The investigation of the association between systemic diseases and periodontitis in subjects referred periodontology clinic

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Özet

Amaç: Bu araştırmanın amacı; periodontitisi olan ve olmayan bireylerde sistemik hastalıkların prevalansını belirleyerek, bu bireyler arasında sistemik hastalık riski açısından farklılık olup olmadığını değerlendirmek ve incelenen populasyonda periodontitis ile sistemik hastalıklar arasında bir ilişki olup olmadığını araştırmaktır. Gereç ve Yöntem: 2004- 2005 yılları arasında, Süleyman Demirel Üniversitesi Diş Hekimliği Fakültesi Periodontoloji Kliniğine başvuran bireylerin, kaydedilmiş tıbbi ve dental anamnez formları değerlendirildi. Bulgular: Anamnez formlarındaki klinik ve radyografik muayene kayıtlarına dayanarak; 1887 bireyde periodontitis olduğu belirlendi. Geriye kalan 850 bireyde ise periodontitis bulgusuna rastlanmadı. Bireylerin 846 sında (% 30,9) sistemik hastalık olduğu belirlendi. En sık görülen sistemik hastalıklar kalp-damar hastalıkları (%12,2) idi. Bunu endokrin hastalıklar (%7,2), romatizmal hastalıklar (%4,3), kan hastalıkları (%3), göğüs hastalıkları (%2,9) ve dermatolojik hastalıklar (%0,5) takip ediyordu. Periodontitisi olan ve olmayan bireyler arasında, sistemik hastalık varlığı açısından anlamlı farklılık izlendi (p<0,001). Lojistik regresyon analizinde sistemik hastalık riskinin periodontitisi olan bireylerde olmayanlara göre 1,775 olasılıklar oranı ile arttığı belirlendi. Sonuç: Bu araştırmanın sonuçları periodontitisi olan bireylerin olmayanlara göre daha fazla sistemik hastalığa sahip olduğunu göstermektedir. Periodontitis sistemik hastalık varlığı için bir risk faktörü olabilir.

Anahtar kelimeler: periodontitis, sistemik hastalıklar, diş kaybı, prevalans

Abstract

Aim: The aims of this study were to determine the prevalence of systemic diseases in subjects referred to periodontology clinic, to evaluate whether there is a difference in risk of systemic disease existence between subjects with and without periodontitis and to assess whether there is any association between periodontitis and systemic diseases in this population. Material and methods: The 2737 medical and dental history forms of the subjects referred Periodontology Clinic of Suleyman Demirel University Faculty of Dentistry which were archived in years 2004-2005 were assessed. Results: A total of 1887 patients were periodontitis while 850 patients were not based on the anamnesis forms. The number of patients with systemic disease was 846 (30.9%). The most common systemic disease was cardiovascular disease (12.1%) followed by endocrine diseases (7.2%), rheumatologic diseases (4.3%), infectious diseases (4.3%), hematologic disorders (3%), pulmonary diseases (2.9%), and dermatologic diseases (0.5%). There was significant difference regarding the presence of systemic diseases between the subjects with and without periodontitis (p<0.001). Periodontitis was found a risk factor for systemic disease existence with an odds ratio of 1.775 in logistic regression analysis. Conclusion: Our findings suggest that periodontitis patients had more systemic disease compared with subjects without periodontitis. Periodontitis may be a risk factor for systemic disease.

Key words: periodontitis, systemic diseases, tooth loss, prevalence

Introduction

Periodontitis is an infectious disease resulting in the degradation of periodontal ligament, gingival connective tissue and alveolar bone. The tissue breakdown develops against a set of specific subgingival plaque bacteria and the host response arises towards the plaque bacteria and its products. The host response expressed as a result of periodontal infections causes the production of biological mediators, interleukins and prostaglandins etc. locally (1) and also the increase of the serum antibody levels systemically (2). Periodontal infection causes the increase in circulating cytokines and inflammatory mediators and consequently systemic inflammation (3). A number of studies have shown that chronic periodontitis is associated with increased levels of C-reactive protein (CRP) and endothelial dysfunction (4, 5).

