Analysis of Tooth Extraction Causes and Patterns

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Abstract

PURPOSE: The purpose of this study was to investigate the causes and patterns of extraction of permanent teeth in the targeted population.

METHODS: The study was conducted for a period of 11 months. An especially designed form was used to record the causes for extraction of a permanent tooth. Further, it was analyzed for age, gender, education, occupation, smoking, tooth position, endodontic treatment, chewing, esthetics, needs replacement, type of existing prosthesis, and causes for extraction. The various causes which were considered to determine association with the tooth extraction were dental caries, periodontal problems, trauma, orthodontics, prosthodontic failures, endodontic failures, and others.

RESULTS: The percentage of extractions was almost the same in males and females aged. Maximum extractions were noticed in 36–45 years of age group (32.5%). The presence of caries was observed to be the main reason for extraction (68.1%), followed by periodontal problems (17.6%) and orthodontic problems (4.8%). The most frequently extracted posterior teeth were first mandibular molar (22.2%), followed by the third maxillary molar (15.2%).

CONCLUSION: Dental caries was found to be the most common reason for the extraction of teeth. Molar teeth were found to be the most frequently extracted, with an increased number of extracted first premolars as a result of orthodontic treatment. Maxillary teeth are extracted more than mandibular, mainly due to caries and periodontal problems.

Introduction

Tooth extraction is one of the major treatment modalities provided worldwide in dentistry. Even though the advancement in preventive and conservative dentistry teeth extraction percentage has come down, but still, there are various reasons which lead to the loss of teeth. These reasons may be caries, periodontal disease, endodontic failures, orthodontic treatment, trauma, and prosthetic procedures [1], [2], [3], [4], [5].

Earlier, most of the studies reported dental caries as a leading reason for teeth extraction, followed by periodontal disease [6]. However, due to public awareness, enhanced community outreach dentistry programs, and advances in preventive procedures, periodontal disease has become the main cause for extraction only in males aged 46–65 years. Mandibular anterior teeth were most extracted due to periodontal involvement [6]. Despite being preventable, dental caries and periodontal disease still remain the most common reason for tooth extraction, especially in developing nations [7], [8].

Every nation has its own oral health policies; these will be effective if the causes and patterns of

tooth loss are known. Dental caries and wisdom teeth extraction are the most common cause of the extraction in Nepal [9]. The percentage of teeth extracted for periodontal reasons and caries was about the same in Singapore [10]. Both caries and periodontal disease were shown to be the main reasons for tooth extraction in the North of Afghanistan [11] and in South Wales [2]. Molar teeth are the most commonly extracted teeth in Tanzania [4], and the third molar is the tooth most often extracted in western regions of Germany [3]. In Brazil, 70% of tooth extraction was found to be due to caries, while extraction because of periodontal disease accounted for only 15% [1].

Moreover, oral disease burden and its etiological factors exhibit inter- and intra-regional variations [12]. There are very few studies in the literature that state the causes and pattern of tooth loss in Saudi Arabia and those were reported almost more than 20 years [13] and the recent most study was conducted 6 years back in Riyadh [14], which is the capital of the country and sociodemographically, economically and literacy wise different from our area, Aseer province. Aseer region is located in the southwest of the country, and no such study was previously conducted here. This region of

Saudi Arabia was named after the Asīr tribe. It has an area of 76,693 km^2 and an estimated population of 1,913,392. The capital of the Aseer Region is Abha. Being one of the important regions of Saudi Arabia, it is important to assess oral health care in this population so as to decide proper policies for the establishment of oral health programs and understanding the various factors which cause tooth loss. Thus, the present study was planned to investigate the causes and patterns of extraction of permanent teeth in the targeted population. In addition, the reasons and patterns of tooth loss are important to understand its impact on the remaining dentition and oral function. It is also important to consider whether space needs to be restored or left as it is [15].

