Reasons for Tooth Extraction in Kuwait

Khalaf F. Al-Shammari a Jassem M. Al-Ansari b Manal Abu Al-Melh a
Areej K. Al-Khabbaz c

 a Faculty of Dentistry, Kuwait University, Jabiya, b College of Health Sciences, Shuwaikh, and
 c Ministry of Health, Salmiyah, Kuwait

Introduction

Although edentulism has been reported to be on the decline in many developed countries [1–3], tooth loss continues to be a major public health problem worldwide [4]. Extraction of permanent teeth is performed for several reasons, including caries, periodontal disease, orthodontic treatment, traumatic injuries, prosthetic indications, and tooth impaction [5]. However, caries and periodontal disease have consistently been shown as the two main reasons for tooth loss [6–9].

The historically prevailing view that caries was responsible for the majority of tooth loss in younger patients while periodontal disease was the principal cause of tooth loss in adults [6, 10] has been repeatedly challenged by the results of several studies implicating caries and its consequences as the main reason for tooth loss in all age groups [11–14]. Surveys of the reasons for tooth loss in different countries have been undertaken and have produced some controversy regarding whether caries or periodontal disease was the dominant reason for tooth loss and whether age differences existed in patterns of tooth loss. The majority of studies have reported caries to be the main reason for overall tooth loss [7, 11, 13, 15]. Some studies reported that periodontal disease was the main reason [16–19], while others found that caries and periodontal disease were equally responsible [20, 21]. Furthermore, although the majority of these studies reported periodontal disease to account for the majority of tooth extractions in older patients [7, 17–19, 22], some reported caries as the main reason for tooth loss in all ages [8, 12, 13].
Assessment of tooth mortality data in different parts of the world is essential for evaluating the adequacy of dental care and preventive oral health programs [23]. Additionally, understanding the relative contributions of the two major oral diseases, caries and periodontal disease, to tooth loss rates should aid in the proper allocation of available dental resources aimed at reducing such rates. No data on the reasons for tooth extraction in Kuwait are available. Therefore, the aims of this study were to investigate the reasons for tooth extraction and to examine the association of age and gender with patterns of tooth loss in Kuwait.

Subjects and Methods

This was a cross-sectional, multi-center study of consecutive cases examining the reasons for tooth extraction in Kuwait. In the Kuwaiti health service system, patients seek primary medical and dental care in one of six health districts based on their area of residency. In an attempt to provide a sample representative of the entire country, 24 general dental practice centers (four centers from each of the six districts) were randomly selected for patient recruitment. Dentists in these centers were interviewed and informed of the objectives of the study and asked to participate. Those working in 21 of the 24 centers agreed to take part, a response rate of 87.5%. These 21 centers represented 25% of the 84 general practice dental centers in Kuwait. The study protocol was submitted for review by the Ethical Review Committee of the Faculty of Dentistry, Kuwait University prior to commencement of the project, and informed consent was obtained from all study participants.

The dentists were requested to complete a specially designed study form on every extraction they were to undertake within a 1-month period (July 2004). The study form documented the patient’s age, gender, and the reason for the performed extraction(s). The list of possible reasons for the extractions was modified from those used in previous studies [7, 8]. These reasons were caries, periodontal disease, orthodontic reasons, root fracture, failed endodontic therapy, tooth malposition, proesthetic or esthetic reasons, or patient refusal of alternative treatment (patient request). A space was also provided for listing other reasons of extraction not included in the study form. Third molar extractions were not included in this study, since indications for removal of third molars are generally different from those of other teeth [24]. Study forms were collected by the principal investigator at the end of the study period for each center.

Statistical Analysis

The main outcome variable was reason for tooth extraction. Study forms with duplicate, missing, or multiple answers were excluded, and only those with a clear indication of the reason for tooth loss were used in the analysis. Means and frequency distributions were calculated for all the background and outcome study variables. Associations of the categorical background variables (age range and gender) with reasons for tooth extraction were examined using $\chi^2$, while differences in the mean number of extracted teeth per patient by reason for extraction were examined with ANOVA. The significance level used was $p < 0.05$.

