

RISK INDICATORS FOR TOOTH LOSS DUE TO PERIODONTAL DISEASE IN PAKISTANI ADULTS

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ABSTRACT

The objective of this study was to identify risk indicators for periodontitis using cross sectional data from a group of Pakistani adults.

The study group consisted of 426 individuals, aged between 18-75 years old. All extractions were performed in two dental hospitals over a 30 day period. Documented information included patient age and gender, medical history findings, dental care visit history, tooth brushing frequency, types and number of extracted teeth, history of menopause and the reasons for the extraction. Reasons were divided into periodontal disease versus other reasons in multiple logistic regression analysis.

A total of 426 patients had 486 teeth extracted. More teeth per patient were lost due to periodontal disease than for other reasons (1.32 ± 0.6 versus 1.05 ± 0.2 , $P < 0.001$). Factors significantly associated with tooth loss due to periodontal reasons in logistic regression analysis were age > 35 years (OR 6.36; 95% confidence interval [CI] 1.63-1.72), smokers (OR 1.09; 95% CI 1.78 to 1.85), anterior tooth type (OR 3.71; 95% CI 1.82 to 1.89), and the presence of either of the following medical conditions: diabetes mellitus (OR 2.65; 95% CI 1.85 to 1.91), hypertension (OR 10.32; 95% CI 1.88 to 1.93), cardiovascular disease (OR 14.7; 95% CI 1.94 to 1.98) or rheumatoid arthritis (OR 10.22; 95% CI 1.96 to 1.99) and Menopause (OR 5.2 $P < 0.001$).

Our data suggests that tooth loss due to periodontal disease is associated with the risk indicators of age, smoking, dental care visits, frequency of tooth brushing, diabetes mellitus, hypertension, rheumatoid arthritis, menopause and anterior tooth type, in this study group.

Key words: Diabetes mellitus; periodontal disease; risk indicators; menopause; smoking; tooth loss.

INTRODUCTION

Periodontal disease is one of the main causes of tooth loss worldwide.¹⁻⁶

Understanding of the risk factors for periodontal disease in various populations is limited. Most studies

were carried out in Europe and America and identified age, gender, socioeconomic status, poor oral hygiene, obesity, smoking and diabetes as being associated with periodontal disease.⁷⁻¹⁸ The contribution of these factors to periodontal disease may vary geographically or racially.¹⁵

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Identification of factors associated with increased risk for tooth loss due to periodontal disease may aid in strengthening the evidence of these factors as risk determinants of periodontal disease severity.¹⁹ With the knowledge of possible links between periodontal disease and systemic health that has emerged during the past decade, investigations into susceptibility to periodontal disease have taken on a wider significance.²⁰

The aim of this study was to examine the association of some of the documented risk indicators for periodontal disease severity with the risk for tooth loss due to periodontal reasons in a limited number of Pakistani population.

Risk Factors

Risk factor can be defined as an occurrence or characteristic that has been associated with the increased rate of a subsequently occurring disease. Risk factors are associated with a disease but not necessarily cause the disease. Risk factors may be divided into modifiable risk factors such as smoking, diabetes, periodontal disease, socioeconomic status, psychological disease local factors, etc and non-modifiable risk factors such as genetics, host response, osteoporosis, and aging etc.²⁰

MATERIALS AND METHODS

This was a cross sectional study examining the factors associated with tooth loss due to periodontal reasons conducted at Armed Forces Institute of Dentistry Rawalpindi and Dental Department POF Hospital Wah.

Inclusion criteria for this study were all adult patients (18 years of age and above). The study protocol was submitted for review by the ethical review committee of the respective hospitals and informed consent was obtained from all study participants. The study questionnaire comprised of patient's age, gender, medical history, dental care visit history, tooth brushing frequency, smoking history, overweight, the tooth/ teeth extracted, and the reason for extraction.

Participating doctors were instructed to consider the extraction performed for periodontal reasons if the

extracted tooth or teeth had two or more of the following: bone loss $\geq 50\%$ of remaining bone support as evidenced from radiograph, probing depth ≥ 7 mm, grade 2-3 mobility, suppuration, or class III furcation involvement for molar teeth. Other options were grossly carious teeth, root fracture, failure of endodontic treatment, malpositioned teeth. Third molars were not included in the study. Individuals with fewer than six teeth present were excluded from the data analysis. Multiple teeth extracted for multiple reasons were not included for the same patient. The study was performed during June 2007.