Materials and Methods

The current research was an observational cross-sectional type of study where the data were collected from the representative population at a specific time interval of 11 months from March 1, 2018, to February 2, 2019. All Saudi patients reported to the College of Dentistry, King Khalid University, during this period were considered understudy, patients reaching to the community outreach program camp of the college were also evaluated. In these, only the patients who needed permanent teeth extraction were included in the study, and this included extractions for orthodontic reasons too. Deciduous teeth extractions were excluded from this study. The chief researcher, along with the coresearchers, collected the data. The College of Dentistry of King Khalid University is one of the major dental centers of the region, with patients reaching from all most all of the province, thus giving the true representation of the population.

Ethical considerations

This study was conducted in compliance with the protocol; ethical approval was obtained from the Ethical Committee of King Khalid University, College of Dentistry (Ethical Approval Number – SRC/ETH/2018-19/144). The subjects participating in the present study provided their informed written consent by signing the consent form. Participation was on a voluntary basis, and there were no incentives. Data protection and anonymity were guaranteed.

The data were collected in a specially designed form in which the causes for extraction of a permanent tooth were recorded. The survey form consisted of three sections. The first section included data related to patient's details such as age, gender, education, occupation, and habits, for example, smoking. The second section was used to record the number of teeth

to be extracted, their positions, foreign direct investment nomenclature, and extraction causes. The causes used to describe the reason for extraction were – dental caries, periodontal problems, trauma, orthodontics, prosthodontic failures, endodontic failures, and others. The third section consisted of dentist opinion regarding extraction effect on chewing, esthetics, whether there is a need for replacement and recording of type of existing prosthesis in patient if any. Data were collected analyzed descriptively using Statistical Package for the Social Sciences version 20 software (SPSS Inc., Chicago, IL, USA), and a comparison of different factors was done using the Chi-square test.

Results

A total of 1511 teeth were extracted in 563 patients (288 males and 275 females) during the period of study. The numbers and percentages of patients undergone for extractions of teeth according to age group, education, occupation, and smoking habit are presented in Table 1.

Table 1: Distribution of patients undergone for extractions according to age, education, occupation, and smoking

Factors	n	%
Age		
16–25 years	63	11.2
26–35 years	159	28.2
36–45 years	183	32.5
46–55 years	109	19.4
56–65 years	38	6.7
>65 years	11	2.0
Total	563	100.0
Education		
Primary school	101	17.9
Prep. School	104	18.5
Secondary school	153	27.2
University student	154	27.4
Graduate	34	6.0
Postgraduate	17	3.0
Total	563	100.0
Occupation		
Housewife	76	13.5
Retired	167	29.7
Manual labor	56	9.9
Office clerk	61	10.8
Engineer	32	5.7
Medical Field	51	9.1
Military	19	3.4
Sales/Trade	31	5.5
Student	70	12.4
Total	563	100.0
Smoking		
Yes	153	27.2
No	410	72.8
Total	563	100.0

Among the study population, the majority of the extractions were belonging to the age group of 36–45 years (32.5%) and 26–35 years (28.2%), education level of either university level (27.4%) or secondary level (27.2%), retired people (29.7%), followed by the housewives (13.5%) and nonsmokers (72.8%).

The pattern of distribution of teeth extraction among jaws was 15.5% in maxillary, 14.9% in

mandibular, and 69.6% in both jaws. Out of 1511, teeth extracted 470 were endodontically treated teeth. Dental caries (68.1%) was the main cause of extraction among the study population, followed by periodontal problems (17.6%) and orthodontic extractions (Graph 1).
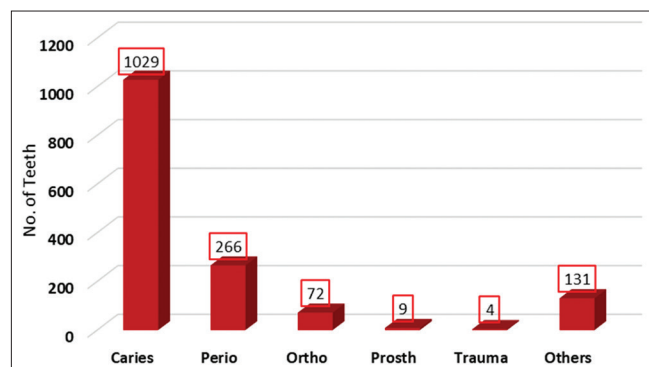
Graph 1: Distribution of extracted teeth according to the reason of extraction

