likely to increase the risk of developing severe periodontitis (Table 5). In accordance with our results previous studies reported that hypertensive patients showed more severe periodontal conditions than healthy ones [28]. Moreover, tooth loss in periodontal disease was shown to be related to high blood pressure levels [9], and successful periodontal treatment has been reported to have a positive effect on decreasing blood pressure [29].

It is well documented that smoking is an important risk factor in the development of periodontitis [6,30]. In the present study, smokers were 1.92 times more likely to have periodontitis compared to non-smokers. The frequency of smoking was also higher in the periodontitis group (48%) compared to the gingivitis group (37.5%) (p = 0.001), and smokers were 2.5 times more likely to have severe periodontitis than mild. Evidence from numerous studies documented that smoking results in a chronic inflammatory process by promoting the secretion of radical oxygen species and proinflammatory mediators that play a role in the destruction of periodontal tissues, ultimately resulting in tooth loss [6]. Moreover, the new periodontal disease classification system has also determined smoking as a modifier for periodontitis severity [10]. The current results may also explain the significant increase in the prevalence of periodontitis from 7.8% in young patients (18-35 years) to 38.3% and 53.9% in adults (36-49 years) and elderly (> 50 years), respectively. Therefore, smoking cessation strategies are urgently required, and periodontologists can play a critical role in providing advice on the benefits of smoking cessation on oral and general health.

Some limitations are present in the present study. Firstly, the study was conducted on a single institution, therefore, the findings cannot be generalized to the general population in Turkey. Secondly, the evaluated parameters were taken retrospectively from patients' medical records but no laboratory or physical examinations were performed on patients. Thirdly, the cross-sectional study design makes it difficult to infer causal relationships for the outcome. Therefore long-term prospective studies are needed to confirm a causal relationship between systemic conditions and periodontal disease. On the other hand, the most current classification of periodontal disease was used, thus allowing comparability with future studies related to this topic worldwide. The findings of this study are also beneficial for public health professionals in terms of community-based preventive actions, especially for diabetics and smokers.

Conclusion

Within the limitations, the results of this study, that self-reported diabetes, hypertension, and tobacco use significantly increased the risk of developing severe periodontitis, may indicate an association between systemic disease and periodontal disease. However, large and longitudinal studies are needed to better understand this association. Nevertheless, identifying the systemic disease of patients through a detailed medical history along with any required medical consultation from the medical professional is essential before making any periodontal treatment plan.

Declarations

Ethics committee approval

Ethics committee approval was obtained from Akdeniz University (KAEK-344\11.05.2022).

Data sharing statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy or ethical restrictions.

Conflict of interest

The authors declare that they have no conflict of interests.

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Author contributions

Concept- Ö.D.; Design- Z.V.S.; Literature Search- Z.V.S; Writing- Ö.D; Critical Review: Ö.D., Z.V.S.

