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Research Article

**STUDY TO DETERMINE THE RISK FACTORS FOR TOOTH
LOSS DUE TO PERIODONTAL DISEASE**Dr Arooj Fatima¹, Dr Samina Alvi², Dr Muhammad Ali Hassan³¹Sharif Medical and Dental College, Lahore²Nishter Institute of Dentistry, Multan³Rawal Institute of Health Sciences, Islamabad**Article Received:** October 2020**Accepted:** November 2020**Published:** December 2020**Abstract:**

Aim: The purpose of this study was to identify risk indicators for periodontitis based on cross-sectional data from adult Pakistanis.

Methods: The study group consisted of 426 people aged 18-75. All extractions were performed in the Orthodontic department of Punjab Dental Hospital, Lahore for six months duration from January 2020 to June 2020. Documented information included the patient's age and gender, medical history, dental visit history, frequency of tooth brushing, types and number of teeth extracted, history of menopause, and reasons for extraction. The causes were categorized as periodontal disease compared with other causes in multiple logistic regression analysis.

Results: A total of 426 patients had 486 teeth removed. More teeth per patient were lost due to periodontal disease than other reasons (1.32 ± 0.6 vs. 1.05 ± 0.2 , $p < 0.05$, 35 years (OR 6.36; 95% confidence interval) 1.63-11.72), 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 any of the following conditions: diabetes (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 $p < 0.001$).

Conclusion: Our data suggest that tooth loss due to periodontal disease is related to age, smoking, dental visits, toothbrushing frequency, diabetes, hypertension, rheumatoid arthritis, menopause, and the type of anterior teeth in this study group.

Keywords: diabetes; periodontal disease; risk indicators; menopause; smoking; tooth loss.

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INTRODUCTION:

Periodontal disease is one of the leading causes of tooth loss worldwide. The understanding of risk factors for periodontal disease in different populations is limited¹⁻². Most of the research was conducted in Europe and America and identified age, gender, socioeconomic status, poor oral hygiene, obesity, smoking, and diabetes as related to periodontal disease. The contribution of these factors to periodontal disease may vary geographically or racially³.

Identifying the factors associated with an increased risk of tooth loss from periodontal disease can help strengthen the evidence for these factors as determinants of the risk of periodontal disease severity⁴⁻⁵. Knowing about the possible relationship between periodontal disease and systemic health that has emerged over the past decade, research into periodontal susceptibility has become more important⁶⁻⁷. The purpose of this study was to investigate the relationship of some documented risk indicators for the severity of periodontal disease with the risk of tooth loss due to periodontitis in a limited number of the Pakistani population. A risk factor can be defined as an occurrence or characteristic associated with an increased incidence of subsequent disease. Risk factors are related to the disease but do not necessarily cause it. Risk factors can be divided into modifiable risk factors such as smoking, diabetes, periodontal disease, socioeconomic status, local factors related to mental illness, etc., and non-modifiable risk factors such as genetics, host response, osteoporosis, aging, etc⁸⁻⁹.

MATERIALS AND METHODS:

It was a cross-sectional study examining the factors associated with tooth loss due to periodontitis, conducted at the Orthodontic department of Punjab Dental Hospital, Lahore for six months duration from January 2020 to June 2020.

All adult patients (18 years of age and over) were included in this study. The study protocol was submitted to the Ethical Review Committee of the

relevant hospitals for review, and informed consent was obtained from all study participants. The study questionnaire included the patient's age, gender, medical history, history of dental visits, frequency of tooth brushing, history of smoking, overweight, removed tooth / teeth, and reason for extraction.

The attending physicians were instructed to consider a periodontal extraction if the removed tooth or teeth had two or more of the following: bone loss with "50% of remaining bone support from X-ray, probing depth \geq 7 mm, grade 2-3 mobility, suppuration or involvement of class III furcation of molars. Other options were heavily carious teeth, root fracture, failure of endodontic treatment, and tooth misalignment. Third molars were not included in the study. People with fewer than six teeth were excluded from the data analysis. For the same patient, multiple teeth extracted for multiple reasons were not included. The data study was performed using SPSS version 19. Using this data, two different people entered the same data into two different data files, which were cross-checked to ensure high data quality and eliminate human error. The means and frequency distribution were calculated for all background variables and the test result. Pearson's chi-square test was used to investigate the relationship between various severity of periodontal disease and each independent variable. The p value <0.001 was adopted to determine statistical significance. Raw odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated for each significant variable. Differences in age and mean number of extracted teeth between the two groups (extractions for periodontitis or other reasons) were compared with the Student's t-test.