It was noted that almost 70% of the teeth those were extracted were not associated with any prosthesis. In Table 2, dentists opinion after extraction regarding chewing, esthetics, and need for replacement is shown. Out of total teeth extracted, 86.8% and 35.1% would hamper chewing and aesthetics in patients, respectively, and 89.1% would require replacement by the prosthesis.

Table 2: Dentists opinion after extraction regarding chewing, esthetics, and need for replacement

Factors	n	%
Chewing		
Acceptable	200	13.2
Not acceptable	1311	86.8
Total	1511	100.0
Esthetics		
Acceptable	981	64.9
Not acceptable	530	35.1
Total	1511	100.0
Need for replacement		
No	1346	89.1
Yes	165	10.9
Total	1511	100.0

The teeth extraction causes association with gender was statistically insignificant (p = 0.299), but with age group (p = 0.042), education (p = 0.007), and occupation (p = 0.010), it was found to be significant. Dental caries was the major reason for tooth extraction in patients younger than 45 years of age, education secondary school (80.4%) or below and in housewives (85.5%), and retired subjects (80.2%). The proportion of teeth extracted for periodontal problems increased with increasing age, constituting over 18.2% of the rationale for tooth extraction in the patients aged 61 years and above. Trauma and impaction as reasons for extraction were observed more commonly among patients in the younger age groups. Smoking was found to be highly associated with teeth extraction causes (p = 0.003) (Table 3).

The highest percentage of extractions was observed in females in all teeth type. The most commonly extracted tooth type in all age groups was the molars (87.7%), followed by premolars (7.2%) and incisor teeth (4.6%) (Table 4).

The most frequently extracted posterior tooth was the first mandibular molar (22.2%) and tooth type showing that the lowest number of extractions was the maxillary lateral incisor (0.1%). Molars and premolars were extracted mainly because of dental caries (73.1% and 42.2%), the second important reason for premolar extraction was orthodontic treatment, followed by periodontal problems while in molars, it was periodontal problems (Table 5).

Discussion

Loss of tooth results not only in improper mastication but also causes psychosocial problems. The tooth loss reasons would be many, but the ultimate end result manifests the patient's attitude toward oral health. This may be effected by the his/her education, awareness, socioeconomic conditions, and availability of dental care in that geographical area. In our area, no such study was found that look into the causes and patterns of tooth extraction in the Saudi population of Aseer region.

The previous researches conducted with similar ethnic group showed that 62% of extractions of permanent and primary teeth in Saudi Arabia were due to caries, with periodontal disease being the main reason for extraction in patients over 40 years of age [13] and a study in Riyadh showed that the percentage of teeth extracted due to caries was 50.2%, with more extractions in females compared with males [14].

A recent observational study [16] investigating tooth extraction in dental practice in the UK pointed out that the most common reasons for extractions were periodontal disease and periapical infection, followed by tooth-root and tooth-crown fractures. Perhaps the most significant finding in this UK study, especially when compared with the previous studies [17], [18], was that virtually no teeth were extracted as the result of active caries. This showed the importance of preventive measures and public awareness programs in that area, which had resulted in low caries risk in the population and reduced caries progression.

In the present study, among the study population, the most common reason of teeth extraction was dental caries in 68.1% cases and the second most common reason was periodontal problems in 17.6% cases, similar to the previous studies [13], [14] in other parts of Saudi Arabia. In all most all age groups, the extractions due to dental caries topped the chart, the reason may be dry climatic conditions, less, and/or improper use of oral hygiene measures. Even though many government and private oral health-care centers are existing, but there is a need for educating and motivating people toward oral hygiene maintenance.