Significant associations have been reported between periodontal disease and cardiovascular diseases (5-10), cerebral infarction (11, 12), diabetes mellitus (13, 14), rheumatoid arthritis (15), and all-cause mortality (16). Since their effects on normal immune and inflammatory mechanisms, certain systemic diseases and disorders such as diabetes mellitus, hypercholesterolemia and cardiovascular diseases may increase individual susceptibility to periodontal diseases and the severity of periodontal diseases (17). The chronic systemic disorders may cause alterations in connective tissue metabolism and endocrine imbalance which are predisposing the formation of periodontal diseases (18). The local and systemic host response developed toward the periodontal bacteria and their toxins has led to the opinion that periodontal diseases affect the prognosis and severity of the systemic diseases (19). Periodontitis increases serum levels of CRP (20), causes hyperlipidemia (21), and enhances the occurrence of atherosclerosis, coronary hearth disease and myocardial infarction (9, 22, 23) and associated with increased central and systemic blood pressure (24). Additionally, the significant associations were found between the presence of periodontal disease and the occurrence of diabetes mellitus (4, 14), chronic obstructive pulmonary disease (33), aspiration pneumonia (26) and preterm low-birth weight (27). The positive effects of the therapy of periodontitis on the course of systemic diseases such as amendatory effects on glycemic control of diabetes mellitus or metabolic control of hyperlipidemia are reported in several studies (28, 29).

In Turkish population, hypertension, hypercholesterolemia, cardiovascular diseases and type 2 diabetes mellitus are common diseases because of genetic susceptibility and abdominal fatness (42). Hypertension is observed in 5.5 million Turkish men and 6.6 million Turkish women and 3.3 million Turkish people had diabetes mellitus and 12 million Turkish people had hyperlipidemia (30). The bi-directional interrelationship between systemic diseases and periodontal diseases (21) was taken into the consideration; the periodontally diseased Turkish patients may experience more systemic disease. The purpose of the present study was to determine the prevalence of systemic diseases in periodontitis patients, to evaluate whether is periodontitis increase the risk of systemic disease and to assess whether there is any association between periodontitis and systemic disease in this population.

Materials and Methods

The study was conducted as a cross-sectional investigation based on selected medical history and clinical examination forms archived in Suleyman Demirel University, Faculty of Dentistry, and Department of Periodontology. The anamnesis forms collected between 2004-2005 years were included in the study.

The medical history forms of subjects referred to the Department of Periodontology for periodontal treatment and diagnosed as periodontitis according to Centers for Disease Control and Prevention and American Academy of Periodontology (having two or more interproximal sites with ≥4 mm clinical attachment loss, not on the same tooth, or two ore more interproximal sites with ≥5 mm probing pocket depth, not on the same tooth) (31) were selected for to constitute the periodontitis group and the other medical history forms belonging to the subjects diagnosed as non-periodontitis according to criteria (31) were selected for to constitute the non-periodontitis group.

Age, gender, educational level, oral hygiene habits, other habits including smoking or bruxism, dental visit frequency, and the systemic conditions of the subjects have been recorded to the medical and dental history form according to all patients' self reports. The periodontitis and non-periodontitis groups were sub-grouped according to age and smoking status. Age was stratified into two groups; 1) ≤ 29 years and 2)>29 years. Since smoking is an important risk factor for periodontal diseases (32), smoking status was

categorized into four groups; 1) non-smoker, 2) light smoker (1-5 cigarettes/day consumed subjects), 3) heavy smoker (6≤cigarettes/day consumed subjects) and 4) former smoker. The following systemic conditions were recorded in accordance to patients' self-reports; cardiovascular, pulmonary, endocrine, rheumatologic and dermatologic diseases, previous hepatitis infections (Hepatitis A, B and C), hematologic disorders, and medications. Investigated medical condition groups were sub grouped and coded numerically.

