



Original Article

Prevalence of chronic periodontitis and its risk determinants among female patients in the Aseer Region of KSA



Nabeeh A. Al Qahtani, MS^a, Betsy Joseph, PhD^{a,*}, Angelin Deepthi, MDS^b and Baiju K. Vijayakumari, PhD^c

^a Department of Periodontics and Community Dental Science, College of Dentistry, King Khalid University, Abha, KSA

^b Division of Oral and Maxillofacial Surgery and Diagnostic Sciences, College of Dentistry, King Khalid University, Abha, KSA

^c Department of Statistics, Government College for Women, Thiruvananthapuram, India

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المخلص

أهداف البحث: لتحديد مدى انتشار التهاب اللثة المزمن ومحدداته بين المرضى في منطقة عسير بالمملكة العربية السعودية.

طرق البحث: تم فحص ما مجموعه ١٠٠٠ مريضة جديدة على التوالي بين سن ٢٥ - ٧٥ عاما لوجود أي أمراض لثة. وقد شملت الخصائص الديموغرافية المختلفة للمشاركين في الدراسة العمر، والمستوى التعليمي، والمهنة، ووجود داء السكري، ووجود أمراض اللثة في العائلة، وممارسات النظافة الصحية الفموية لكل مشارك، وتم تسجيلها. كما تم تسجيل معلومات نسبة انتشار أمراض اللثة وشدها.

النتائج: من بين هؤلاء المرضى، وُجد أن ٤٥٧ لديهن ما يدل على وجود أمراض اللثة. خضع هؤلاء المرضى لفحص مفصل للثة. أظهر اختبار مربع كاي لصلاحية الانطباق أن ٤٦.٦٪ لديهن التهاب لثة مزمن محدود في حين أن ٢.٢٪ لديهن التهاب لثة مزمن عام. وقد تراوحت نسبة وجود التهاب اللثة المزمن المحدود من ٤.٢٪ إلى ١٢٪، بينما تراوحت نسبة وجود التهاب اللثة المزمن العام من ٣.١٪ إلى ١٤.٧٪. أظهرت إحصاءات مربع كاي لـ "كروسكال - والنيس" اللامحدودة أن عوامل مثل العمر، والتعليم، والمهنة، ويُعد الزيارة الأخيرة لطبيب الأسنان، ووجود داء السكري، والنزف بمجرد الملامسة بألة معدنية كانت محددات مخاطر ذات قيمة للإصابة بأمراض اللثة في المجموعة المختارة.

الاستنتاجات: أظهر غالبية المرضى وجود التهاب لثة مزمن محدود. ويُعد العمر، والتعليم، والمهنة، وقلة زيارات طبيب الأسنان، ووجود داء السكري محددات خطيرة مهمة لحدوث التهاب اللثة المزمن. ينبغي تقييم المعلومات المتعلقة بالمخاطر الفردية لحدوث أمراض اللثة بعناية لغرض المعالجة المناسبة للمرضى، والوصول إلى صحة عامة شاملة أفضل.

الكلمات المفتاحية: التهاب اللثة المزمن؛ نسبة انتشار؛ سبر عمق الجيب؛ محددات خطيرة

Abstract

Objectives: To determine the prevalence of chronic periodontitis and its determinants among patients in the Aseer Region of KSA.

Methods: A total of 1000 consecutive new female patients between 25- to 75-years of age were screened for the presence of any periodontal disease. The various demographic characteristics of the study participants included age, educational level, occupation, presence of diabetes mellitus, family history of periodontal disease, and oral hygiene practices per subject were recorded. The parameters addressing periodontal prevalence and severity were also recorded.

Results: Of these patients, 457 were found to have evidence of periodontal disease. These patients were considered for a further detailed periodontal examination. The chi-square test for goodness of fit showed that 46.6% have localized chronic gingivitis while 2.2% have generalized chronic gingivitis. Localized chronic periodontitis ranged from 4.2% to 12%, whereas generalized chronic periodontitis varied from 3.1 to 14.7%. The non-parametric Kruskal–Wallis chi-square statistics showed that factors such as age, education, occupation, infrequent last dental visit, presence of diabetes mellitus and bleeding on probing were significant risk determinants for periodontal disease in the selected cohort.