Data study was performed using SPSS version 10. Using this data two different persons entered the same data in two different data files, which were validated against one another to ensure a high quality of data and eliminate human error. Means and frequency distribution were calculated for all background and outcome study variables. Pearson chi-square test was used to test the association between different degrees of periodontal disease severity and each independent variable. P value < 0.001 was used to determine statistical significance. Crude odds ratios (OR) and their 95% confidence intervals (CI) were calculated for each significant variable.

Differences in age and mean number of extracted teeth between the two groups (extractions due to periodontal or other reasons) were compared to the Student t test.

RESULTS

A total of 426 patients had 500 teeth extracted during the 30 day study period, for overall mean tooth loss rate of 1.14 teeth per patient. The demographic data and smoking status of patients are summarized in Table 1. The mean age of all patients was 42.9 years (range=18-75 years), and patients losing teeth for periodontal reasons were significantly older than those losing their teeth for other reasons (51.7 versus 37.9 years) respectively; $P < 0.001$. Fewer teeth were lost due to periodontal disease than for other reasons (34.3 versus 65.7, respectively), more teeth per patient were lost due to periodontal reason than for other causes (1.32 versus 1.05) respectively; $P < 0.001$.

Females although comprised 43.6 % of the sample but greater proportion of them lost their teeth on

TABLE 1: PATIENT DEMOGRAPHICS & SMOKING HISTORY

Variable	Periodontal Disease	Other Reasons*	Total
Mean age	51.71	37.90	42.87
Number of patients(%)	146(34.3)	280(65.7)	426
Number of extracted teeth (%)	192(40.0)	294(60.0)	486
Teeth lost Per Patient	1.32	1.05	1.14
Gender Male%	74(30.83)	166(69.17)	240(56.34)
Female%	72(38.7)	114(61.3)	186(43.66)
Smoking status			
Smoker(%)	28(35.89)	50(64.10)	78(18.3)
Nonsmoker(%)	118(33.90)	230(66.09)	348(81.7)

*caries, failed endodontic, broken roots, tooth malposition

Medical History Findings	Frequency	Percentage %
No Disease	294	69
Diabetes Mellitus	52	12.2
Hypertension	40	9.4
Hepatic	14	3.3
Cardiovascular	12	2.8
Asthma	8	1.9
Renal	4	0.9
Rheumatoid Arthritis	2	0.5
Total	426	100

TABLE 2: MEDICAL HISTORY FINDINGS

account of periodontal reasons than did males (38.2-30.8 respectively) $P < 0.05$. smokers accounted for 18.3 of all patients.

The most common medical history finding in all patients was diabetes mellitus (12.2%) followed by hypertension (9.4%) and, hepatitis (3.3%). Other medical problems were present in smaller proportion (Fig 1 & Table 2). Only 7% of all patients reported having had a dental care visit within 6 months, 24% reported once a year, whereas, a substantial percentage 69% have never had such a visit. (Fig. 2). Similarly, the tooth brushing frequency of the patients was low. With only 16% brushing the teeth twice a day, 49% once a day, whereas 34% never brushed their teeth or used a tooth brush occasionally (Fig 3.).

Mandibular and maxillary molars were the most commonly extracted teeth in all patients and were extracted more commonly for reasons other than periodontal disease ($P < 0.001$) (Table 3). Maxillary and mandibular anterior teeth were extracted more for

TABLE 3: REASONS FOR EXTRACTION OF DIFFERENT TOOTH TYPES

Tooth Type	Periodontal disease n %	Other reasons* n %	P value†	Total n %
Maxillary Molar	33(28.7)	82(71.3)	<0.001	115(23.7)
Maxillary Premolar	24(40.7)	35(59.3)	NS	59(12.1)
Maxillary Incisor	13(68.4)	6(31.6)	<0.001	19(3.9)
Maxillary Canine	4(23.5)	13(76.5)	<0.001	17(3.5)
Mandibular Molar	34(26.7)	116(73.3)	<0.001	150(30.9)
Mandibular Premolar	22(55.0)	18(45)	NS	40(8.2)
Mandibular Incisor	14(77.7)	4(22.3)	<0.001	18(3.7)
Mandibular Canine	2(25.0)	6(75.0)	<0.001	89(1.6)

