Alveolar Bone Loss and Reported Medical Status among a Sample of Patients at a Saudi Dental School

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Purpose: Periodontitis is a common chronic disease globally. It is a major cause of tooth loss among adults, and recently has been suggested as a possible risk factor for some systemic diseases such as cardiovascular disease. In Saudi Arabia, research on periodontitis prevalence, as well as its relation to systemic diseases, is lacking. The objectives of this study were: (1) to determine the prevalence of periodontitis among a sample of Saudi Dental School patients population; and (2) to examine the association between periodontitis and systemic diseases in the selected sample.

Materials and Methods: Retrospective evaluations of 282 randomly selected dental records were conducted. Age, gender, nationality and medical history were abstracted from these records. Number of remaining teeth and number of teeth with more than 20% of bone loss were determined from panoramic radiographs. Descriptive statistics, t-test, chi-square and regression models were used for data analyses.

Results: About 68% of the sample had radiographic alveolar bone loss; of these, 28% had a localised and 40% had a generalised form. Prevalence of systemic diseases was generally higher among individuals with the generalised form. About 21% and 13% of those with generalised periodontitis reported history of diabetes and hypertension respectively, whereas only about 2% of those with localised periodontitis reported history of these diseases.

Conclusion: The findings of the present study showed a high prevalence of periodontitis in the selected sample. There is an urgent need for further studies with larger sample size to confirm these findings and to implement an effective measure to reduce periodontitis prevalence in Saudi Arabia.

Key words: cardiovascular disease, diabetes, periodontitis, risk factors, Saudi Arabia

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Periodontal disease results in destruction of the alveolar bone and tooth supporting structures and subsequently may lead to tooth loss (The American Academy of Periodontology, 1996). It is caused primarily by bacterial infection; however, individuals differ in their susceptibility to developing periodontitis (The American Academy of Periodontology, 1999). Several factors are associated with increased risk and prevalence of periodontitis such as age, smoking, diabetes, stress, obesity, physical inactivity and poor overall diet quality (Albandar, 2002; Al-Zahrani et al, 2003; Al-Zahrani et al, 2005a, 2005b; Genco 1996; Merchant et al, 2003; Saito et al, 2001).

Growing evidence demonstrates a relationship between periodontal and general health. Systemic diseases, such as diabetes, are known to increase the risk and severity of periodontitis (Grossi and Genco, 1998). Periodontal infection, on the other hand, was recently suggested to have some systemic influence. Several studies reported an association between periodontal infection and increased risk for developing a rather wide variety of systemic diseases, such as cardiovascular disease and stroke (for reviews, see Holmstrup et al, 2003; Scannapieco, 1998). Therefore, it is

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Table 1 Characteristics of the study population and extent† of periodontitis

Variable		Sample size (n=282)	Extent of periodontitis (mean ± SD)		P-value*
Age					
	18–25	91	10.51	(18.42)	
	26–38	97	28.80	(34.75)	
	39–80	94	68.26	(37.12)	0.000
Gender					
	Male	132	34.36	(39.48)	
	Female	150	37.54	(39.44)	0.500
Nationality					
	Saudi	140	31.67	(38.96)	
	Non-Saudi	142	40.37	(39.53)	0.064
Diabetes					
	Yes	28	78.61	(33.08)	
	No	254	31.36	(37.23)	0.000
Hypertension					
	Yes	19	75.93	(33.09)	
	No	263	33.17	(38.31)	0.000
Heart disease					
	Yes	6	70.69	(46.04)	
	No	276	35.30	(39.02)	0.029
Anaemia					
	Yes	25	36.54	(34.46)	
	No	257	36.00	(39.93)	0.942
Asthma					
	Yes	12	41.47	(45.33)	
	No	270	35.81	(39.21)	0.627
Hepatitis/Jaundice					
	Yes	4	60.42	(46.21)	
	No	278	35.70	(39.30)	0.214

† (number of teeth with alveolar bone loss/total number of present teeth) x 100
* Comparison of group means using t-test and a one-way ANOVA

clear that there is a relationship between periodontal and general health that is complicated and actually may be bidirectional.

Worldwide, periodontitis is one of the most common chronic conditions, but it is more prevalent in developing countries (WHO, 2003). In the United States, about 35% of the adults aged 30 years or older suffer from periodontitis (Albandar et al, 1999). In contrast, prevalence of periodontal disease was nearly 100% among Iraqi adults aged 35 years or older (Khamrco, 1999) and about 92% among adults in Thailand aged 30 years or older (Baelum et al, 2003).

