

Causes and Patterns of Loss of Permanent Teeth among Patients Attending a Dental Teaching Institution in South India

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Abstract

Aim: The aims of the present study are to determine the causes and pattern of loss of permanent teeth among patients attending a dental teaching institution in southern India.

Methods and Materials: Data collected from patients attending the outpatient wing of the Sri Sankara Dental College, Kerala, during a three month period was used for the study. The cause for extraction was classified as follows: (1) caries and its sequelae, (2) periodontal disease, (3) orthodontic purposes, (4) impactions, (5) prosthodontic purposes, and (6) other reasons.

Results: A total of 1791 permanent teeth were extracted of which 708 (39.5%) teeth were extracted due to caries and its sequelae, 508 (28.4%) due to periodontal disease, 347 (19.4%) for orthodontic purposes, 29 (1.6%) due to impactions, 155 (8.7%) for prosthodontic purposes, and 44 (2.5%) for other reasons.

Conclusion: The results of the present study suggest caries and periodontal disease are the major causes of tooth mortality in the study population.

Clinical Significance: Data regarding the causes of tooth loss indirectly provides invaluable information on the pattern of oral health in a population which can be utilized for planning public health policies designed to address the burden of oral diseases.



Keywords: Tooth extraction, tooth loss, India, dental caries, periodontal disease

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Introduction

Oral diseases such as dental caries and

Health Problems Worldwide



periodontal disease, resulting in tooth loss, are major public health problems worldwide.¹ Poor oral health and tooth loss have a profound effect on general health, quality of life, and can lead to poor dietary habits.^{2,3} Although the patterns of dental disease are gradually changing, dental caries and periodontal disease are still the most important reasons for extraction of permanent teeth among most populations. Because of the impact of tooth loss on the functional and socioeconomic aspects, it is essential to identify the reasons for extraction of permanent teeth in individual populations so dental health policies can be developed more effectively. National surveys to determine the causes and pattern of extraction have been carried out in several countries.⁴⁻¹⁰ These studies show the reasons for tooth loss vary among different populations. At present, there is very little information regarding the trends in loss of permanent teeth among patients in India. Therefore, the aims of the present study were to identify the reasons and pattern of extraction of permanent teeth among patients attending a dental teaching institution in southern India.

Methods and Materials

The study was conducted at the dental clinic of Sri Sankara Dental College, Trivandrum, India. Data collected from patients who had undergone extraction of permanent teeth during the period from March through May 2006 were used for the study. Variables recorded include age and sex



of the patient, tooth extracted, and the cause for extraction. The main reasons for extraction were classified as follows:

1. Dental caries and its sequelae
2. Periodontal disease
3. Orthodontic purposes
4. Impactions
5. Prosthetic purposes
6. Other reasons (including mutilation, trauma, and malposition)

Data was categorized and analyzed using SPSS, Version 10 (SPSS Inc., Chicago, IL, USA) statistical software.

Results

A total of 1791 permanent teeth were extracted from 1428 patients during the study period. The age of the patients ranged from eight to 80 years. Of the 1791 extracted teeth, 685 (38.2%) were extracted in males and 1106 (61.8%) were extracted in females. Table 1 shows the number of teeth extracted in various age groups among males and females. In almost all the age groups more teeth were extracted in females than in males. The largest numbers of teeth were extracted in the age groups of 55-64 years followed by the age groups of 15-24 and 35-44 years.

The pattern of extraction in the maxillary and mandibular arches as well as the right and left sides of the dentition was analyzed. Of the 1791 teeth extracted, 881 (49.2%) were extracted from the maxillary arch and 910 (50.8%) were extracted from the mandibular arch; 855 (47.7%) teeth were

Table 1. Number of teeth extracted among males and females in various age groups.

Age (years)	Male	Female	Total	Percent
Below 15	70	120	190	10.6
15-24	125	167	292	16.3
25-34	63	163	226	12.6
35-44	91	200	291	16.2
45-54	103	154	257	14.3
55-64	120	181	301	16.8
65-74	107	116	223	12.5
75 and above	6	5	11	0.6
Total	685	1106	1791	100

Table 2. Causes of tooth extraction among males and females.