*caries, failed endodontic, broken roots, tooth malposition

†chi square test

NS not statistically significant

TABLE 4: ASSOCIATIONS OF DEMOGRAPHIC, MEDICAL, AND DENTAL VARIABLES WITH REASONS FOR TOOTH LOSS

Variables	Periodontal Disease	Other Reasons*	P Value†	Total
Age				
≤ 35 years	16(9.5)	123(88.5)	<0.001	139
> 35 years	130(45.3)	157(54.7)		287
Gender				
Male	90(34.3)	172(65.7)	0.162	262
Female	102(45.5)	122(54.5)		224
Medical History Problem				
Diabetes Mellitus	28(54.9)	23(45.1)	<0.001	51
Hypertension	34(80.9)	8(19.1)	<0.001	42
Cardiovascular	14(87.5)	2(12.5)	<0.001	16
Rheumatoid Arthritis	10(83.3)	2(16.7)	<0.001	12
Asthma	6(60.0)	4(40.0)	0.084	10
Renal	2(50.0)	2(50.0)	0.424	4
Hepatic	2(16.7)	10(83.3)	0.109	12
Osteoporosis	2(50.0)	2(50.0)	0.424	4
Smoking Status				
Smoker	28(35.9)	50(64.1)	0.416	78
Nonsmoker	118(33.9)	230(66.1)		348
Dental care Visits				
Yes	34(23.8)	109(76.2)	<0.001	143
Never	112(39.6)	171(60.4)		283
Tooth brush use				
Once daily	52(24.8)	158(75.2)	<0.001	210
Twice daily	14(20.0)	56(80.0)		70
Occasionally	80(54.8)	66(45.2)		146
Weight				
Normal	124(33.0)	252(67.0)	0.085	376
Overweight	22(44.0)	28(66.0)		50
Tooth Types §				
Posterior	135(33.8)	264(66.16)	<0.001	399
Anterior	57(65.5)	30(34.48)		87

*caries, failed endodontic, broken roots, tooth malposition

†chi square test

NS not statistically significant

§ Posterior: molar or premolar, Anterior: incisors or canine

TABLE 5: ASSOCIATION OF HORMONAL DISTURBANCES WITH TOOTH LOSS

Variables	Periodontal Diseasesn %	Other Reasons*n %	P Value†	Totaln %
Puberty	0	20	NS	20
Pregnancy	2((33.3)	4(66.6)	<0.001	6(3.2)
Menopause	52(57.8)	38(42.2)	<0.001	90(48.4)

*caries, failed endodontic, broken roots, tooth malposition

†chi square test

NS not statistically significant

TABLE 6: LOGISTIC REGRESSION ANALYSIS OF FACTORS ASSOCIATED WITH TOOTH LOSS FOR PERIODONTAL REASONS*

Variables	OR	95% CI
Age >35	6.36	1.63 to 1.72
Diabetes mellitus	2.65	1.85 to 1.91
Hypertension	10.32	1.88 to 1.93
Cardiovascular	14.7	1.94 to 1.98
Rheumatoid arthritis	10.22	1.96 to 1.99
Menopause	5.2	3.55 to 3.69
Smoker	1.09	1.78 to 1.85
Anterior tooth type	3.71	1.82 to 1.89

*All above variables were significant at $P < 0.001$

OR: Odds Ratio

95% CI: 95% Confidence Interval of percentage

periodontal disease than for other reasons ($P < 0.001$). No significant differences were found in the reasons for extractions of premolar teeth.

On the other hand, when only the teeth extracted for periodontal reasons were analyzed for tooth types (Fig 4), mandibular and maxillary molars were also the teeth most commonly extracted. The teeth least likely to be lost due to periodontal reasons were mandibular and maxillary canines.

Association between background study variables and periodontal reasons are presented in (Table 4). Grouping of the patients 35 years of age or younger