Statistical analysis

All quantitative variables were expressed as mean ± standard deviation for each group. Kolmogorov-Smirnov test was performed to check the normality of age and number of missing teeth data before running tests. Chi-square and t-tests were performed for comparisons of related qualitative variables. Spearman correlations were estimated to see highly correlated variables. A p-value less than 0.05 were considered to be statistically significant. Odds ratios (ORs) for systemic disease as the dependent variable were calculated with a logistic stepwise regression model (significance level: 0.05) adjusted for multiple independent variables. The binary logistic regression model was constructed as Systemic diseases =Age groups + Gender + Smoking status + Missing teeth + Prosthetic appliances + Periodontal status.

Variables that showed Spearman correlation rho>0.75 with other variables were excluded to avoid co-linearity. Statistical analyses were made with SPSS 15.0 statistical packet.

Results

The study sample consisted of 1352 women and 1385 men, a total of 2737 subjects. The age range of the subjects was 7-80, the mean age was 35.07±12.9 years in women and 37.03±13.6 years in men. The percentage of uneducated individuals was 2.4%, elementary school graduated was 24.6%, high schoolgraduated was 34.3%, and university graduated was 38.7%. The number of subjects having regular brushing habit was 1969 (71.9%), and 768 (28.1%) subjects were not brushing their teeth regularly. The number of subjects using interdental cleaning devices in addition to the brushing was only 127 (4.6%).

The number of cigarette consumers was 783 (28.6%). The number of non-smoker subjects was 1473 (53.8%), the number of light smokers was 154 (5.6%),

the number of heavy smokers was 629 (23%) and the number of former smokers was 481 (17.6%). In all smoking subgroups; the number of smoker men was statistically significantly higher than that of women (p<0.05). Additionally, there were statistically significant differences between the smoking subgroups regarding mean age and age groups (p<0.05). Most of non- smoker subjects were in thirty ages. All study population was consisted of 1887 periodontitis patients (68.9%) and 850 (31.1%) non-periodontitis subjects. The distribution of age groups, gender, presence of systemic disease, number of missing teeth, brushing habits, regular dental visit, smoking status, presence of prosthetic appliances and bruxism habit in periodontitis and non-periodontitis groups were showed in Table 1. The distribution of systemic diseases regarding age groups and gender are shown in Table 2.

Table 1. Descriptive statistics and statistical test results of examined characteristics by periodontal status.

Groups	Periodontitis	Non-Periodontitis	Total
Age (mean±sd)	41.51±11.27*	23.96±8.79	36.6±13.3
Gender			
Female n(%)	864 (45.8)*	488 (57.4)	1352 (49.4)
Male n(%)	1023 (54.2) *	362 (42.6)	1385 (50.6)
Age groups			
≤29 years n(%)	270 (14.3)*	659 (77.5)	929 (33.9)
> 29years n(%)	1617 (85.7) *	191 (22.5)	1808 (66.1)
Smoking status			
Non-smoker n(%)	1017 (53.9)	456 (53.6)	1473 (53.8)
Light smoker n(%)	116 (6.1)	38 (4.5)	154 (5.6)
Heavy smoker n(%)	453 (24)	176 (20.7)	629 (23)
Former smoker n(%)	301 (16)	180 (21.2)	481 (17.6)
Number of missing teeth			
0 n(%)	618 (32.8) *	532 (62.6)	1150 (42.0)
1-3 n(%)	582 (30.8) *	242 (28.5)	824 (30.1)
4≤ n(%)	687 (36.4) *	76 (8.9)	763 (27.9)
Brushing habits			
0/day n(%)	607 (32.2) *	161 (19)	768 (28)
1/day n(%)	679 (36)*	295 (35)	974 (35.6)
2/day n(%)	490 (26)*	329 (39)	819 (30)
3/day n(%)	111 (5.88)*	65 (8)	176 (6.4)
Regular dental visit n(%)	122 (6.5)*	100 (11.8)	222 (8.11)
Prosthetic appliances n(%)	812 (43.0)*	128 (15.1)	940 (34.3)
Bruxism n(%)	244 (12.9)	92 (10.8)	336 (12.3)
Total	1887 (68.9) *	850 (31.1)	2737 (100)