Cause for Extraction	Males		Females		Total	
	N	%	N	%	N	%
Caries	194	28.3	514	46.5	708	39.5
Periodontal Disease	272	39.7	236	21.3	508	28.4
Orthodontics	147	21.5	200	18.1	347	19.4
Impaction	12	1.8	17	1.5	29	1.6
Prosthodontics	38	5.5	117	10.6	155	8.7
Others	22	3.2	22	2.0	44	2.5
Total	685	100	1106	100	1791	100
p<0.005						

extracted from the right side while 936 (52.3%) teeth were extracted from the left side.

The distribution for the causes of extraction of the teeth among males and females was analyzed (Table 2).

Dental caries was found to be the main cause of tooth extraction in the study population. Caries and periodontal disease together accounted for more than 65% of the extractions. Of the 1791 teeth extracted, 708 (39.5%) teeth were extracted due to caries and its sequelae, 508 (28.4%) teeth due to periodontal disease, 347 (19.4%) teeth for orthodontic purposes, 29 (1.6%) teeth due to impactions, 155 (8.7%) teeth for prosthodontic purposes, and 44 (2.5%) teeth due to other reasons such as mutilation, trauma, and malposition. In males, the leading cause for tooth extraction was found to be periodontal disease (39.7%) followed by caries (28.3%). However, in

females, dental caries (46.5%) was found to be the primary cause for tooth loss while periodontal disease accounted for 21.3% of the extractions. The observed difference between the two groups was found to be statistically significant.

When the distribution of causes for extraction in different age groups was analyzed (Figure 1), dental caries was observed to be an important factor in the extraction of permanent teeth in patients above 15 years of age. In individuals below 25 years of age more teeth (68.9%) were extracted for orthodontic purposes than due to any disease. Orthodontic extractions accounted for 91.6% of the extractions in the age group of up to 14 years and 54.1% of extractions in the age group of 15-24 years. Dental caries was the major reason for extraction in individuals in the age groups of 25-34 years (78.8%) and 35-44 years (70.1%). In individuals above 44 years of age the leading cause of tooth loss was

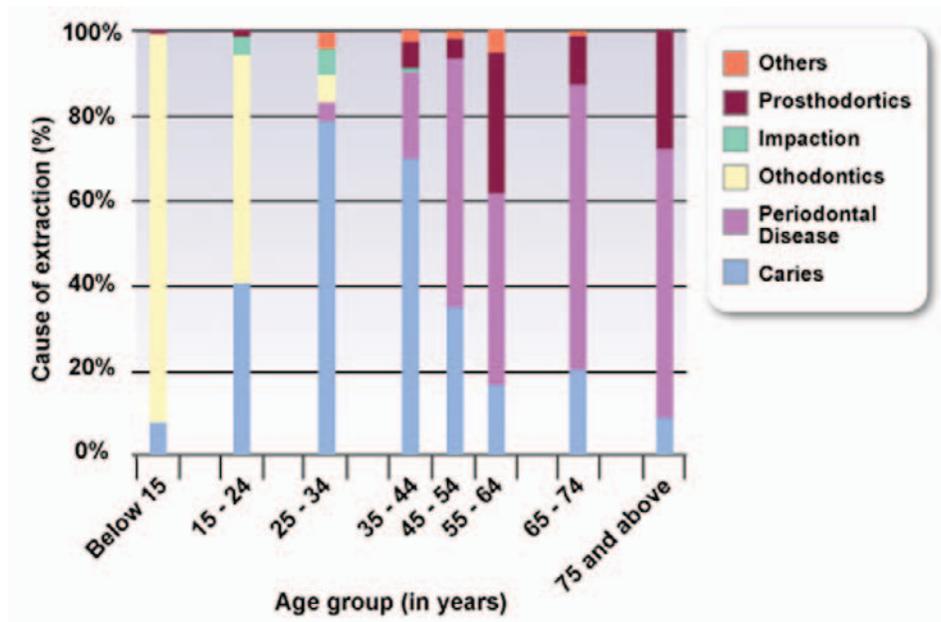


Figure 1. Cause of extraction in various age groups.

Table 3. Causes of extraction in various age groups among males and females.