Conclusion: The majority of the population showed the presence of localized chronic gingivitis. Age, education, occupation, infrequent dental visits and presence of diabetes mellitus are significant risk determinants for the

* Corresponding address: Division of Periodontics, PO Box No 3263, College of Dentistry, King Khalid University, Abha, KSA.

E-mail: bjoseph@kku.edu.sa (B. Joseph)

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occurrence of chronic periodontitis. Information concerning individual risk for developing periodontal disease should be carefully evaluated for proper patient management and for better overall general health.

Keywords: Chronic periodontitis; Prevalence; Probing pocket depth; Risk determinants

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Introduction

Periodontitis is a disease of the supporting tissues of the teeth, which are naturally inflammatory. It is a multifactorial disease causing destruction of the periodontium.¹ Not only does it affect general health,² it also forms a component of the global burden of chronic diseases. Geographical variations are found in the prevalence of periodontal disease³ and they are mainly attributed to variations in socioeconomic conditions, behavioural factors, systemic conditions of people and oral hygiene patterns.

Varying rates of prevalence and the extent of various forms of periodontal disease exist among different populations.^{4,5} As age increases, an increase in the prevalence of periodontal disease has been observed. Influences of nutritional supplements and dietary components have also been known to influence periodontal health.^{6,7} Moreover, due to an increase in life expectancy, there are more people who have permanent dentition and therefore have an increased chance of developing various forms of periodontal diseases.^{8,9} There is a tendency for the prevalence of periodontal diseases to differ according to geographical regions and zones of the world. Furthermore, prevalence in a region also depends on the case definition of periodontitis and the population that is being studied.

There may be an increased prevalence of periodontal disease in developing countries than in the developed ones.¹⁰ The National Health and Nutrition Examination Survey III (NHANES III) conducted in the United States (USA) between 1988 and 1994 demonstrated that gingival inflammation occurs in 50% of the adult population.¹¹ A national survey in the US estimated that 19.9% of the 30-year-old subjects and 7.3% of those aged 90 years had a clinical attachment level (CAL) greater than or equal to 5 mm and 7 mm, respectively. The United Kingdom is estimated to have the presence of periodontitis in approximately 42% of the 35- to 44-year-olds and 70% of the 55- to 64-year-olds with CAL greater than 3.5 mm.¹² According to the WHO, in Germany, nearly one in five people suffers from periodontitis. The economic burden of this disease can be estimated from various reports. One such report indicates that periodontal and preventive procedures totalled 14.3 billion dollars, of which, 4.4 billion dollars was spent on periodontal services to directly treat the disease.¹³

Although periodontal diseases are highly prevalent with varying patterns in different populations, the prevalence

reports are affected by a number of factors such as the technique used for measurement, the case definition used in the particular study, the evaluation protocol and variations in oral health status.¹⁴ In 2015, the Joint EU/USA Periodontal Epidemiology Working Group suggested that the principles followed for the reporting of the prevalence and severity of periodontal diseases should be standardized. This would facilitate better comparisons between populations and knowledge regarding the variation in prevalence of periodontitis worldwide. The need for reporting various periodontal data within specific age groups has been stressed.¹⁴ Furthermore, various exposure profiles such as diabetes mellitus, smoking status, educational level or socioeconomic level, health care availability and oral hygiene behaviours need to be considered for a better understanding of the reasons for the variation of prevalence.¹⁵

Although a number of epidemiological studies have been conducted to determine the prevalence of oral diseases in the KSA,^{16–20} details of disease severity along with the risk factors has not been reported in the region of Aseer Province, KSA. Therefore, the research objectives of this study were to provide estimates on the prevalence and risk determinants of chronic periodontitis in patients between 25- and 75-years-old and attending the female out-patient department of the College of Dentistry, King Khalid University, Abha, KSA.