RESULTS:

A total of 426 patients had 486 teeth extracted during the 30-day study period, with an overall average tooth loss rate of 1.14 teeth per patient. Patients' demographics and smoking status are summarized in Table 1. The mean age of all patients was 42.9 years (range = 18-75 years), and the periodontal loss patients were significantly older than those who lost their teeth for other reasons. (51.7 vs.37.9 years); $P < 0.001$.

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)

Women accounted for 43.6% of the sample, but a greater proportion of them lost their teeth due to periodontitis than men (38.2-30.8, respectively). $P < 0.05$. 18.3 of all patients were smokers.

Diabetes mellitus (12.2%) followed by hypertension (9.4%) and hepatitis (3.3%) was the most frequent finding in all patients. Other health problems occurred in a smaller proportion (Fig. 1 and Table 2).

TABLE 2: MEDICAL HISTORY FINDINGS

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

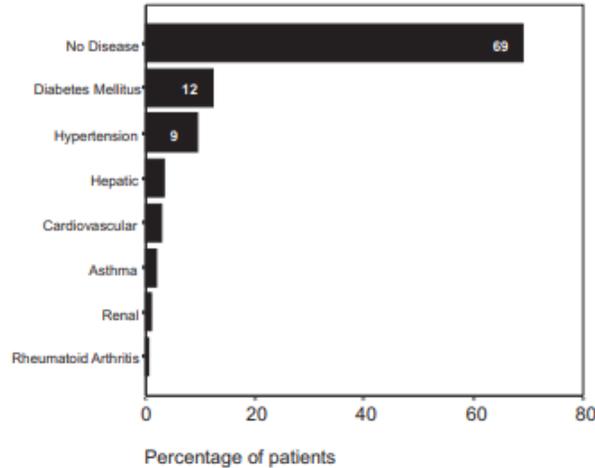


Fig 1. Medical History Findings

Only 7% of all patients reported visiting the dentist within 6 months, 24% reported once a year, while a significant percentage of 69% never had such an appointment. visit. (Fig. 2) Similarly, the frequency of toothbrushing in patients was low. Only 16% brush their teeth twice a day, 49% once a day, while 34% have never brushed their teeth or used an occasional toothbrush (Fig. 3).

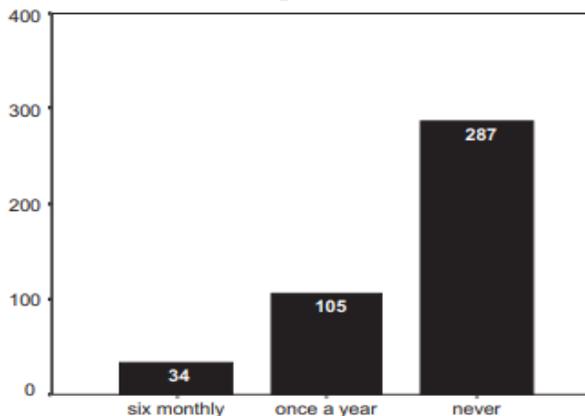


Fig 2. Dental care visits

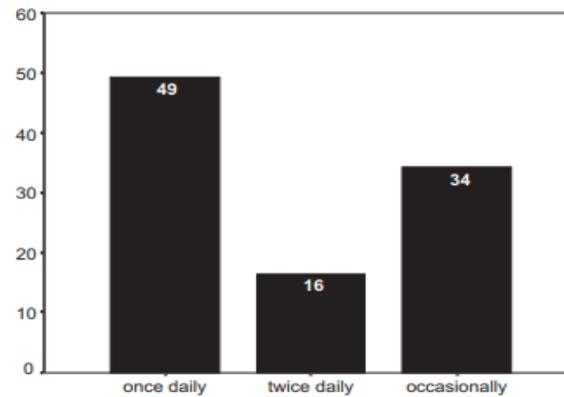


Fig 3. Frequency of tooth brushing

The mandibular and maxillary molars were the most frequently removed teeth in all patients and were removed more frequently for reasons other than periodontal disease ($p < 0.001$) (Table 3). The anterior teeth in the maxilla and the mandible were removed more often due to periodontal disease than other reasons ($P < 0.001$). There were no significant differences in the causes of premolar extraction.