Age Groups	Caries	Periodontal Disease	Orthodontics	Impaction	Prosthodontics	Others
MALES						
Below 15	13	0	56	0	0	1
15-24	33	0	82	7	0	3
25-34	42	6	9	4	0	2
35-44	47	26	0	0	17	1
45-54	27	73	0	0	0	3
55-64	20	90	0	1	0	9
65-74	11	72	0	0	21	3
75 and above	1	5	0	0	0	0
FEMALES						
Below 15	2	0	118	0	0	0
15-24	86	0	76	5	0	0
25-34	136	4	6	10	0	7
35-44	157	34	0	2	0	7
45-54	65	76	0	0	11	2
55-64	32	45	0	0	98	6
65-74	36	75	0	0	5	0
75 and above	0	2	0	0	3	0
Total	708	508	347	29	155	44
p<0.005						

Table 4. Number of extractions according to tooth types.

Tooth Type	N	%
Central Incisor	77	4.3
Lateral Incisor	84	4.7
Canine	119	6.6
First Premolar	471	26.3
Second Premolar	207	11.6
First Molar	333	18.6
Second Molar	196	10.9
Third Molar	304	17.0
Total	1791	100.0

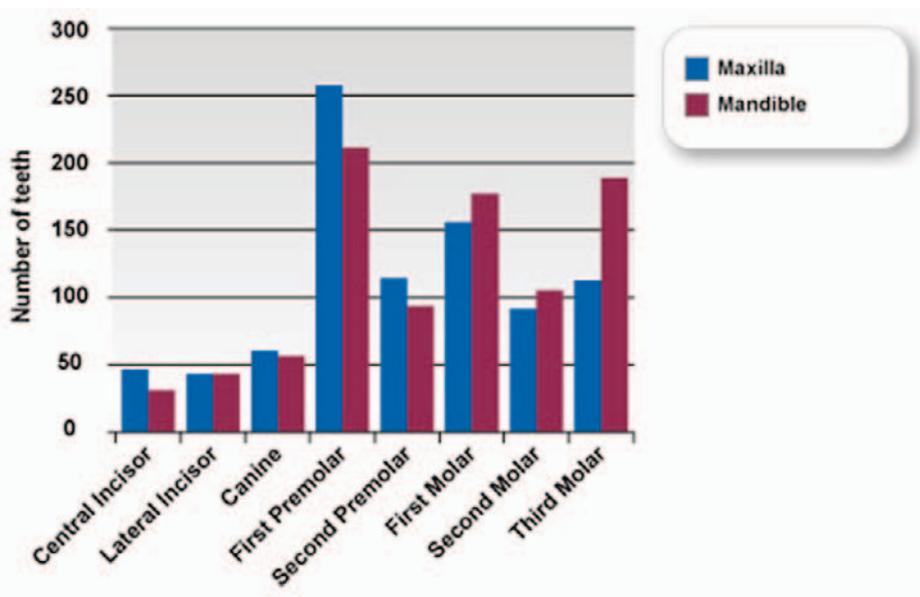


Figure 2. Extraction of individual teeth in maxilla and mandible.

periodontal disease, accounting for over 55% of the extractions.

The differences in the cause of extraction across various age groups was statistically significant ($p < 0.005$). Table 3 shows the age distribution of the causes of extraction in males and females.

Distribution of the frequency of individual tooth types extracted (Table 4) showed the most frequently extracted tooth was first premolar (471), followed by first molar (333), and third molar (304).

The pattern of extraction of individual tooth types in both the arches was also examined (Figure 2), and the difference was found to be significant ($p < 0.005$).

First premolars (258 in the maxillary arch and 213 in the mandibular arch) were the most frequently extracted tooth in both the arches. The first molars (156) and the second premolars (115) were the next most frequently extracted teeth in the maxillary arch. In the mandibular arch the next most frequently extracted teeth were the third molars (191) and the first molars (177). Incisors, canines, and premolars were extracted more from the maxillary arch while molars were extracted more from the mandibular arch.

Figure 3 shows the extraction of individual tooth types across various age groups ($p < 0.005$). In individuals below 25 years of age the most frequently extracted tooth was the first premolar. Molars, particularly the third and first molars, were the most frequently extracted teeth in

the age groups of 25-64 years. Anterior teeth (incisors and canines) were more frequently extracted in individuals above 45 years of age.