Materials and Methods

Ethical approval was sought from the Head of the Department of Human Research Ethics Committee of King Khalid University, Abha, Aseer Region of KSA and was conducted in accordance with the code of ethics in the Declaration of Helsinki. A cross-sectional study was conducted at the female OPD, College of Dentistry, King Khalid University. A total of 1000 consecutive new patients between the age of 25- and 75-years-old, who attended OPD from November 2015 to April 2016 and gave informed consent to participate, were included in the study. They were screened for the presence of any periodontal disease including gingival inflammation. Exclusion criteria included patients with any systemic conditions except diabetes mellitus, periodontal therapy in the last 6 months, systemic antibiotics within the last 3 months, along with pregnant and lactating mothers were excluded from the study. The estimates were determined according to the suggested standard case definitions for population-based surveillance of periodontitis and to estimate the burden of periodontitis on the adult U.S. population.^{21,22}

Characteristics of study subjects

A detailed description of the characteristics of the study participants have been collected in major age strata to facilitate an understanding of the factors that may account for observed differences in prevalence across studies.

In this study, age [25–34(I), 35–44 (II), 45–54 (III), 55–64 (IV), 65–74 (V), and 75+(VI)], educational level [below 5th grade (I), primary schooling (II), high school (III) and graduate/post graduate (IV)], occupation [housewife (I), worker (II), semi-professional (III), and professional (4)],

presence of diabetes mellitus and presence of a family history of periodontal disease [Yes (1) and No (0)]; tooth brushing frequency [<2 times/day (1) and ≥ 2 times/day (2)]; use of interdental aids [Yes (1) and No (0)]; last dental visit [Within the last 12 months (1) and less often (0)] and the presence of plaque [Yes (1) and No (0)] are reported. The number of teeth present and the number of dental implants per subject were also recorded.

Periodontal items addressing periodontal prevalence and severity

After the demographic details were collected from each patient, a single examiner conducted the periodontal examinations. Gingival recession (GR) [= distance between the free gingival margin (FGM) and the cemento-enamel junction (CEJ)] and probing pocket depth (PPD) (= distance from FGM to the bottom of the sulcus or periodontal pocket) were measured for all of the teeth excluding third molars. For these measurements, a William's graduated periodontal probe was positioned parallel to the long axis of the tooth at each site. Each measurement was rounded to the lower whole millimetre. Clinical attachment loss, which is the extent of periodontal support that has been destroyed around a tooth (CAL) was calculated by the sum of PPD and GR. The subject level assessment of the prevalence of PPD and CAL was conducted according to Table 1 (based on an Update by the Task Force of American Academy of Periodontology Board of Trustees – 2014)²³

For localized chronic periodontitis, the criteria was that 30% of the teeth or less are affected, whereas generalized chronic periodontitis was defined as periodontitis with $>30\%$ of the teeth affected.²⁴

Sample size calculation

The data were collected from the first 1000 consecutive new patients who attended OPD from November 2015 to April 2016. Using the formula provided below, it was determined that the study had a power of 90%.

$$n = 4 \left(\frac{pq}{L} \right)^2$$

where p = population proportion of positive character, $q = 1-p$ and L = allowable error.

For this study, L was presumed to be 10% of p , which provided a power of $(1-L)$, i.e., 90% for the study. Because there is not much data available regarding the prevalence of chronic periodontitis in this region, p may be taken as 30%.⁷ Therefore, it was concluded that a minimum of 635 patients were needed for this study.

Table 1: Guidelines for determining the severity of periodontitis.

Severity of periodontitis	Slight	Moderate	Severe
Probing depths	>3 & <5 mm	≥ 5 & <7 mm	≥ 7 mm
Clinical attachment loss	1–2 mm	3–4 mm	5 + mm

Data analysis

A subject-level analysis was performed statistically for each of the parameters using SPSS software for Windows, Version 16.0. (SPSS Inc., Chicago, IL, USA). The frequency and percentage were calculated as summary measures for condensing the raw data. S chi-square test for goodness of fit was employed to find a significant proportion difference in various types of chronic periodontitis. Non-parametric Kruskal–Wallis chi-square statistics was calculated to find significant risk determinants associated with various types of chronic periodontitis. A calculated p -value less than 0.05 was considered statistically significant.