References

1. Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J (2017) Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: A call for global action. J Clin Periodontol 44: 456-462.
2. Mealey BL, Ocampo GL (2007) Diabetes mellitus and periodontal disease. Periodontol 2000 44: 127-153.
3. Genco RJ, Graziani F, Hasturk H (2020) Effects of periodontal disease on glycemic control, complications, and incidence of diabetes mellitus. Periodontol 2000 83: 59-65.
4. Genco RJ, Sanz M (2020) Clinical and public health implications of periodontal and systemic diseases: An overview. Periodontol 2000 83: 7-13.
5. Sanz M, Del Castillo AM, Jepsen S, Gonzalez-Juanatey JR, D'Aiuto F, et al. (2020) Periodontitis and cardiovascular diseases: Consensus report. J Clin Periodontol 47: 268-288.
6. Leite FRM, Nascimento GG, Scheutz F, López R (2018) Effect of smoking on periodontitis: A systematic review and meta-regression. Am J Prev Med 54: 831-841.
7. Decker A, Askar H, Tattan M, Taichman R, Wang H-L (2020) The assessment of stress, depression, and inflammation as a collective risk factor for periodontal diseases: A systematic review. Clin Oral Investig 24: 1-12.
8. Kanasi E, Ayilavarapu S, Jones J (2016) The aging population: Demographics and the biology of aging. Periodontol 2000 72: 13-18.
9. Xu K, Yu W, Li Y, Li Y, Wan Q, et al. (2022) Association between tooth loss and hypertension: A systematic review and meta-analysis. J Dent 123: 104178.
10. Tonetti MS, Greenwell H, Kornman KS (2018) Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Clin Periodontol 20: S149-S161.
11. Faul F, Erdfelder E, Lang A-G, Buchner A (2007) G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods 39: 175-191.
12. Chapple ILC, Mealey BL, Van Dyke TE, Bartold PM, Dommisch H, et al. (2018) Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: Consensus report of workgroup 1 of the 2017 World Workshop on the classification of periodontal and peri-implant diseases and conditions. J Periodontol 89: S74-S84.
13. Löe H (1967) The gingival index, the plaque index and the retention index systems. J Periodontol 38: 610-616.
14. Ainamo J, Bay I (1975) Problems and proposals for recording gingivitis and plaque. Int Dent J 25: 229-235.
15. Georgiou TO, Marshall RI, Bartold PM (2004) Prevalence of systemic diseases in Brisbane general and periodontal practice patients. Aust Dent J 49: 177-184.
16. Satman I, Omer B, Tutuncu Y, Kalaca S, Gedik S, et al. (2013) Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. Eur J Epidemiol 28: 169-180.
17. Aggarwal A, Panat SR, Talukder S (2011) Self-reported medical problems among dental patients in Western Uttar Pradesh, India. J Dent Educ 75: 1635-1640.
18. Furuta M, Fukai K, Aida J, Shimazaki Y, Ando Y, et al. (2019) Periodontal status and self-reported systemic health of periodontal patients regularly visiting dental clinics in the 8020 Promotion Foundation Study of Japanese Dental Patients. J Oral Sci 61: 238-245.
19. Frydrych AM, Parsons R, Kujan O (2020) Medical status of patients presenting for treatment at an Australian dental institute: A cross-sectional study. BMC Oral Health 20: 289.
20. Nery EB, Meister F Jr, Ellinger RF, Eslami A, McNamara TJ (1987) Prevalence of medical problems in periodontal patients obtained from three different populations. J Periodontol 58: 564-568.
21. King M, Lipsky MS (2015) Clinical implications of aging. Dis Mon 61: 467-474.
22. Relvas M, López-Jarana P, Monteiro L, Pacheco JJ, Braga AC, et al. (2022) Study of prevalence, severity and risk factors of periodontal disease in a Portuguese population. J Clin Med 11: 3728.
23. Chatzopoulos GS, Tsalikis L (2016) Periodontal treatment needs and systemic diseases in an older population in Greece. J Clin Exp Dent 8: 32-37.
24. Madi M, Abuohashish HM, Attia D, AlQahtani N, Alrayes N, et al. (2021) Association between periodontal disease and comorbidities in Saudi's eastern province. Biomed Res Int 2021: 5518195.
25. Sperr M, Kundi M, Tursic V, Bristela M, Moritz A, et al. (2018) Prevalence of comorbidities in periodontitis patients compared with the general Austrian population. J Periodontol 89: 19-27.
26. Lertpimonchai A, Rattanasiri S, Vallibhakara S A-O, Attia J, Thakkinstian A (2017) The association between oral hygiene and periodontitis: A systematic review and meta-analysis. Int Dent J 67: 332-343.
27. Chatzopoulos GS, Cisneros A, Sanchez M, Wolff LF (2018) Systemic medical conditions and periodontal status in older individuals. Spec Care Dentist 38: 373-381.
28. Martin-Cabezas R, Seelam N, Petit C, Agossa K, Gaertner S, et al. (2016) Association between periodontitis and arterial hypertension: A systematic review and meta-analysis. Am Heart J 180: 98-112.
29. Vidal F, Cordovil I, Figueredo CMS, Fischer RG (2013) Non-surgical periodontal treatment reduces cardiovascular risk in refractory hypertensive patients: A pilot study. J Clin Periodontol 40: 681-687.
30. Nociti FH Jr, Casati MZ, Duarte PM (2015) Current perspective of the impact of smoking on the progression and treatment of periodontitis. Periodontol 2000 67: 187-210.