Table 3: Associations with the patient (gender, age, education, occupation, and smoking) with teeth extraction causes

Factors	Caries		Perio		Ortho		Prosth		Trauma		Others		Chi-square	p-value
	n	%	n	%	n	%	n	%	n	%	n	%		
Gender														
Male	216	75.0	27	9.4	7	2.4	0	0.0	2	0.7	36	12.5	6.07	0.299
Female	217	78.9	26	9.5	8	2.9	2	0.7	1	0.4	21	7.6		
Age														
16–25 years	45	71.4	3	4.8	1	1.6	0	0.0	0	0.0	14	22.2	38.47	0.042
26–35 years	120	75.5	17	10.7	2	1.3	0	0.0	1	0.6	19	11.9		
36–45 years	141	77.0	15	8.2	6	3.3	0	0.0	2	1.1	19	10.4		
46–55 years	90	82.6	11	10.1	3	2.8	1	0.9	0	0.0	4	3.7		
56–65 years	29	76.3	5	13.2	3	7.9	1	2.6	0	0.0	0	0.0		
>65 years	8	72.7	2	18.2	0	0.0	0	0.0	0	0.0	1	9.1		
Education														
Primary School	81	80.2	13	12.9	4	4.0	1	1.0	1	1.0	1	1.0	45.52	0.007
Prep. School	77	74.0	7	6.7	3	2.9	1	1.0	0	0.0	16	15.4		
Secondary School	123	80.4	13	8.5	7	4.6	0	0.0	2	1.3	8	5.2		
University Student	118	76.6	10	6.5	1	0.6	0	0.0	0	0.0	25	16.2		
Graduate	22	64.7	7	20.6	0	0.0	0	0.0	0	0.0	5	14.7		
Postgraduate	12	70.6	3	17.6	0	0.0	0	0.0	0	0.0	2	11.8		
Occupation														
Housewife	65	85.5	5	6.6	1	1.3	1	1.3	1	1.3	3	3.9	63.53	0.010
Retired	134	80.2	16	9.6	6	3.6	1	0.6	0	0.0	10	6.0		
Manual Labor	30	53.6	11	19.6	3	5.4	0	0.0	2	3.6	10	17.9		
Office Clerk	48	78.7	3	4.9	4	6.6	0	0.0	0	0.0	6	9.8		
Engineer	21	65.6	7	21.9	0	0.0	0	0.0	0	0.0	4	12.5		
Medical Field	42	82.4	3	5.9	0	0.0	0	0.0	0	0.0	6	11.8		
Military	16	84.2	1	5.3	0	0.0	0	0.0	0	0.0	2	10.5		
Sales/Trade	20	64.5	4	12.9	1	3.2	0	0.0	0	0.0	6	19.4		
Student	57	81.4	3	4.3	0	0.0	0	0.0	0	0.0	10	14.3		
Smoking														
No	330	80.5	38	9.3	7	1.7	2	0.5	2	0.5	31	7.6	18.33	0.003
Yes	103	67.3	15	9.8	8	5.2	0	0.0	1	0.7	26	17.0		

It was determined that the extraction percentages due to periodontal problems were more in aged population, above 55 years and increases with the increased age, while extractions due to orthodontics problems were more in younger population similar to the various previous studies [10], [18], [19].

Table 4: Distribution of tooth extraction according to tooth type

Tooth type	n	%
Incisor	68	4.5
Canine	9	0.6
Pre-molar	109	7.2
Molar	1325	87.7
Total	1511	100.0

One of the important reasons for this finding might be the old traditional way of maintaining oral hygiene, in the study population, by Miswak stick in the aged population, especially in rural and sub-urban areas. Eid _et al_. [20] examined the influence of Miswak on gingival health and periodontal health.