Figures 4 and 5 show the age distribution of individual teeth extracted among males and females, respectively.

Regarding the cause of extraction of individual teeth (Figure 6), incisors and canines were extracted mainly due to periodontal disease and for prosthodontic purposes. The main cause of extraction of first premolars was for orthodontic

treatment while second premolars were extracted mainly due to caries and periodontal disease. Dental caries was the leading cause of extraction of the molar teeth. These differences were statistically significant.

Figures 7 and 8, respectively, show the cause of extraction of individual teeth from maxillary and mandibular arches. The tooth most frequently extracted due to caries was the mandibular first molar (147), followed by the maxillary first molar (98), and the mandibular third molar (92). The maxillary first molar (47), mandibular third molar

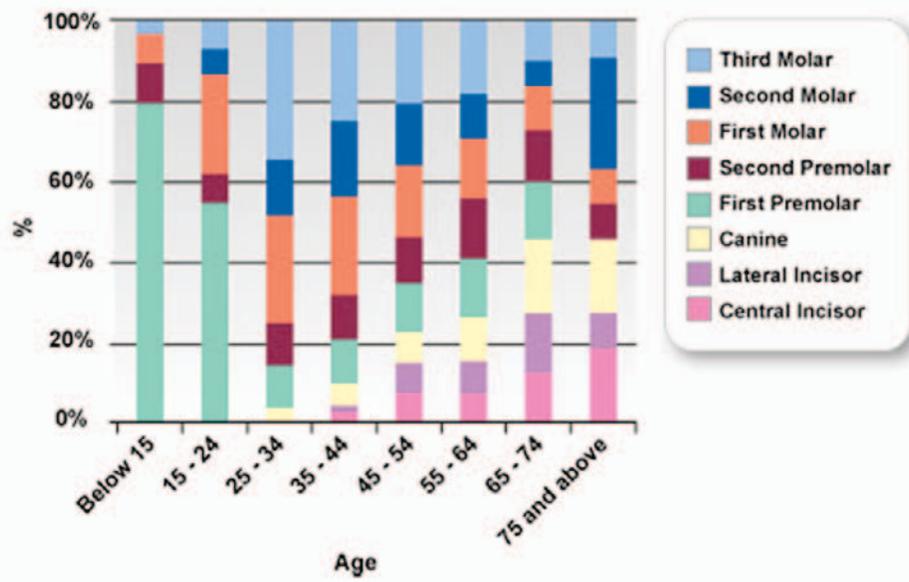


Figure 3. Extraction of individual teeth among various age groups.

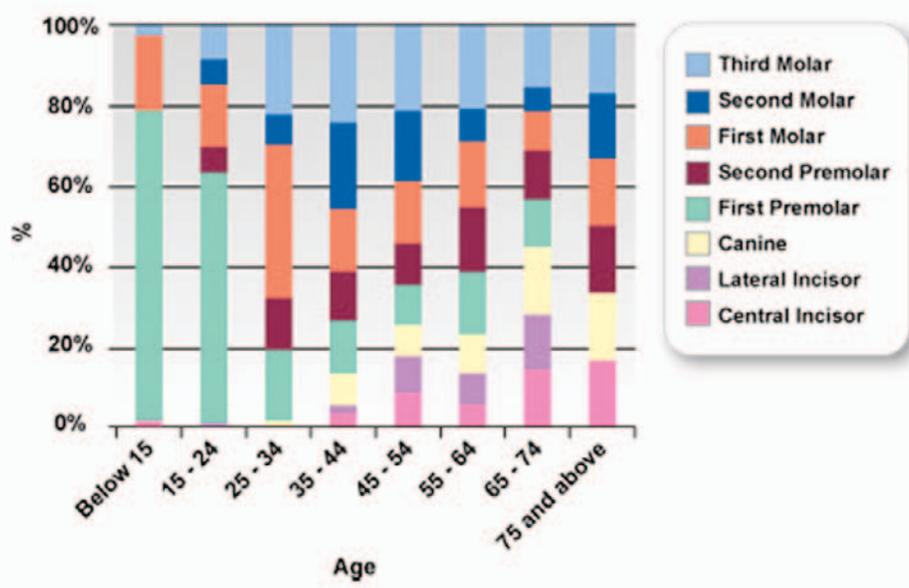


Figure 4. Extraction of individual teeth among various age groups in males.