Results

Among the patients who attended the OPD, 1000 consecutive new patients during November 2015 to April 2016 were screened for periodontal disease. This included 328 patients between 25- and 34-years-old (32.8%); 255 patients between 35- and 44-years-old (25.5%); 128 patients between 45- and 54-years-old (12.8%); 152 patients between 55- and 64-years-old (15.2%) and 137 between 65- and 74-years-old (13.7%). Of these, 457 patients were found to have a presence of periodontal disease, including gingival inflammation, and hence were included in a more detailed periodontal examination. Table 2 shows the demographic characteristics of the study subjects who underwent the detailed periodontal examinations. Among the population observed, a significant majority of the patients were below a 5th grade (100%) and primary school (68.56%) education level and were in the 65- to 74-year-old group and the 25- to 34-year-old group, respectively. Only 7.73% were college educated and they were in the 25- to 34-year-old age category. In terms of occupation, a significant majority were housewives, i.e., 100% were in the 65- to 74-year-old group and 83.33% were in the 45- to 54 and 55- to 64-year-old group, whereas only 22.68% in the 25- to 34-year-old group and 1.53% in the 35- to 44-year-old group were professionals. Of the total population examined, 15.75% were reported to be diabetic. A significant majority (38.8%) of diabetes mellitus was present in the 45- to 54-year-old category, whereas a family history of diabetes mellitus was at a maximum in the 35- to 44-year-old group (51.91%). A total of 26.38% in the 45- to 54-year-old category reported a family history of periodontal disease, whereas 83.3% brushed less than twice a day in the 65- to 74-year-old category and 34.02% reported brushing twice or more daily in the 25- to 34-year-old group. Though none of the patients used an the interdental brush was in the 65- to 74-year-group, 17.01% in the 25- to 34-year-old group reported to be using it. In terms of the last dental visit, 43.11% (35- to 44-year-old group) had their dental visit within last one year while 91.67% (65- to 74-years-old) had it less often. The study population had a maximum of 27.10 ± 3.15 teeth (25- to 34-years-old) and a minimum of 18 ± 6.22 teeth (65- to 74-years-old) and there were no dental implants in anyone examined.

Tables 3 and 4 shows the distribution of probing pocket depth and severity of periodontitis, respectively. In terms of probing pocket depth, a significant majority (87.11%) had a probing depth ≤ 3 mm and were in the 25- to 34-

Table 2: Characteristics of the study subjects who underwent periodontal examinations (Total n = 1000; Periodontal findings in n = 457).

	Age group, years				
	25–34	35–44	45–54	55–64	65–74
Number of subjects	194	131	72	48	12
Education					
Below 5th Grade (162)	21 (10.82%)	52 (39.69%)	47 (65.28%)	30 (62.50%)	12 (100%)
Primary school (266)	133 (68.56%)	75 (57.25%)	18 (25%)	18 (37.50%)	0
High School (36)	25 (12.89%)	4 (3.05%)	7 (9.72%)	0	0
College and above (15)	15 (7.73%)	0	0	0	0
Occupation					
Housewife (307)	138 (71.13%)	57 (43.51%)	60 (83.33%)	40 (83.33%)	12 (100%)
Worker (39)	3 (1.55%)	27 (20.61%)	5 (6.94%)	4 (8.33%)	0
Semi-professional (65)	9 (4.64%)	45 (34.35%)	7 (9.72%)	4 (8.33%)	0
Professional (46)	44 (22.68%)	2 (1.53%)	0	0	0
Diabetes Mellitus (72)	8 (4.12%)	22 (16.79%)	28 (38.80%)	10 (20.80%)	4 (33.3%)
Family history of Periodontal disease (58)	23 (11.80%)	11 (8.35%)	19 (26.38%)	5 (10.42%)	0
Family history of DM(148)	45 (23.19%)	68 (51.91%)	30 (41.67%)	5 (10.42%)	0
Tooth brushing frequency					
<2 times/day	128 (65.46%)	89 (67.93%)	(62)86.11%	(30)62.51%	10 (83.3%)
≥2 times/day	66 (34.02%)	42 (32.06%)	(10)13.89%	(18)37.49%	2 (16.60%)
Use of interdental aids					
No	161 (82.98%)	124 (94.65%)	62 (86.11%)	43 (89.58%)	12 (100%)
Yes	33 (17.01%)	7 (5.34%)	10 (13.88%)	5 (12.50%)	0
Last dental visit					
Within last 12 months	44 (22.68%)	57 (43.11%)	14 (19.44%)	12 (25%)	1 (8.33%)
Less often	150 (77.31%)	74 (56.48%)	58 (80.55%)	36 (75%)	11 (91.67%)
Tooth count	27.10 ± 3.15	26.98 ± 3.4	24.61 ± 4.76	23.16 ± 3.41	18 ± 6.22
Prevalence of dental implants	0%	0%	0%	0%	0%