In Saudi Arabia, limited data exist on periodontitis prevalence and risk factors. The aims of the present study, therefore, were: (1) to investigate the extent of periodontitis (as defined by radiographic alveolar bone loss) in a sample of dental school patients in the western region of Saudi Arabia; (2) to determine factors associated with the extent of periodontitis in the present sample; and (3) to compare prevalence of reported medical conditions in patients with and without generalised periodontitis.

MATERIALS AND METHODS

Retrospective evaluation of dental records at King Abdulaziz University (KAU) Faculty of Dentistry for pa-

Table 2 Factors associated with extent of periodontitis† in the linear regression model

	B Coefficients‡	Standard Error	P-value
Males	-0.112	0.035	0.002
Diabetics	0.203	0.063	0.001
Age (decades)	0.182	0.014	0.000

† (total number of teeth with alveolar bone loss/total number of present teeth) x 100

‡ R-square = 0.45

tients 18 years of age or older, who were admitted during the year 2003, was conducted. The research protocol of this study was in compliance with the principles enunciated in the Helsinki declaration. A total of 297 dental records were randomly selected. Out of these records, 15 (5%) were excluded, 11 (3.7%) were completely edentulous and 4 (1.3%) had less than six remaining teeth. Thus the final sample available for the present analysis consisted of 282 subjects. Age in years, gender, nationality (Saudi or non-Saudi) and medical history were abstracted from these records. Medical history consisted of: convulsions, tuberculosis, heart murmur, epilepsy, ulcers, radiotherapy/chemotherapy, heart disease, diabetes, rheumatic fever, hepatitis, jaundice, low and high blood pressure, asthma, anaemia, stroke, blood disorders and mental retardation. To determine the extent of periodontitis, one calibrated examiner determined the number of remaining teeth and the number of teeth with more than 20% of bone loss on one or more inter-proximal surfaces from panoramic radiographs, taken prior to any dental treatment. For each subject, the percentage of teeth with bone loss was calculated using the following formula: (number of teeth with bone loss/total number of present teeth) x 100. Subjects with ≥ 30% of present teeth with bone loss were considered to have generalised periodontitis. Those with bone loss but at less than 30% of present teeth were considered to have localised periodontitis. Descriptive statistics, t-test, chi-square and linear and logistic regression models were used for data analyses.

RESULTS

Description of the study sample

The sample consisted of records of 282 patients; of these, 46.8% were males and 53.2 % were females. The age ranged between 18 and 80 years, and the mean age was 34.7 (± 13.1) years. The mean percentage of teeth with radiographic bone loss was 36.5 (± 39.42). Thirty-two percent of the subjects (n = 89) had no radiographic bone loss, whereas 28% (n = 79) and 40% (n = 114) had localised and generalised bone loss respectively.

As shown in Table 1, the extent of periodontitis was higher among older than younger individuals. Subjects with diabetes, hypertension and heart disease had a higher extent of periodontitis than those without these diseases. The extent of periodontitis was not significantly different between males and females. Non-Saudi subjects had a higher extent of periodontitis, although this was not statistically significant. The extent of periodontitis was the same in subjects with or without anaemia, asthma and hepatitis.

Factors associated with extent of periodontitis

Table 2 shows the factors that were significant in the multivariable linear regression model. Age was found to be significantly associated with higher extent of alveolar bone loss. An increase in age of 10 years was associated with an 18% increase in extent of alveolar bone loss. Diabetes was also found to be associated with higher extent of alveolar bone loss. Diabetics had a 20% increase in extent of alveolar bone loss compared with non-diabetics. On the other hand, males had a 12% decrease in alveolar bone loss compared with females.

Frequency of reported medical conditions by periodontitis status

As shown in Table 3, in the total study sample, approximately 10% reported a history of diabetes whereas approximately 7% reported a history of hypertension. Only 2% of the subjects reported a history of

Table 3 Prevalence of medical condition in patients with and without generalised periodontitis (GP)

Medical conditions	N (%) in the total sample	Frequency and % of medical conditions in patients		Unadjusted OR (95% CI)	Age-adjusted OR (95% CI)
		without GP (n = 168)	with GP (n = 114)		
Diabetes	28 (9.9%)	4 (2.4%)	24 (21.1%)	11 (4–32)*	2.7 (1.1–10)*
Hypertension	19 (6.7%)	4 (2.4%)	15 (13.2%)	6.7 (2.2–21)*	1.2 (0.4–4.3)
Heart disease	6 (2.1%)	2 (1.2%)	4 (3.5%)	2.2 (0.5–13.6)	1.1 (0.4–8.0)
Anaemia	25 (8.9%)	11 (6.5%)	14 (12.3%)	2.0 (0.9–4.6)	3.5 (1.4–9.0)*
Asthma	12 (4.3%)	6 (3.6%)	6 (5.3%)	1.5 (0.5–4.8)	1.9 (0.5–7.5)
Hepatitis/ Jaundice	4 (1.4%)	2 (1.2%)	2 (1.8%)	1.5 (0.2–11)	1.9 (0.2–26)