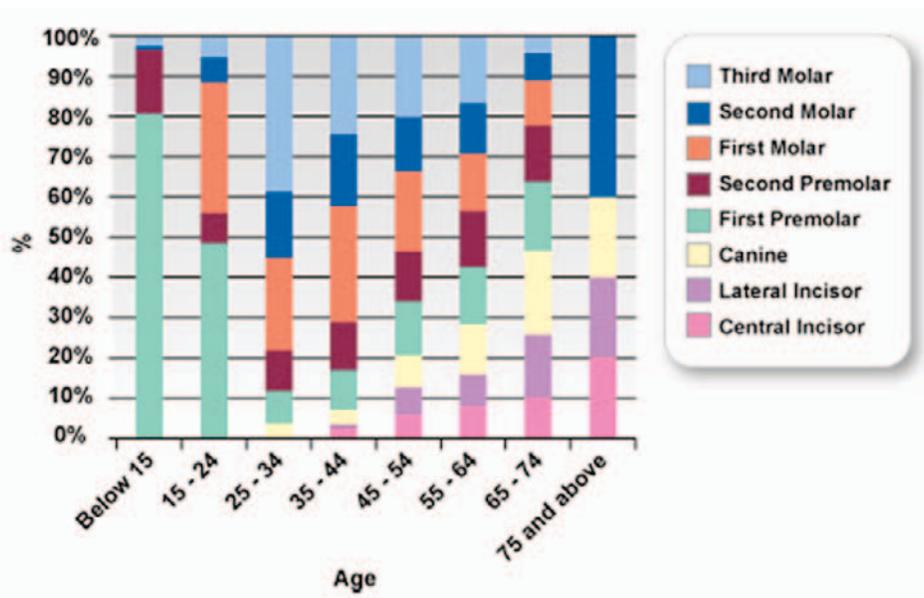


Figure 5. Extraction of individual teeth among various age groups in females.

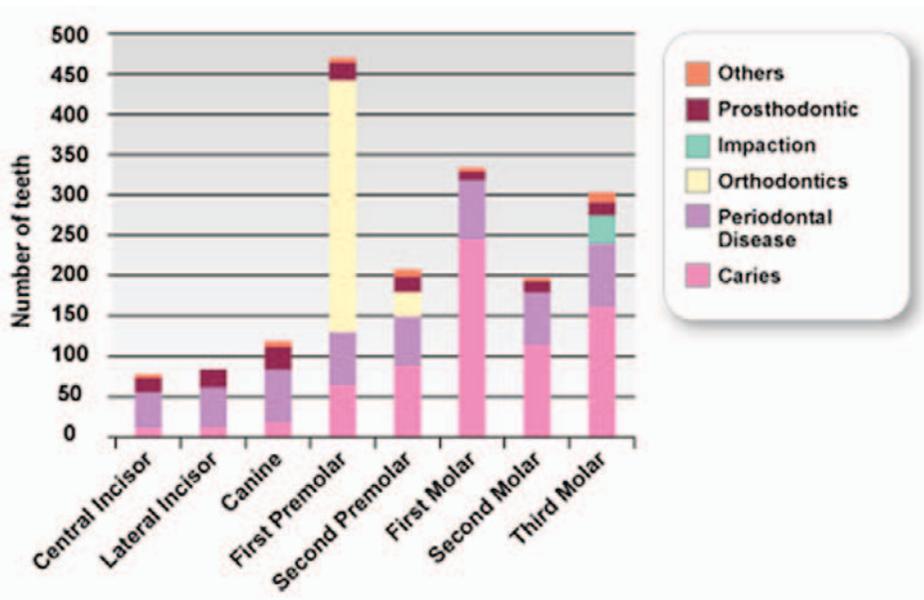


Figure 6. Cause of extraction of individual teeth.

(41), and maxillary second molar (39) were the teeth most commonly extracted due to periodontal disease. A larger proportion of anterior teeth were extracted due to periodontal disease in the mandible (90.6% of the anterior teeth) than in the maxilla (73.7%). Besides orthodontic purposes, maxillary premolars were extracted mainly due to caries while mandibular premolars were extracted due to periodontal disease. All third molars extracted due to impaction were from the mandibular arch.