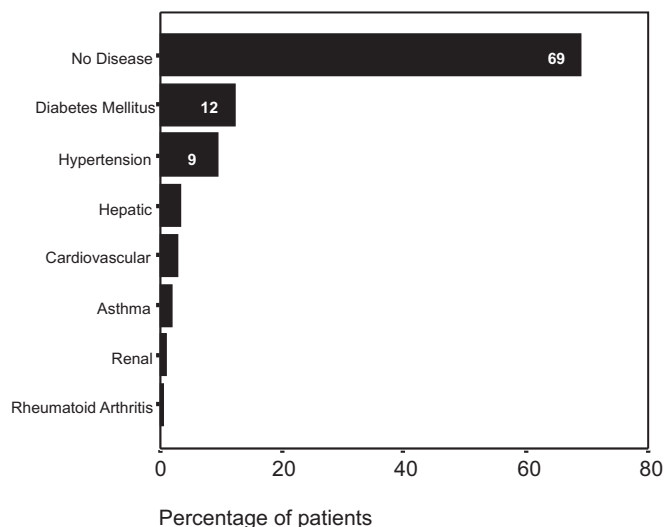


Fig 1. Medical History Findings

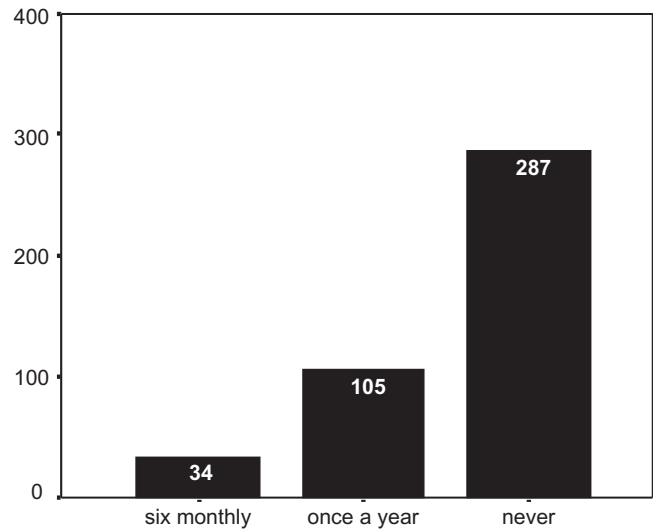


Fig 2. Dental care visits

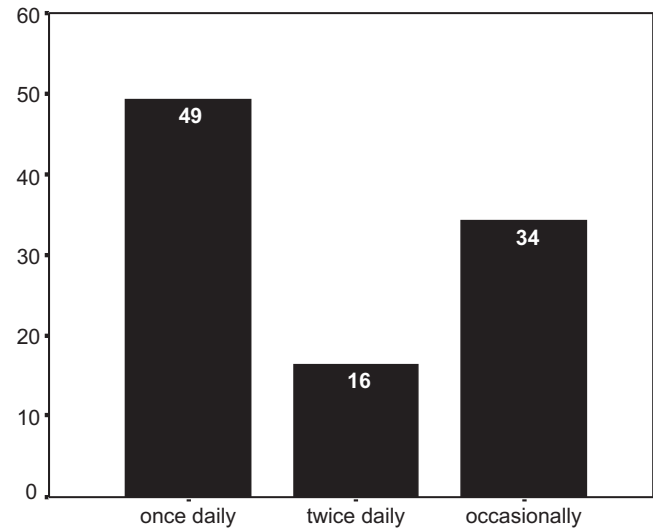


Fig 3. Frequency of tooth brushing

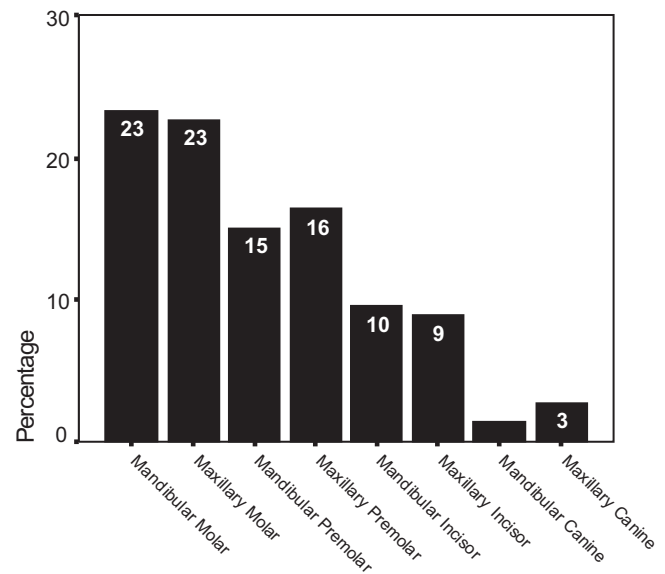


Fig 4. Tooth loss due to periodontal disease

versus those older than 35 years revealed significantly different pattern of tooth loss. Although few teeth were extracted for periodontal reasons in younger patients, periodontal disease accounted for the majority of tooth extractions in patients older than 35 years (45.3% versus 9.5%). Gender differences were not significant ($P=0.162$). Several medical history problems significantly associated with tooth loss for periodontal reasons including diabetes, hypertension, cardiovascular disease, and rheumatoid arthritis ($P<0.001$). Smoking history did not reach a statistically significant level ($P=0.416$). Comparison of dental care visit history and tooth brushing frequency revealed that never or occasional dental care visit and never or occasional use of tooth brush were significantly associated with tooth loss for periodontal reasons ($P<0.001$). Additionally anterior tooth types (canines and incisors) were significantly associated with tooth loss due to periodontal disease ($P<0.001$). Association between menopause and loss of teeth due to periodontal disease was significant (57.8% versus 42.3%) $P<0.001$ (Table 5).