* $p < 0.05$, calculated using logistic regression models

heart disease whereas approximately 9% reported a history of anaemia. Systemic conditions in general were more prevalent in patients with generalised periodontitis. More than 21% of patients with generalised periodontitis suffered from diabetes, whereas only 2.4% of patients with localised or no periodontitis had diabetes. Hypertension and anaemia were also more frequent among subjects with generalised periodontitis (13.2% and 12.3% respectively) than those without (2.4% and 6.5% respectively). The association between anaemia and periodontitis was stronger and statistically significant after adjusting for age. Heart disease, asthma and hepatitis were more frequent among generalised periodontitis subjects; however, the differences were not statistically significant.

DISCUSSION

This study retrospectively evaluated the records of 282 dental patients. The results showed that prevalence of periodontitis, as measured based on radiographic alveolar bone loss, among the studied sample was high (68%). Approximately 28% of the study sample had localised periodontitis, whereas 40% had generalised periodontitis. Patients with generalised periodontitis were more likely to report one or more medical conditions than patients with no or localised periodontitis. Age and diabetes were associated with a greater extent of alveolar bone loss, whereas males had a lesser extent of alveolar bone loss than females. The findings of the present study confirmed previous findings of higher periodontitis prevalence in the developing countries (WHO, 2003). The results also were consistent with other studies that showed associations between increased age and diabetes and periodontitis severity (Albandar, 2002). On the other hand, studies on developed countries showed that males are more likely to have periodontitis than females (Albandar 2002; Genco 1996; The American Academy of Periodontology, 1996), whereas in the present study, females were more likely to have periodontitis than males. The reason for this difference is not clear. A possible explanation for this difference may be related to the nature of the selected sample. A population of dental school patients may have some inherited bias, which might explain the previous difference. However, a study in an Iraqi population showed that prevalence of periodontal diseases tend to be higher in females than males, which is in line with the present finding (Khamrco, 1999).

Our findings showed a higher prevalence of systemic conditions among individuals with generalised periodontitis, which is consistent with a recent study in an Australian population (Georgiou et al, 2004). An interesting finding in the present study is the higher prevalence of generalised periodontitis among individuals with anaemia after adjusting for age. This finding, however, needs to be confirmed in a study with a larger sample size, taking into consideration all periodontitis risk factors. The present study also showed that the mean percentage of sites with alveolar bone loss was higher among patients with hypertension, heart disease and diabetes than in those without these conditions. These findings are consistent with previous studies that reported an association between radiographic alveolar bone loss and systemic conditions such as cardiovascular disease (Engebretson et al, 2005; Jansson et al, 2001; Grossi and Genco, 1998; Mattila et al, 1993; Molloy et al, 2004; Renvert et al, 2004).

The increased prevalence of systemic conditions among patients with periodontitis may indicate that periodontitis shares common risk factors with these conditions or it may actually contribute to their increased prevalence. Thus a collaboration between dental and medical professionals is necessary in order to maintain the overall health of individuals.

One limitation of the present study is that screening records had no information on patients' oral hygiene habits and smoking behaviours. Thus we were not able to examine the association of these variables and periodontitis. Furthermore, the sample for the present study is small and consisted of a random sample of dental school patients, which may differ from the general population in several factors. For example, these patients might have a lower income and education level than the general population. Thus their periodontitis prevalence is probably higher than that in the general population. It is also possible that prevalence of undiagnosed systemic conditions among dental school patients is higher because they might be less health conscious.

In this study, a self-reported medical questionnaire was used to obtain the frequency of systemic conditions. This method is routinely used and has been shown to be reliable (Nery et al, 1987; Suomi et al, 1975; Ho et al, 1997). For example, Ho et al (1997) compared self-reported systemic conditions to the actual presence of these conditions and concluded that the self-reported medical questionnaire is a reliable and cost-effective method, especially for research purposes. It has to be noted, however, that this method provides no information on the time of the initial diagnosis and the duration of systemic diseases.

In conclusion, our findings showed a high prevalence of reported medical conditions, especially diabetes, anaemia and hypertension, among individuals with periodontitis. This underscores the importance of managing both periodontal and systemic diseases in order to improve a person's wellbeing. Furthermore, the results of this study suggest a high prevalence of periodontitis in Saudi Arabia. Further studies with a larger and more representative sample are required to confirm these findings and to formulate effective preventative measures to reduce periodontitis prevalence.

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