* significantly different than the non-periodontitis group (p<0.001), n: the number of subjects

A total of 846 (30.9%) person had systemic diseases in all study groups. The mean age of subjects having systemic disease was 42.52 ± 12.9 years while the mean age of systemically healthy subjects was 33.52 ± 12.6 years. The age difference between the subjects with systemic disease and medically healthy subjects was statistically significant (p<0.001).

The most common systemic disease in study population was cardiovascular diseases (331 person,

Table 2. Descriptive statistics and statistical test results of examined systemic disease characteristics for age and gender groups.

Systemic diseases	Age groups				Gender				
	≤29 (n=929)		>29 (n=1808)		p	Male (n=1385)		Female (n=1352)		p
	n	%	N	%		n	%	n	%	
Cardiovascular diseases					<0.001					<0.001
yes	26	2.8	305	16.9		134	9.7	197	14.6	
no	903	97.2	1503	83.1		1251	90.3	1155	85.4	
Pulmonary diseases					<0.05					<0.05
yes	14	1.5	65	3.6		29	2.1	50	3.7	
no	915	98.5	1743	96.4		1356	97.9	1302	96.3	
Endocrine diseases					<0.001					<0.001
yes	13	1.4	183	10.1		60	4.3	136	10.1	
no	916	98.6	1625	89.9		1325	95.7	1216	89.9	
Dermatologic diseases					NS					NS
yes	4	0.4	10	0.6		7	0.5	7	0.5	
no	925	99.6	1798	99.4		1378	99.5	1345	99.5	
Rheumatologic diseases					<0.001					NS
yes	16	1.7	102	5.6		50	3.6	68	5.0	
no	913	98.3	1706	94.4		1335	96.4	1284	95.0	
Hematologic disorders					NS					<0.001
yes	25	2.7	58	3.2		14	1.0	69	5.1	
no	904	97.3	1750	96.8		1371	99.0	1283	94.9	
Medication					<0.001					<0.05
yes	23	2.5	211	11.7		102	7.4	132	9.8	
no	906	97.5	1597	88.3		1283	92.6	1220	90.2	
Hepatitis					NS					NS
yes	19	2.0	49	2.7		39	2.8	29	2.1	
no	910	98.0	1759	97.3		1346	97.2	1323	97.9	

n: number of subjects, p: significance levels with Chi-square test,
NS: not significant

12.1%; especially hypertension 203 person, 7.4%), followed by endocrine diseases (196 person, 7.2%), rheumatologic diseases (118 person, 4.3%), infectious diseases (117 person, 4.3%), hematologic disorders (83 person, 3%), pulmonary diseases (79 person, 2.9%), and dermatologic diseases (14 person, 0.5%). The percentage of the subjects taking medication regularly was 8.5% (234 subjects).

A total of 691 (36.6%) subjects in periodontitis group and 155 (18.2 %) subjects in non-periodontitis group had one or more systemic disease. There was a statistically significant difference between periodontitis and non-periodontitis groups for the prevalence of systemic diseases (p<0.001). The comparison of groups regarding the presence of systemic diseases is demonstrated in table 3. The systemic diseases were observed significantly higher in the subjects with one or more tooth loss than the full dentate patients (p<0.001). The distribution of the mean number of missing teeth regarding systemic diseases is presented in Table 4. The significant correlations were found between age and the presence of periodontitis (rho=0.624, p<0.001), the number of missing teeth (rho=0.604, p<0.001), cardiovascular diseases (rho=0.295, p<0.001), endocrine diseases (rho=0.222, p<0.001), and presence of one or more systemic disease (rho=0.290, p<0.001).