Results

A total of 2,783 teeth were extracted in 1,604 patients during the study period (mean extractions per patient = $1.73 \pm 0.07$ teeth). The distribution of patients and extracted teeth by age range and gender is presented in Table 1. Males comprised 53.5% of the sample, but had slightly fewer teeth extracted than females (50.2 vs. 49.8% of all extractions, respectively). The patients ranged in age from 12 to 83 years old, the largest proportion being between 31 to 40 years of age (29.9%). On average, older
patients lost more teeth than younger patients, as measured by the mean number of teeth lost per patient in each group (fig. 1). The highest tooth extraction rate per patient was seen in the 51- to 60-year age group (3.08 ± 0.36 teeth) and the >60-year age group (3.84 ± 0.72 teeth; p < 0.001).

Overall, caries was responsible for the extraction of 43.7% of the teeth, while periodontal reasons accounted for 37.4% of the extractions. Other reasons included patient request: 8.6%; orthodontic reasons: 4.3%; failed endodontic therapy: 2.7%; root fracture: 2.4%; and other reasons (preprosthetic, esthetics, tooth malposition, or unspecified reason: 0.9%. The reasons for extraction in different age ranges are listed in table 2. Caries was the principal cause for tooth extraction in various age groups; 12–20: 52.9%; 21–30: 70.0%; and 31–40: 61.1%. On the other hand, periodontal disease was the most common reason for extraction in all age groups over 40 years of age, 41–50: 45.1%; 51–60: 66.6%; >60: 77.5%. In ≤40-year-old patients, caries and periodontal disease accounted for 60.7 and 19.9% of extractions, respectively, while in >40-year-old patients, the corresponding percentages were 63.0% for periodontal disease and 23.0% for caries (p < 0.001).

Significant gender differences were also seen in the reasons for tooth extraction (table 3). Females lost more teeth due to caries or orthodontic reasons, while males had more teeth extracted due to periodontal disease (p < 0.001). Additionally, more teeth per patient were lost due to periodontal disease (2.47 ± 0.21 teeth) than all other causes (p < 0.001; fig. 2).

The frequency of extraction of different tooth types is presented in figure 3. The most commonly extracted

<p>| Table 2. Reasons for tooth extraction by age range |</p>
<table>
<thead>
<tr>
<th>Age range years</th>
<th>Caries</th>
<th>Periodontal disease</th>
<th>Orthodontic reasons</th>
<th>Root fracture</th>
<th>Failed RCT</th>
<th>Patient request</th>
<th>Other reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>12–20 (n = 223)</td>
<td>118 (52.9)</td>
<td>2 (0.9)</td>
<td>88 (39.5)</td>
<td>1 (0.4)</td>
<td>5 (2.2)</td>
<td>7 (3.2)</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>21–30 (n = 506)</td>
<td>354 (70.0)</td>
<td>31 (6.1)</td>
<td>22 (4.3)</td>
<td>22 (4.3)</td>
<td>15 (3.0)</td>
<td>55 (10.9)</td>
<td>7 (1.4)</td>
</tr>
<tr>
<td>31–40 (n = 633)</td>
<td>387 (61.1)</td>
<td>131 (20.7)</td>
<td>9 (1.4)</td>
<td>31 (4.9)</td>
<td>35 (5.6)</td>
<td>33 (5.2)</td>
<td>7 (1.1)</td>
</tr>
<tr>
<td>41–50 (n = 495)</td>
<td>180 (36.4)</td>
<td>223 (45.1)</td>
<td>0</td>
<td>7 (1.4)</td>
<td>21 (4.2)</td>
<td>60 (12.1)</td>
<td>4 (0.8)</td>
</tr>
<tr>
<td>51–60 (n = 592)</td>
<td>118 (19.9)</td>
<td>394 (66.6)</td>
<td>0</td>
<td>3 (0.5)</td>
<td>0</td>
<td>75 (12.7)</td>
<td>2 (0.3)</td>
</tr>
<tr>
<td>≥61 (n = 334)</td>
<td>60 (18.0)</td>
<td>259 (77.5)</td>
<td>0</td>
<td>3 (0.9)</td>
<td>0</td>
<td>9 (2.7)</td>
<td>3 (0.9)</td>
</tr>
<tr>
<td>Total (n = 2,783)</td>
<td>1,217 (43.7)</td>
<td>1,040 (37.4)</td>
<td>119 (4.3)</td>
<td>67 (2.4)</td>
<td>76 (2.7)</td>
<td>239 (8.6)</td>
<td>25 (0.9)</td>
</tr>
</tbody>
</table>

Figures in parentheses indicate percentages. Other reasons: preprosthetic, esthetic reasons, tooth malposition, or unspecified reason. 1 The most common reason for extraction within the age group (χ² test; p < 0.01).