Data are presented as numbers (percentages) or means ± standard deviations.

years-old group, whereas the highest mean probing pocket depth was measured at 5.33 ± 0.77 mm and was in the 65- to 74-year-old group. With regard to the severity of periodontitis, 65.46% showed no clinical attachment loss, whereas the highest attachment loss was recorded in the 65- to 74-year-old group (7.0 ± 0.9 mm). The data and test of significance regarding prevalence of various forms of chronic periodontitis (chi-square test for goodness of fit) is detailed in Table 5, whereas the distribution of data and test of significance (Kruskal Wallis chi-square) for various risk factors with respect to periodontal disease are shown in Table 6. The chi-square test for goodness of fit showed that among the population observed, a significant majority of 46.6% have localized chronic gingivitis ($p < 0.01$). This is statistically highly significant. The other disease entities were found in varying percentages as follows: generalized chronic gingivitis (2.2%), localized mild chronic periodontitis (6.3%), localized moderate chronic periodontitis (12.0%), localized severe chronic periodontitis (4.2%), generalized mild chronic periodontitis (10.9%), generalized moderate chronic periodontitis (14.7%) and generalized severe chronic periodontitis (3.1%). The Kruskal–Wallis test showed that age, education, occupation, BOP and infrequent dental visits were a significant risk determinant for the occurrence of chronic periodontitis ($p < 0.01$), whereas the presence of diabetes mellitus was also found to be a risk determinant at $p < 0.05$, which is statistically significant. It was also found that the presence of plaque, the number of teeth present, a family history of periodontitis, frequency of tooth brushing and use

of interdental aids had no association with the occurrence of chronic periodontitis ($p > 0.05$) in this study population.

Discussion

To the best of our knowledge, this is the first detailed report of the prevalence of chronic periodontitis and its risk determinants among females in the Aseer Region. Accessibility to data from females was easily collected; hence, this study describes the disease in the female population. It is of great significant relevance to understand the pattern and aetiology of periodontal disease in a population. Other than being one of the most common causes of tooth loss in adults, knowledge regarding the prevalence of periodontitis becomes even more important with emerging evidence strongly suggesting the association between oral health and systemic health. Studies support the association between periodontal disease and various systemic conditions such as cardiovascular disease, type 2 diabetes mellitus, adverse pregnancy outcomes, and osteoporosis.^{25–28} There is also evidence that improvement in periodontal status ameliorates these systemic illnesses.²⁹ Hence, as the first step, we sought to determine the prevalence of chronic periodontal disease in our population. As periodontal disease is multifactorial, effective disease management also requires a clear understanding of all of the associated risk factors.

Various case definitions have been used throughout the literature to report prevalence estimates. This heterogeneity

Table 3: The distribution of the probing pocket depth and severity of periodontitis according to the Task Force of the American Academy of Periodontology Board of Trustees (2014 update).

Severity of periodontitis	Age, years				
	25–34	35–44	45–54	55–64	65–74
	(n = 194)	(n = 131)	(n = 72)	(n = 48)	(n = 12)
Prevalence PD ≤ 3 mm	169 (87.11%)	103 (78.63%)	48 (66.67%)	28 (58.83%)	6 (50%)
Prevalence PPD >3 &< 5 mm	15 (7.73%)	26 (19.85%)	10 (13.89%)	9 (18.75%)	0
Prevalence PPD ≥ 5 to <7 mm	10 (5.15%)	2 (1.53%)	8 (11.11%)	6 (12.50%)	5 (41.67%)
Prevalence PPD ≥ 7 mm	0	0	6 (8.33%)	5 (10.42%)	1 (8.33%)
Mean PPD (mm)	2.9 ± 0.7	2.82 ± 0.8	2.7 ± 1.1	2.41 ± 1.5	5.33 ± 0.77

Data are presented as numbers (percentages) or means ± standard deviations.

Table 4: The distribution of clinical attachment loss and severity of periodontitis of subjects in total and according to age based on the 1999 International Workshop for a Classification of Periodontal Diseases and Conditions.

