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# Frequency and distribution of early tooth loss and endodontic treatment needs of permanent first molars in a Turkish pediatric population

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## ABSTRACT

**Objectives:** The objective of this study is to evaluate the frequency and distribution of early tooth loss and endodontic treatment needs of permanent first molars in a Turkish pediatric population. **Materials and Methods:** A total of 7,895 panoramic radiographs taken for routine dental examination at the Department of Oral Maxillofacial Radiology between 2008 and 2012 years were investigated. Two independent specialists evaluated early tooth loss and endodontic treatment needs of permanent first molars using panoramic radiography and patient anamnesis forms. The teeth were classified according to the following data: (a) Missing teeth, (b) teeth requiring extraction, (c) endodontically treated teeth (ETT), (d) teeth requiring endodontic therapy. The data also classified according to four factors: Age group (6-12 and 13-16), gender (boy and girl), jaw (mandible and maxilla) and side (right and left). A Chi-square test was used for statistical analyses. **Results:** A total of 19,488 and 12,092 teeth were evaluated in the child group and adolescent group respectively. All data were higher in adolescents than children ($P < 0.001$). For gender factor, only ETT was higher in girls than it was in boys ($P < 0.001$). For the jaw factor, all data were higher ($P < 0.001$) in mandible than in the maxilla. For the side factor, no statistical difference existed between right and left. **Conclusions:** Early tooth loss and endodontic treatment needs of permanent first molars showed variability according to age groups and jaws. When the results were compared according to the side and gender factors, no statistical difference was found ($P > 0.05$) except with the data of ETT in gender groups.

**Key words:** Age, endodontic, gender, tooth loss

## INTRODUCTION

Despite the significant improvements that have been made in oral health, tooth loss remains a dental public health problem.[1] Tooth loss is the basic indicator of failure or success in the dental community health programs. The main purpose of these programs is to prevent tooth loss due to incurable caries or periodontal problems.[2]

It is commonly known that having healthy teeth affects oral health. In developing countries, dental caries remains one of the most prevalent health problems, especially in children. Tooth loss reduces one's quality-of-life due to reduced aesthetics, speaking ability and chewing ability.[3] Recently, some researchers have focused on the effect of early tooth loss on human life and found that tooth loss was associated with premature mortality in ancient times.[4]

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Tooth extraction can be performed for various reasons. However, the most common reasons for tooth extractions are dental caries, periodontal disease, impacted teeth, orthodontic treatment and prosthetic purposes.[4] Different data relations that point to the most common reasons for tooth extraction are present in previous studies. Some of these studies suggested that periodontal diseases are the most common reason for tooth extraction,[5,6] while others reported that deep carious lesions are highly linked with tooth extraction.[7-9] Based on these studies, one can conclude that while teeth extractions generally occur in older adults due to advanced periodontal diseases, they generally occur in adolescents and children due to incurable caries.[9] Therefore, early tooth loss in pediatric patients may be reduced by inhibiting these deep carious lesions.

Similarly, the high availability of endodontically treated teeth (ETT) and teeth requiring endodontic therapy (TRET) as a result of deep caries is also a dental community problem.[10] The health-care system of a place indeed may influence the endodontic status of there. Several factors may affect the fate of the dental pulp: One of the most important factors is the caries disease that stems from microorganisms, which may result in pulp infection that necessitates endodontic treatment.[11] However, children especially may not tolerate endodontic treatment. Furthermore, endodontic treatment has some risk factors such as flare-ups, perforations and the fracture of an instrument in the root canal and anatomical failures.[12-14] Thus, early prevention of caries lesions may reduce endodontic treatment needs.

A large number of epidemiological studies evaluate the Frequency of ETT[15-17] and tooth loss[5-8] in different populations. These studies especially were performed in the adults and elderly population. Eriksen and Bjertness.[15] have emphasized that the purposes of the few epidemiological studies were the adjustment of preventive and clinical procedures and the determination of endodontic treatment status. Furthermore, endodontic epidemiology is required to provide a general picture of endodontic disease, its treatment and the treatment outcome in different societies. In Turkey, no epidemiological studies of endodontic status have been published. Similarly, some investigators[18,19] focused on tooth loss in recent decades, but did not provide detailed information about early loss of permanent first molars in children and adolescents.

The purpose of the present study was to evaluate the frequency and distribution of early missing as well as the endodontic status of permanent first molars based on age, gender, jaw and side factors in a Turkish pediatric population.

## MATERIALS AND METHODS

This cross-sectional study was conducted in the Cappadocia region of Turkey and featured a total of 7,895 patients (3,752 boys and 4,143 girls) ages 6-16 years. Panoramic radiographs taken routinely and anamnesis forms were obtained from the archive of Erciyes University, Faculty of Dentistry, Department of Oral and Maxillofacial Radiology between August 2008 and December 2012. The scientific committee of the dental faculty approved the study and patient anonymity was strictly respected.

Panoramic images were captured by a radiology assistant using a panoramic system (Orthopantomography® OP100, Tuusula, Finland). Two independent Endodontists with more than 5 years of experience evaluated the digital radiographs. Before this study, panoramic radiographs that were not included in the research were used to calibrate the two observations. Patients with edentulism due to a systemic disease were excluded from the study. The teeth with deep carious lesions (too close to the pulp), but no pain and mortality according to anamnesis forms were excluded from the study. In the present study, only first molar teeth were evaluated. The following information was recorded on the prepared form for each individual: The number and location of missing teeth (MT), teeth requiring extraction (TRE), TRET and root-filled teeth. The data collected were examined by jaw, gender, age and side. In the case of a disagreement, the third observers made the final decision.