When risk estimates were calculated with odds ratio; age, gender, periodontal status, smoking, number of missing teeth and usage of prosthetic appliances were defined as risk factors for the presence of systemic diseases in this study population. The distribution systemic diseases regarding risk factors and adjusted odds ratios are presented in Table

Table 3. The comparisons of systemic diseases between the periodontitis and non-periodontitis groups

Systemic diseases n (%)	Periodontitis n(%)	Non- n(%)	Total Periodontitis	p
Cardiovascular				
Hyperlipidemia	34 (1.8)	1 (0.1)	35 (1.3)	<0.001
Hypertension	196 (10.4)	22 (2.6)	218 (7.9)	<0.001
Hypotension	24 (1.3)	10 (0.4)	34 (1.3)	<0.001
Myocardial infarction or Angina Pectoris	24 (1.3)	2 (0.2)	26 (0.9)	<0.001
Congestive Heart Failure	14 (0.7)	0 (0)	14 (0.5)	<0.001
Congenital Heart Diseases or Valvular Dysfunctions or Valvular Prosthesis	17 (0.9)	3 (0.4)	20 (0.7)	<0.001
Endocrine				
Thyroid disorders	73 (3.9)	15(1.8)	88 (3.2)	<0.001
Diabetes Mellitus	64 (3.4)	5 (0.6)	69 (2.5)	<0.001
Menopause and osteoporosis	45 (2.4)	1 (0.1)	46 (1.7)	<0.001
Pulmonary				
Tuberculosis and pneumonia	9 (0.4)	3 (0.4)	12 (0.4)	NS
Bronchitis	12 (0.6)	9 (1.1)	21 (0.8)	NS
Asthma	39 (2.1)	5 (0.6)	44 (1.6)	<0.001
Chronic obstructive pulmonary disease	1 (0.1)	1 (0.1)	2 (0.1)	NS
Dermatologic diseases				
Lichen planus	4 (0.2)	0 (0)	4 (0.1)	NS
Pemphigus	1 (0.1)	0 (0)	1 (0.01)	NS
Psoriasis	1 (0.1)	3 (0.4)	4 (0.1)	NS
Behçet's disease	1 (0.1)	2 (0.2)	3 (0.1)	NS
Rheumatologic diseases				
Rheumatoid arthritis	58 (3.1)	6 (0.7)	64 (2.3)	<0.001
Acute arthritis	9 (1.1)	45 (2.4)	54 (2)	<0.001
Lupus erythematosus	1 (0.1)	1 (0.1)	2 (0.1)	NS
Hepatitis				
A	27 (1.4)	22 (2.6)	49 (1.8)	NS
B	45 (2.4)	18 (2.1)	63 (2.3)	NS
C	5 (0.3)	0 (0)	5 (0.2)	NS
Hematologic disorders				
Anaemia	51 (2.7)	24 (2.8)	75 (2.7)	NS
Haemophilia	3 (0.2)	0 (0)	3 (0.1)	NS
Leukaemia	3 (0.2)	0 (0)	3 (0.1)	NS
Medication	209 (11.1)	25 (2.9)	234 (8.5)	NS
Total	691 (36.6)	155 (18.2)	846 (31)	<0.001

n: the number of subjects,
p: significance levels with Chi-Square test,
NS: not significant

Table 4. Descriptive statistics and statistic test results of the number of missing teeth (mean±SD) regarding examined systemic diseases and periodontal status.