Table 5: Association of the reason for tooth extraction with extracted tooth type

Reason	Incisor		Canine		Pre-molar		Molar		Chi-square	p-value
	n	%	n	%	n	%	n	%		
Caries	8	11.8	7	77.8	46	42.2	968	73.1	558.59	<0.001
Perio	57	83.8	2	22.2	19	17.4	188	14.2		
Ortho	1	1.5	0	0.0	42	38.5	29	2.2		
Prosth	0	0.0	0	0.0	0	0.0	9	0.7		
Trauma	2	2.9	0	0.0	2	1.8	0	0.0		
Others	0	0.0	0	0.0	0	0.0	131	9.9		

The authors reported the use of Miswak is a possible factor to gingival recession and may influence the periodontal health. Agrawal _et al_. [21] demonstrated that Miswak users exhibited good oral hygiene and a favorable gingival index score, but they also had higher gingival recession scores, which may influence their periodontal health. With the advancement of general health care services, the life expectancies of Saudi population are increasing. However, the importance of prevention of oral problems in elderly population cannot be understated. This group is at an increased risk of oral disease due to factors such as inadequate nutrition, decreased dexterity, reduced immunity, the aggregate medical and dental disease, and inability to maintain their oral hygiene [22].

In our study, extractions in younger age group due to orthodontic reasons and impaction were next to dental caries, which were comparable to the study conducted in Jordan and could be associated with the increased understanding of the various treatment modalities in dentistry and enhanced demand of aesthetics in the society [23]. Gender specifications showed statistically no difference in the extractions for orthodontics purpose between them, indicating that both males and females are high demanding in esthetics. Trauma was the least common reason for teeth extractions; the majority of extractions done due to trauma were mainly seen in pre-school or secondary school going young population. Remarkably, trauma was not noted as a cause of extraction in the aged population at all. This may be due to matured behavior with age, sedentary lifestyle, and less involvement in exploiting activities [24].

In contrast to some previous studies, in our study, the maxillary teeth were more often extracted than mandibular teeth, although other studies observed that maxillary teeth were more often extracted [25], [26], [27], [28]. In the present study, the most common tooth extraction was of first molar 37.1%, followed by third and second molars 25.5% and 25.1%, respectively, then premolars 7.6%. The reasons may be the posterior location of these teeth, less visible, and also inaccessible to the patient for maintenance, along with that these are often more challenging and costly to restore and are esthetically unimportant. Many earlier studies had also reported a similar finding [6], [13].

Molars were reported to be extracted mainly due to caries (73.1%), periodontal (14.2%), and others

such as impaction problems (9.9%). The anterior teeth extraction was mainly due to periodontal disease (83.8%) which may be due to improper and excessive use of Miswak.

The most frequently extracted tooth was the first mandibular molar (22.2%), followed by the third maxillary molar (15.2%). The majority of extractions of third molars occurred in the age group of 21–30 years (48.2%), while most of the extracted first premolars (58%) occurred in the age group of 10–20 years.

Other reasons for extraction observed in this study include failed root canal therapy, impactions, fracture, and supernumerary teeth. Although these accounted for a comparatively small proportion of the cases seen, the percentages observed are comparable to the previous study in Saudi Arabia [14].

Overall, the results of such study are useful in determining the efficacy of oral health-care programs in that area furthermore it provides the guideline for the establishment of dental health policies in the area. In addition, the causes and patterns of teeth extraction in Aseer region population have provided insight of oral health status of the population in this area and showed that there is a need to enhance curative and preventive dental care in the population.

Even though dental caries remained the main cause of tooth extraction, but there is a continuous reduction of percentages in recent years [10], [17], [18]. This is due to advanced preventive care programs worldwide. It can be further reduced only by increased education and awareness programs in the society.

Conclusion

It can be concluded from the results of the study that dental caries and periodontal problems are the main reasons for tooth extraction in the population of Aseer region of Saudi Arabia. Molars are extracted most frequently than any other teeth. Maxillary teeth are extracted more than mandibular mainly due to caries and periodontal problems, respectively. Overall, there is a need for implementation of preventive dental health-care programs and enhancement of public awareness about oral health, which will reduce the extractions due to dental diseases in the future.

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