Degree of Periodontitis	Age, years				
	25–34	35–44	45–54	55–64	65–74
	(n = 194)	(n = 131)	(n = 72)	(n = 48)	(n = 12)
No (0 CAL)	127 (65.46%)	65 (49.62%)	15 (20.83%)	0	0
Mild (CAL 1–2 mm)	25 (12.89%)	10 (7.63%)	13 (18.06%)	13 (27.08%)	5 (41.67%)
Moderate (CAL 3–4 mm)	18 (9.28%)	50 (38.71%)	26 (36.11%)	20 (41.67%)	3 (25.00%)
Severe (CAL ≥ 5 mm)	24 (12.37%)	6 (4.58%)	18 (25%)	15 (31.25%)	4 (33.33%)
Mean CAL (mm)	4.5 ± 1.1	3.2 ± 0.8	3.9 ± 1.3	4.4 ± 1.7	7.0 ± 0.9

Data are presented as numbers (percentages) or means ± standard deviations.

causes difficulty in comparison between populations and in drawing conclusions regarding the worldwide prevalence of periodontal disease. Therefore, the present study follows the recommendations promulgated by the Joint EU/USA Periodontal Epidemiology Working Group in 2015 to report prevalence. It was found that in this population, a significant majority (46.6%) have localized chronic gingivitis. The results of this study may be applicable for a larger population

because a wide range of patients from age 25 to 70 participated in this study.

In the present study, the Kruskal Wallis test showed that age is a significant risk factor/determinant for the occurrence of chronic periodontitis ($p < 0.01$). Generalized chronic gingivitis has the highest chance of occurrence in the 25- to 34-year-old group. This is in accordance with an earlier study¹⁸ where the prevalence and severity of gingivitis was found to be increased with age to a peak in the 21- to 30-year-old age group. Similarly, there is evidence indicating that periodontal diseases in the early stages were more prevalent in the younger age groups compared to advanced stages that were more prevalent in the older age groups.³⁰

The impact of socioeconomic inequalities on health is well-documented.³¹ In the present study, education was found to be a significant risk factor/determinant for the occurrence of chronic periodontitis ($p < 0.01$) and the group that received primary schooling had highest chance (73.7%) of developing localized chronic periodontitis (severe) ($p < 0.01$). A majority of participants belonged to the middle of the lower category of education, which could be one of the reasons for a greater risk of periodontitis. It could be noted that efforts to eliminate educational inequalities, which lead to better periodontal health, should focus on early life interventions through incorporation of lessons on importance and practice of oral health more effectively into the education system.

In the case of occupation, housewives had the highest chance of occurrence (97%) of generalized chronic periodontitis (moderate) ($p < 0.01$). It is likely that the widely observed relationship between education and occupation

Table 5: The data and test of significance regarding the prevalence of various forms of chronic periodontitis (chi-square test for goodness of fit).

Disease distribution	Frequency	Percentage	<i>p</i> -value
Localized Chronic Gingivitis	213	46.6	<0.01**
Generalized Chronic Gingivitis	10	2.2	
Localized Mild Chronic Periodontitis	29	6.3	
Localized Moderate Chronic Periodontitis	55	12.0	
Localized Severe Chronic Periodontitis	19	4.2	
Generalized Mild Chronic Periodontitis	50	10.9	
Generalized Moderate Chronic Periodontitis	67	14.7	
Generalized Severe Chronic Periodontitis	14	3.1	

** (statistically highly significant).

Table 6: Distribution of data and test of significance (Kruskal Wallis chi-square) for various risk factors with respect to chronic periodontitis.

Risk determinants	Risk determinants-most prevalent category	Disease variant-most prevalent	Percentage	p-value
Age, years	25–34	Generalized Chronic Gingivitis	100	<0.01**
Education	Primary schooling	Localized Chronic Periodontitis (Severe)	73.7	<0.01**
Occupation	Housewife	Generalized Chronic Periodontitis (Moderate)	97	<0.01**
Last dental visit	Less than once a year	Generalized Chronic Gingivitis	90	<0.01**
BOP	Present	Localized Chronic Periodontitis (Severe)	94.7	<0.01**
Diabetes Mellitus	Present	Generalized Chronic Gingivitis	90	<0.05*
Presence of plaque	–	–	–	>0.05 ^{ns}
Tooth count	–	–	–	>0.05 ^{ns}
Family history of Periodontitis	–	–	–	>0.05 ^{ns}
Tooth brushing frequency	–	–	–	>0.05 ^{ns}
Use of interdental aids	–	–	–	>0.05 ^{ns}