	n	The number of missing teeth (mean±SD)	p value
Systemic diseases			<0.001
yes	846	3.5±4.1	
no	1891	2.2±3.3	
Cardiovascular diseases			<0.001
yes	331	4.2±4.2	
no	2406	2.4±3.5	
Pulmonary diseases			<0.05
yes	79	3.9±4.7	
no	2658	2.5±3.6	
Endocrine diseases			<0.001
yes	196	3.9±4.5	
no	2541	2.5±3.5	
Dermatologic diseases			NS
yes	14	2.4±2.1	
no	2723	2.6±3.6	
Rheumatologic diseases			<0.001
yes	118	3.9±4.3	
no	2619	2.5±3.6	
Hematologic disorders			NS
yes	83	1.9±2.9	
no	2654	2.6±3.6	
Medication			<0.001
yes	234	4.4±4.1	
no	2503	2.4±3.5	
Hepatitis			NS
yes	117	2.7±3.5	
no	2620	2.6±3.6	
Periodontal status			<0.001
Non- Periodontitis	850	1.0±1.9	
Periodontitis	1887	3.2±3.9	

n: the number of subjects, p: significance levels with t test; NS: not significant

Table 5. Associations between prevalence of systemic diseases and adjusted odds ratios of risk factors estimated with logistic regression model.

Risk Factors	Prevalence of systemic disease (%)	n	Odds ratio (95% CI)	p
Age groups (years)				.000
≤ 29	16.8	929	1.00	
> 29	38.2	1808	1.948 (1.499-2.531)	
Gender				.000
Male	24.3	1352	1.00	
Female	37.7	1385	2.037 (1.705-2.434)	
Periodontal status				.000
Non- Periodontitis	18.2	850	1.00	
Periodontitis	36.6	1887	1.775 (1.386-2.272)	
Smoking status				.021
None smoker	24.9	1954	1.00	
Smoker	33.3	783	0.776 (0.635-0.948)	
Number of missing teeth				.022
0	23.6	1150	1.00	
1+	36.2	1587	1.143 (0.922-1.417)	
Prosthetic appliances				.013
No	26.2	1797	1.00	
Yes	40.0	940	1.286 (1.048-1.578)	

n: the number of subjects, OR: Odds ratio, CI: confidence interval, p: significance levels
Binary Logistic regression model; Systemic diseases= 0.667*, Age groups= +0.712*, Gender= -0.254*, Smoking status= +0.133*, Missing teeth = +0.251*, Prosthetic appliances= +0.574*, Periodontal status= -2.178*

Discussion

The aim of this study was to determine the prevalence of systemic diseases in periodontitis patients and, to evaluate whether there is any association between the presences of periodontitis and systemic diseases in this population. This study was conducted as a cross- sectional investigation.

A number of factors limited the present study. Firstly; the information regarding the presence of systemic diseases was based on the data obtained from self reported medical history forms. However, medical questionnaires are used routinely in epidemiological and clinical studies. (32, 33) Secondly; the relationships between the measures of periodontitis such as clinical attachment level or probing pocket depth and the measures of systemic status such as blood pressure, body mass index, blood glucose levels and lipid profiles were not evaluated in this study. Age is a risk factor for both periodontitis and several systemic diseases (34). Chronic periodontitis, a more prevalent form of periodontal disease, was seen in patients aged thirty but it may be seen in younger subjects. Hence the study population embraced all age groups. Additionally, the study population was divided into two groups; 29 years of age and younger and older than 29 years, and the prevalence of systemic diseases was compared between these age groups. Few epidemiological studies including older individuals (35- 37) have suggested that the prevalence and severity of periodontitis increase with age. Similarly, the prevalences of periodontitis were found 14.3 % in ≤29 years group and 85.7 % in >29 years group in this study.

Molloy et al. (32) reported that there was an association of periodontal disease parameters with systemic medical conditions and tobacco use in subjects 50 years of age and older. De Stefano et al. (22) found that the subjects with periodontitis, aged between 25-74 years, had a 46% increased risk for mortality from all mortality causes in NHANES-I population. It was reported that the increased risk of mortality due to periodontitis remained significant even after controlling multiple variables including age, gender, race, education, poverty index, physical activity, diabetes mellitus, systolic blood pressure, cholesterol, alcohol consumption and cigarette smoking.