<p>| Table 3. Reasons for tooth extraction by gender |</p>
<table>
<thead>
<tr>
<th>Reason</th>
<th>Males</th>
<th>Females</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries</td>
<td>563 (40.6)</td>
<td>654 (46.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Periodontal disease</td>
<td>575 (41.5)</td>
<td>465 (33.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Orthodontic reasons</td>
<td>40 (2.9)</td>
<td>79 (5.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Other reasons</td>
<td>208 (15.0)</td>
<td>199 (14.2)</td>
<td>NS</td>
</tr>
</tbody>
</table>

Figures in parentheses indicate percentages. Other reasons: root fracture, failed RCT, patient request, preprosthetic, esthetic reasons, tooth malposition, or unspecified reason.
1 χ² test.
teeth were the mandibular and maxillary first molars (17.9 and 13.3% of all teeth, respectively), while mandibular canines were extracted least commonly (2.1%). Significant differences in the reasons for extraction of the different tooth types were present (table 4). Molars and maxillary premolars were more commonly extracted due to caries, while mandibular premolars and maxillary and mandibular anterior teeth (canines and incisors) were more commonly extracted due to periodontal disease ($p < 0.001$).

Discussion

The results of this study indicate that caries and periodontal disease are the main causes of tooth extractions performed in general dental practice centers in Kuwait. This finding is consistent with reports in other countries. The finding that caries was the most common reason for tooth loss overall (43.7%) is in agreement with the majority of similar studies [7, 13, 22, 25–27]. While periodontal disease accounted for 37.4% of all tooth extractions, it was found to be increasingly more common in older age groups. It was also observed that significantly different patterns of tooth loss were seen when patients were stratified by age range $\leq$ or >40 years. While being responsible for only 11.9% of extractions in patients 40 years of age or younger, periodontal disease accounted for 63% of extractions in those older than 40 years old. Other reasons, including failed root canal treatment, were responsible for a smaller proportion of extractions, especially in older patients. This is likely due to the selection of periodontal disease as the primary reason for extraction in older patients even when other conditions (such as failed RCT) co-exist. These findings are in agreement with most tooth loss studies that have reported increasing prevalence of extractions due to periodontal disease in patients older than 40 years [7, 16–19, 22, 26, 27], yet dif-
fer from other reports of caries being the primary reason for tooth loss even in older age cohorts [8, 12, 13, 25]. These differences may be due to variations in study designs or overrepresentation of certain age ranges or tooth types that may have affected the samples studied, or to differences in practice patterns and attitudes towards the retention of teeth by both patients and dental care providers [17]. They may also be related to differences in susceptibility to periodontal disease, since risk assessment studies have suggested increased genetic susceptibility to destructive forms of periodontal disease in certain ethnic groups [28, 29]. These differences also highlight the difficulties of comparing tooth loss studies due to the differing methodologies and populations studied, necessitating caution in the interpretation of such comparisons [27].

Significant gender differences were also noted in this study. While extractions for caries and orthodontic reasons were more common in females, extractions for periodontal disease were more common in males, which is in agreement with previous investigations [30, 31]. Male gender has been reported as a risk indicator for periodontal disease severity [32]. This study also indicates that more teeth per patient are lost to periodontal disease than for any other reason. This confirms previous findings that although it may be responsible for tooth loss in fewer patients, periodontal disease is responsible for the loss of more teeth than any other cause [18].

Regarding tooth types, molars and maxillary premolars were more commonly extracted due to caries, while mandibular premolars, and maxillary and mandibular anterior teeth were more commonly extracted due to periodontal disease. These findings have been reported previously [7, 9, 17]. A possible explanation that has been proposed for this pattern is that since lower anterior teeth are less susceptible to caries than other teeth, they are more likely to remain in the dentition in older patients where periodontal disease becomes the more common reason for extraction [33, 34]. Extractions for orthodontic reasons were more common in mandibular and maxillary premolars, which is also in agreement with previous findings [7, 35].

**Conclusion**

The results of this study indicate that caries and periodontal disease are the main reasons for tooth extraction in Kuwait. Caries is the dominant reason for extractions in younger patients, while periodontal disease accounts for the majority of tooth extractions in patients older than 40 years. Furthermore, this study indicates that more teeth per patient are lost to periodontal disease than for any other reason.
References

25. Al-Shammari / Al-Ansari / Al-Melh / Al-Khabbaz

422