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)

On the other hand, when only teeth removed for periodontium were analyzed (Fig. 4), the most frequently removed teeth were also the molars of the mandible and maxilla. The teeth least exposed to periodontal loss were the canines

of the mandible and maxilla. The relationship between the variables of the pivotal study and the causes of periodontium is presented in (Table 4).

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)		139
> 35 years	130(45.3)	157(54.7)	<0.001	287
Gender				
Male	90(34.3)	172(65.7)		262
Female	102(45.5)	122(54.5)	0.162	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)		78
Nonsmoker	118(33.9)	230(66.1)	0.416	348
Dental care Visits				
Yes	34(23.8)	109(76.2)		143
Never	112(39.6)	171(60.4)	<0.001	283
Tooth brush use				
Once daily	52(24.8)	158(75.2)		210
Twice daily	14(20.0)	56(80.0)		70
Occasionally	80(54.8)	66(45.2)	<0.001	146
Weight				
Normal	124(33.0)	252(67.0)		376
Overweight	22(44.0)	28(66.0)	0.085	50
Tooth Types §				
Posterior	135(33.8)	264(66.16)		399
Anterior	57(65.5)	30((34.48)	<0.001	87

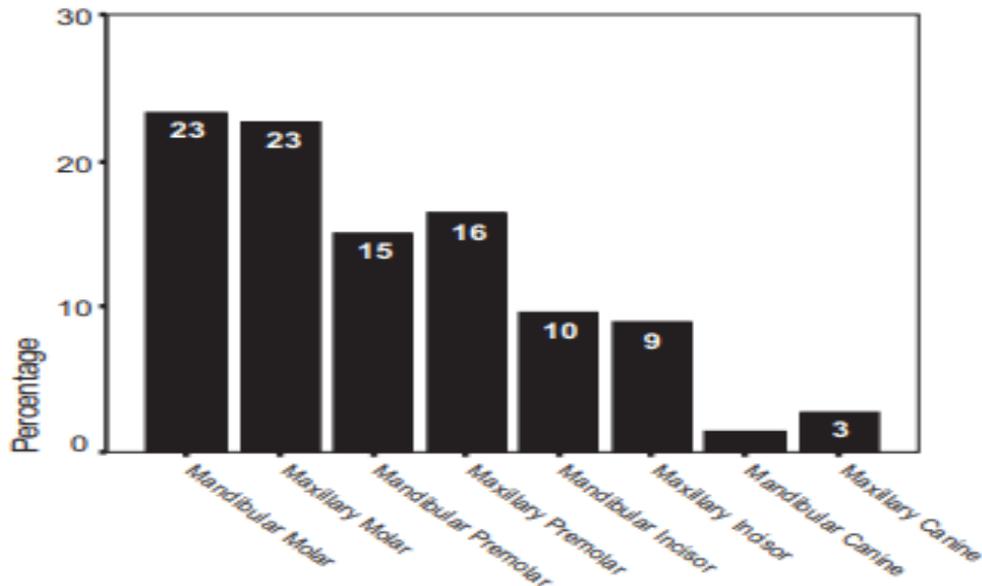


Fig 4. Tooth loss due to periodontal disease

Grouping of patients aged 35 and younger children over 35 showed a significantly different pattern of tooth loss. Although fewer teeth were removed for periodontitis in younger patients, periodontal disease accounted for the majority of tooth extractions in patients over 35 years of age (45.3% versus 9.5%). Sex differences were not significant ($p = 0.162$). Several history problems that were significantly associated with periodontal tooth loss, including diabetes mellitus, hypertension, cardiovascular disease, and rheumatoid arthritis ($P < 0.001$). The smoking history did not reach statistically significant levels ($P = 0.416$). A comparison of dental visit history and tooth brushing frequency showed that never or intermittent dental visits and never or intermittent use of a toothbrush were significantly associated with periodontal tooth loss ($P < 0.001$). In addition, anterior tooth types (canines and incisors) were significantly associated with tooth loss due to periodontal disease ($P < 0.001$). (Table 5).