Smoking is accepted as the important risk factor for periodontal disease (32, 38- 40). In contrast to this agreement, the prevalence of periodontitis was found higher in the non-smokers (53.9%) than that in smokers (30.1%) and former smokers (16%) in the present study. Smoking contributes to the development of many systemic diseases as well. In this study, the prevalence of systemic diseases was higher in non-smokers (30.7%) than that in smokers (22.2%). Since the ages of non-smoker subjects were higher than those of smoker and former smoker subjects in the present study, this is an expected result. In the present study, the most frequent systemic condition was hypertension, and coronary heart disease, diabetes mellitus, and rheumatoid arthritis were more common other systemic diseases. This is in agreement with previous studies carried out in periodontitis patients (32, 37, 41, 42). But allergy, the most prevalent medical condition in these previous studies, was not evaluated in our study. The previous studies in the literature reported that the prevalence of cardiovascular diseases was higher in men than in women (37, 41). However in our study, the prevalence of cardiovascular diseases except myocardial infarction and the prevalence of other systemic diseases were found higher in women than in men. In addition, risk of systemic disease was found higher in women with an odds ratio of 2.037

in logistic regression model. Only myocardial infarction prevalence was higher in men than that in women. The prevalence of periodontitis and the number of missing teeth were also found higher in men. A study conducted on a Turkish periodontal patient population (43) reported that the prevalence of systemic diseases, especially cardiovascular diseases, rheumatologic diseases and anemia were higher in women than in men. Similar to these results, Tekharf study reported that the prevalence of cardiovascular diseases, hypertension, diabetes mellitus and obesity were higher in Turkish women than those of Turkish men (30). It was suggested that the risk for these diseases in Turkish women is increased with systemic pro-inflammatory status and abdominal obesity (30). In the light of these results, it is possible that the existence of periodontitis which increases systemic pro-inflammatory status may be contributed to the increasing of the prevalence of systemic diseases in women.

Lagerval et al. (41) suggested that the presence of cardiovascular disease, diabetes mellitus and rheumatologic diseases was significantly associated with an increased frequency of lost teeth and they showed an additive effect of about one lost tooth for every systemic disorder with a regression model. Molloy et al. (32) reported that vascular disease, heart surgery, vascular surgery, high blood pressure, stroke, heart attack, angina, diabetes mellitus, arthritis, joint replacement and stomach ulcers were more prevalent as the number of missing teeth increased. The association between tooth loss and cardiovascular disease has been reported in the literature (22, 44). In the present study, it was found that one or more tooth loss increased the possibility of systemic disease occurrence with an odds ratio of 1.143. In the present study, the prevalence of all systemic diseases was found lower in non-periodontitis subjects than in periodontitis patients. It was found that the presence of periodontitis associated with the presence of cardiovascular diseases, endocrine diseases, rheumatologic diseases, taking medication and the presence of certain systemic disease. It was shown in a logistic regression model that the periodontitis patients have greater risk of systemic disorder experience than the non-periodontitis subjects in this study population with an odds ratio of 1.775. Cueto et al. (10) reported that there was a strong significant association between periodontitis and acute myocardial infarction; however Lagerval et al. (41) did not report any correlations between systemic

disorders and periodontal diseases.

In conclusion; in this study population, the periodontitis patients were subjected to more systemic diseases than the non-periodontitis subjects. The results of this study performed in a Turkish urban population presented that periodontitis is a risk factor for systemic disease existence. Further studies are needed to explore the relationships between the measures of periodontitis such as alveolar bone level or attachment level and the measures of systemic diseases like blood pressure, blood glucose or cholesterol level etc. in Turkish population.

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