Discussion

Numerous studies have been conducted to identify the causes of loss of permanent teeth in various populations. These include national surveys, studies targeting local populations, and institution based studies.⁴⁻¹⁹ However, very little data is available regarding causes for the loss of permanent teeth among patients in India.

In the present study, the attempt was to identify

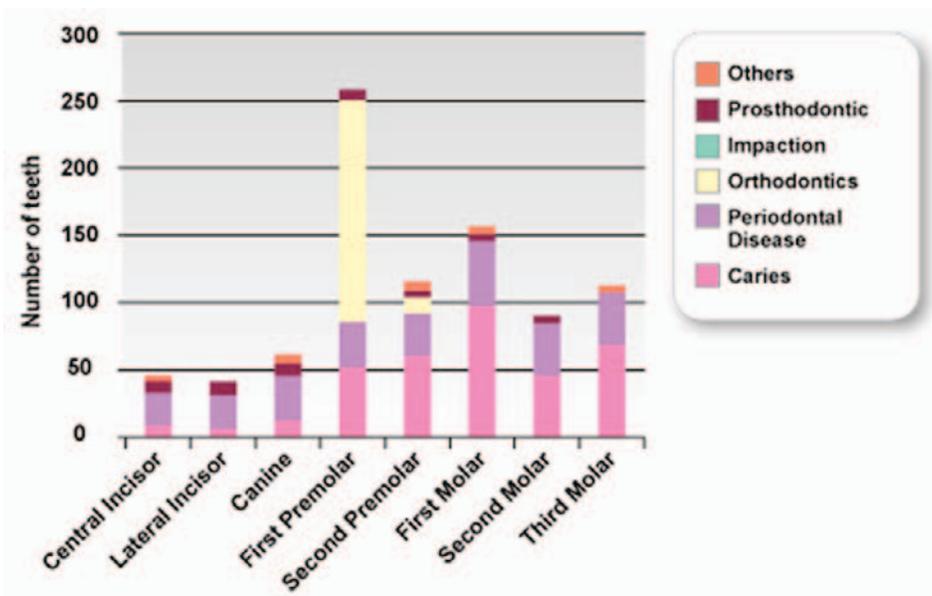


Figure 7. Cause of extraction of individual teeth in maxilla.

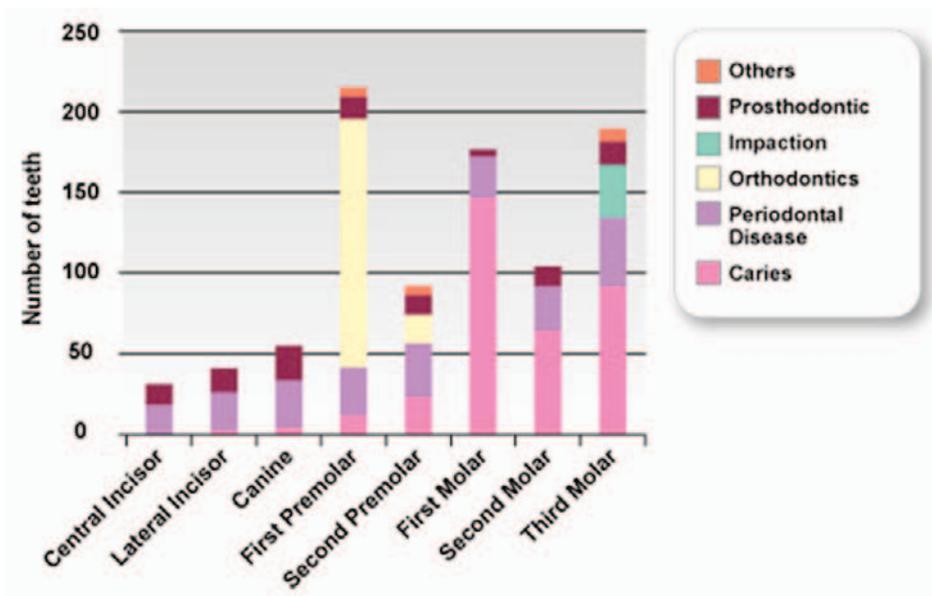


Figure 8. Cause of extraction of individual teeth in mandible.

the causes and patterns of extraction of permanent teeth among patients attending the outpatient wing of Sri Sankara Dental College in Trivandrum, India.