TABLE 5: ASSOCIATION OF HORMONAL DISTURBANCES WITH TOOTH LOSS

Variables	Periodontal Disease %	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)

The odds ratios and their corresponding 95% confidence intervals are shown in Table 6. Factors significantly associated with periodontal tooth loss after adjusting for confounding factors are age > 35 years (OR = 6.36), diabetes (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), type front tooth (OR = 3.71). Asthma, kidney problems, liver problems and osteoporosis were eliminated from the final model due to lack of relevance.

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

DISCUSSION:

Currently, risk assessment is an important element of modern dental therapy. It is imperative to identify those individuals who are more likely to experience the severity and progression of periodontal disease in order to establish appropriate preventive and therapeutic measures for those individuals who will benefit most from such measures. Periodontal disease is most common in a specific group of patients with the highest rates of tooth loss and attachment. The study was undertaken to investigate the relationship between several reported risk indicators for the severity of periodontal disease and tooth loss from periodontal disease⁸⁻¹⁰.

Periodontal tooth loss was significantly age-related (OR = 6.36) in patients over 35 years of age. Many researchers confirm this link between old age and the loss of attachment and teeth due to periodontitis. Although only 34.3% of patients lost teeth due to periodontal disease, these patients lost more teeth per patient than patients who lost their teeth from other reasons (1.32 vs. 1.05). This supports previous findings that while periodontal disease is responsible for the loss of teeth in fewer patients, it is responsible for the loss of more teeth than any other cause. The male odd rate was 0.70, in contrast to other studies where it ranged from 1.36-1.42¹¹. This may be due to the greater number of patients participating in this research trial. Smokers were also more likely to experience tooth loss due to periodontium than patients who never smoked (OR = 1.09). The effects of smoking on periodontal disease and tooth loss are well documented. Several problems in the history

were significantly associated with increased tooth loss due to periodontal disease (Table 6). Diabetic patients had more tooth loss due to periodontal disease than non-diabetic patients (OR = 2.65). The relationship between diabetes and periodontal disease is also well known¹². It is worth noting that the odds ratio of tooth loss in patients with diabetes in this study (OR = 2.65) is also very similar to that reported by Khalaf et al. For attachment loss and diabetes (OR = 2.64). Other medical history issues related to the loss of teeth due to periodontal disease include hypertension (OR = 10.32), rheumatoid arthritis (OR = 10.22), and cardiovascular disease (OR = 14.7). There was a strong association between hypertension, rheumatoid arthritis and cardiovascular disease, and the loss of teeth due to periodontium, which is confirmed by other studies. (Table 4). In our study, asthma, kidney disease, liver problems, and osteoporosis did not show a significant association with periodontal tooth loss. Other studies have found a significant association with these diseases¹³. This may be due to the small sample size in our study. Dental history and toothbrush use were significantly associated with the risk of tooth loss due to periodontitis ($p < 0.001$). This is consistent with the results of studies confirming the role of patient compliance with the dental visit and brushing in maintaining periodontal health¹⁴.

In tooth types, the probability of removal of the front teeth was greater for periodontitis than for the back teeth (OR = 3.71). This discovery has been reported earlier. When analyzing periodontal loss teeth, mandibular and maxillary molars were removed much more often than other teeth, while mandibular and

maxillary canines were removed much less frequently than other teeth¹⁵. This is consistent with the results of studies in which mandibular canines were the least removed from all types of teeth (Fig. 4). There is a strong association between tooth loss from periodontal disease and postmenopausal women (OR = 5.2).

CONCLUSION:

We identified age, lack of dental visits, frequency of toothbrushing, diabetes, hypertension, cardiovascular disease, rheumatoid arthritis, menopause, and anterior tooth type as significant risk factors for periodontitis in our study group. In our study, smoking was not significantly associated with periodontitis, perhaps due to the large number of non-smokers in Pakistan. Being overweight was also not significantly associated with periodontitis. It was a cross-sectional study of a small group of patients requiring tooth extraction. Longitudinal data is needed to establish real risk factors for tooth loss from periodontal disease.

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