** (statistically highly significant); * statistically significant; ns (not significant).

levels and periodontal health is a function of better oral hygiene among the better educated, more positive attitudes toward oral hygiene, and a greater frequency of dental visits among the more dentally aware.³² The prevalence of periodontal disease was significantly higher in the poor oral hygiene group compared to the good oral hygiene group. This finding is consistent with previously reported differences in oral hygiene.³³ It is well documented that only some (5%–15%) of any population suffers from severe generalized periodontitis even though moderate disease affects a majority of adults.⁸ The results of the present study are similar to this because 3.1% had generalized severe chronic periodontitis, whereas 14.1% had generalized moderate chronic periodontitis and 10.9% had generalized mild chronic periodontitis.

Diabetes mellitus was found to be associated with a high chance (90%) of occurrence of generalized chronic gingivitis ($p < 0.05$). The people with diabetes have been known to have significantly more disease than the controls. Diabetic patients were twice as likely as non-diabetic subjects to have attachment loss.³⁴ The prevalence of diabetics and a family history of periodontal disease may have been underestimated in this study due to the method of identification (based on the patient's memory) and possibly because a low educational status, and hence, subjects may not be aware of their condition or do not consider it important enough to report it appropriately.

Similarly, infrequent dental visit (less than once a year) was also found to be a risk determinant as patients in this group had the highest chance (90%) of generalized chronic gingivitis ($p < 0.01$). This result is in correlation with other studies^{30,35} where infrequent dental visits are a risk indicator for chronic periodontitis. Similarly, the presence of bleeding from probing was found to be significant risk factor/determinant for the occurrence of chronic periodontitis ($p < 0.01$) as it showed a 94.7% chance to develop localized severe chronic periodontitis. These results are in agreement with the majority of the literature, which reports the presence of BOP as an indicator for periodontitis.³⁶

The impact of periodontal disease on general health has been widely studied.² Among Saudi mothers, a higher incidence of preterm low birth weight was reported in

patients with periodontal disease.^{37,38} Another study reported a high prevalence of periodontal disease among pregnant females, especially with gestational diabetes mellitus (GDM). Severe periodontal diseases were elicited in 37% of the pregnant females with GDM, 29% of the pregnant females without GDM and 14% of the non-pregnant normal control group.³⁹ Therefore, adequate information regarding the load of periodontal disease in a population is important to manage it effectively. However, the limitation of the present study includes the fact that only female patients have been assessed and therefore generalization of the results needs to be done carefully. Additionally, this is a hospital-based study and hospital patients provide higher estimates of the disease unlike field studies. Moreover, use of manual probes for estimating periodontal parameters should also be considered while evaluating the results. It should be noted that to overcome this, a double-pass technique was used to probe the periodontal pockets.

Conclusion

Overall, the study demonstrates the presence of periodontal disease in varying degrees. A total of 46.6% have localized chronic gingivitis, whereas 2.2% have generalized chronic gingivitis. Localized chronic periodontitis ranged from 4.2% to 12%, whereas generalized chronic periodontitis varied from 3.1 to 14.7% in this population. Based on the results of this study, age, education, occupation, BOP and infrequent dental visits and the presence of diabetes mellitus are significant risk determinants for the occurrence of chronic periodontitis. Information concerning the individual risk for developing periodontal disease should be carefully obtained through careful evaluation of the patient's demographic data, medical and dental history and a clinical examination for effective patient management.

Recommendation

Because risk prediction is a potential science in periodontology, the information from such studies regarding the prevalence of periodontal disease and its risk determinates is

important for managing it effectively. This would also allow the development of a risk calculator specific to this region that could enable clinicians to evaluate the patient's risk of disease to provide timely intervention.

Conflict of interest

The authors have no conflict of interest.

Authors' contribution

NAQ and BJ conceived and designed the study. NAQ, BJ and AD conducted the research, provided the research materials, and collected and organized the data. BKV analysed and interpreted the data. NAQ, BJ, AD and BKV wrote the initial and final draft of the article and provided logistic support. All of the authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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