Of the 1791 teeth extracted, 685 (38.2%) were extracted in males and 1106 (61.8%) were in females. This may be explained by the fact males are less frequent visitors to the dentist so a lower number of extractions are performed for males. Moreover, the terminal stage of oral disease treatment sought by most females was extraction. This may be due to the social mind

set in which dental treatment is given a low priority due to its cost.

Dental caries and its sequelae were found to be the leading cause of tooth loss in the study population, accounting for 39.5% of the extractions. The findings in this study also suggest caries was a significant factor for tooth loss in all age groups above 15 years and the leading cause of tooth extraction in females. Trends in tooth loss observed in this study support the widely held view caries is the leading cause of tooth loss, particularly in the younger age groups.^{4,5,9,12,16,19} A nationwide survey

conducted in France reported caries as the major cause of tooth loss (49%).⁴ Two different studies conducted in Scotland 15 years apart reported dental caries and its sequelae as the leading cause of tooth extraction accounting for 50% of extractions.^{5,9} A study conducted among patients attending private dental clinics in South Wales reported 59% of teeth were extracted due to dental caries.¹⁶ The data from the present study also indicates caries is a major public health challenge among the study population.

Periodontal disease accounted for 28.4% of the extractions among patients in the present study. Periodontal disease is the second most important cause of extraction in many populations.^{4,5,9,16,19} However, a few investigators have reported periodontal disease as the leading cause of tooth extraction in the respective study populations.^{13,14}

In the present study, periodontal disease was observed to be the leading cause of tooth extraction in older age groups. This is consistent with the findings of other investigators who found periodontal disease to be the cause of extraction in older age groups which probably reflects the changing trends of dental disease with aging.²⁰ Periodontal disease was also observed to be the important cause of tooth extraction in males in the present study. This may reflect the life style and oral hygiene practices among males in Kerala state, where the habit of smoking and the use of smokeless tobacco are highly prevalent.



In individuals below 15 years of age extraction for orthodontic purposes was the leading cause of tooth loss which is consistent with similar findings reported by other investigators.^{4,7-10,14} This trend may reflect the increasing number of patients seeking orthodontic treatment. In the present study, this observation may have also been influenced by the timing of the study which was conducted during the end of the academic year throughout the state when more students are likely to seek orthodontic treatment.

Of all the teeth extracted, the tooth mostly frequently extracted was the first premolar which was extracted mainly for orthodontic purpose. The next most frequently extracted teeth were the molars. The chief cause for the loss of molar teeth was dental caries while periodontal disease was the primary reason for loss of anterior teeth. This difference in the cause of loss of anterior and posterior teeth may be related to the morphology of the teeth. A greater proportion of mandibular anterior teeth were extracted due to periodontal disease compared to the maxillary anterior teeth. This may be due to mandibular anterior teeth being less susceptible to caries compared to maxillary anteriors.^{21,22}

Conclusion

In the present study, dental caries and periodontal disease together accounted for majority i.e. over 65% of the extractions which is in agreement other investigators as indicated previously. This emphasizes the need for public health programs with prevention and intervention strategies designed to better address the burden of caries and periodontal disease.

The female preponderance for tooth extraction calls for more attention in the areas of dental awareness and motivation of these vulnerable patients. However, there are certain limitations in interpreting the data. The present study has been conducted among patients attending an institution which may not be representative of the general population. Moreover, several studies have reported on the influence of other variables such as socio-economic factors on the patterns of tooth loss in various populations.^{23,24} India being a country with diverse socio-economic, life style, and dietary characteristics, the cause and pattern

of tooth loss may vary in different regions. Hence, further studies which account for the above mentioned factors need to be conducted among various groups to obtain a better understanding of the cause of tooth loss among the general population.

Clinical Significance

Data regarding the causes of tooth loss indirectly provides information on the pattern of oral health in a population. At present, very little data is available regarding the causes of loss of permanent teeth among the Indian population. Hence, the data generated from this study can be used for conducting similar studies in other regions of the country. Data generated from such studies would serve as a valuable reference for the design of public oral health policies for this nation's population.

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