Odds Ratios and corresponding 95% confidence interval are presented in Table 6. Factors significantly associated with tooth loss due to periodontal reasons after adjusting for confounding variables were age >35 years (OR=6.36), diabetes mellitus (OR=2.65), hypertension (OR=10.32), cardiovascular disease (OR=14.7), rheumatoid arthritis (OR=10.22), menopause (OR=5.2), smoker (OR=1.09), anterior tooth type (OR=3.71). Asthma, renal problems, hepatic problems and osteoporosis were eliminated from the final model due to lack of significance.

DISCUSSION

Today the important component of modern dental therapy is risk assessment.³ It is imperative to identify those individuals who are at greater risk for periodontal disease severity and progression for institution of proper preventive and therapeutic measures for those individuals who can benefit the most from such measures. Periodontal disease is mostly found in a specific group of patients exhibiting the greatest rates of tooth and attachment loss.

The study was undertaken to examine the association between several reported risk indicators for periodontal disease severity and tooth loss due to periodontal disease.

Tooth loss for periodontal reasons was significantly associated with age (OR=6.36) for patients older than 35 years. Many investigators confirm this association between older age and with attachment loss^{16,22} and tooth loss for periodontal reasons. Although only 34.3% of the patients lost their teeth due to periodontal disease, these patients lost more teeth per patient than patients losing their teeth for other reasons (1.32 versus 1.05). This confirms previous findings that periodontal disease, although, is responsible for tooth loss in fewer patients, but responsible for the loss of more teeth than any other cause.²³

Odd ratio for male gender was 0.70 in contrast to other studies,^{16,24,25} where it was in between 1.36-1.42. This may be due to the greater number of female patients participating in this sample of study. Smokers were also more likely to have tooth loss due to periodontal reasons than patients who had never smoked (OR=1.09). The effect of smoking on periodontal disease and loss of teeth are well documented.

Several medical history problems were significantly associated with increased tooth loss due to periodontal disease (Table 6). Patients with diabetes were more likely to have tooth loss due to periodontal disease than non diabetic patients (OR=2.65). The association between diabetes and periodontal disease is also well established.^{17,18,26-28} It is worth noting that the odds ratio for tooth loss in patients with diabetes in this study (OR=2.65) is also very close to that reported by Khalaf et al¹⁹ for attachment loss and diabetes (OR=2.64).

Other medical history problems associated with tooth loss for periodontal disease were hypertension (OR=10.32), rheumatoid arthritis (OR=10.22) and cardiovascular diseases (OR=14.7). A strong association was found between hypertension, rheumatoid arthritis and cardiovascular disease and tooth loss for periodontal reasons which confirms the other studies.^{29,30} (Table 4). In our study asthma, renal disease, liver problems and osteoporosis showed no significant association with tooth loss due to periodontal reasons. Other studies showed significant association with these diseases.¹⁹ This may be due to the small sample size of our study.

Dental care visit history and tooth brush use were significantly associated with risk for tooth loss due to

periodontal reasons ($P < 0.001$). This corresponds to the research evidence supporting the role of the patient compliance with dental care visit and brushing in maintaining periodontal health.³¹⁻³⁸

In tooth types, anterior teeth were more likely to be extracted for periodontal reasons than posterior teeth ($OR = 3.71$). This finding has been reported previously.^{1,5,44,45}

When the teeth lost for periodontal reasons were analyzed, mandibular and maxillary molars were extracted much more commonly than other teeth, whereas, the mandibular and maxillary canines were extracted significantly less commonly than other teeth. This agrees with studies^{39,19} where mandibular canines were the least extracted of all tooth types. (Fig 4).

There is a strong association between tooth loss due to periodontal disease and post menopausal women ($OR = 5.2$). This is supported by another study conducted by Tezal et al.⁴⁶

The prevalence of tooth loss due to periodontal reasons in this representative sample of adult dental patients in Pakistan (34.3% of all the patients and 40% of all the teeth) was remarkably similar to most studies performed around the world including studies in France,⁴⁰ Germany,⁴¹ England,⁴² Kuwait,¹⁹ and US.⁴³ This may support the validity of these risk indicators and their association with tooth loss for periodontal disease in other parts of the world.

CONCLUSION

We have identified age, lack of dental care visits, frequency of tooth brushing, diabetes mellitus, hypertension, cardiovascular disease, rheumatoid arthritis, menopause and anterior tooth type as significant risk factors for periodontitis in our study group. Smoking was not significantly associated with periodontitis in our study, perhaps on account of the large number of female patients who usually do not smoke in Pakistan. Overweight was also not significantly associated with periodontitis.

This was a cross sectional study of a small sample of patients needing extraction of teeth. A longitudinal follow up data is required to ascertain true risk factors for the tooth loss due to periodontal disease.

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