Uncultivated data were analyzed using the Excel® 2007 (Microsoft Corporation, Redmond, WA, USA). The Chi-squire test was used to determine significant differences in terms of age, gender and location of the teeth for the following parameters: Number of MT, TRE, TRET and root-filled teeth.

## RESULTS

The results for all groups have been shown in Table 1. The total number of first permanent molars examined was 31,580. Of the 19488 teeth examined in children group, 122 (0.63%) were missing, 91 (0.47%) required extraction, 780 (4%) required endodontic therapy

and 91 (0.47%) ETT were found. Of the 12,092 teeth examined in the adolescent group, 501 (4.14%) were missing, 157 (1.30%) required extraction, 736 (6.09%) requiring endodontic therapy and 517 (4.28%) ETT were found. For all data, statistically significant differences existed between the child and adolescent groups ($P < 0.001$) [Table 1].

Of the 15008 teeth examined in the boys group, 276 (1.84%) were missing, 108 (0.72%) required extraction, 724 (4.82%) required endodontic therapy and 239 (1.59%) ETT were found. Of the 16,572 teeth examined in the girls group, 347 (2.09%) were missing, 140 (0.84%) required extraction, 792 (4.78%) required endodontic therapy and 369 (2.23%) ETT were found. A statistically significant difference ($P < 0.001$) was found for ETT data between the child and adolescent groups, but no statistically significant difference for other data was found between these two groups ($P > 0.05$) [Table 1].

A total of 15,790 teeth were examined in the maxilla as well and 185 (1.17%) were missing, 83 (0.53%) required extraction, 551 (3.49%) required endodontic therapy and 224 (1.42%) ETT were found. In the mandible, where the same number of teeth was examined, 438 (2.77%) were missing, 165 (1.04%) required extraction, 755 (4.78%) required endodontic therapy and 384 (2.43%) ETT were found. All data were statistically higher in the mandible than in maxilla ($P < 0.001$) [Table 1].

When data were assessed in terms of the side factor (right or left), 302 (1.91%) teeth were missing, 116 (0.73%) required extraction, 770 (4.88%) required endodontic therapy and 305 (1.93%) ETT were found. In left side, where the same number of teeth that was on right side were examined, (2.037%) were missing, 132 (0.73%) required extraction, 746 (4.72%) requiring endodontic therapy and 303 (1.92%) ETT were found. No statistically significant difference between right and left were found ($P > 0.05$) [Table 1].

Table 2 shows MT, TRE, ETT and TRET data in each age separately. For all data while 15-16-year-old patients showed the highest results, 12-year-old patients had the lowest results, except for the results dealing with TRET and TRE in adolescents. TRET was higher in 13-14 year-old patients and TRE was too close to each other in groups 12, 13 and 14. In addition, for all data while 10-11-year-old patients showed the highest results and 6-7-year-old patients had the lowest results in the child group.

Table 3 shows MT, TRE, ETT and TRET data according to the side and jaw. While MT, TRE and ETT data were highest in the left mandible, TRET was highest in the right mandible in adolescents. In contrast while MT, TRE and ETT data were highest in the right mandible, TRET was highest in the left mandible in children.

## DISCUSSION

Tooth loss and endodontic therapy need are major public health problems in many developing countries.[1,20] Consequently, many epidemiologic studies address these subjects in different countries.[5-8,15-17] The present study provides cross-sectional research on early loss of and endodontic status of permanent first molars in a Turkish pediatric population. This study was the first comprehensive study to assess both early

**Table 1: The results according to age, gender, jaw and side**

| Categories | Endodontically treated teeth | | Teeth requiring endodontic therapy | | Missing teeth | | Teeth requiring extraction | |
|---|---|---|---|---|---|---|---|---|
| | *n* (%) | *P* | *n* (%) | *P* | *n* (%) | *P* | *n* (%) | *P* |
| Age | | | | | | | | |
| Child (*N*=19488) | 91 (0.47) | 0.000 | 780 (4.00) | 0.000 | 122 (0.63) | 0.000 | 91 (0.47) | 0.000 |
| Adolescent (*N*=12092) | 517 (4.28) | | 736 (6.09) | | 501 (4.14) | | 157 (1.30) | |
| Gender | | | | | | | | |
| Boys (*N*=15008) | 239 (1.59) | 0.000 | 724 (4.82) | 0.852 | 276 (1.84) | 0.104 | 108 (0.72) | 0.208 |
| Girls (*N*=16572) | 369 (2.23) | | 792 (4.78) | | 347 (2.09) | | 140 (0.84) | |
| Jaw | | | | | | | | |
| Maxilla (*N*=15790) | 224 (1.42) | 0.000 | 551 (3.49) | 0.000 | 185 (1.17) | 0.000 | 83 (0.53) | 0.000 |
| Mandible (*N*=15790) | 384 (2.43) | | 755 (4.78) | | 438 (2.77) | | 165 (1.04) | |
| Side | | | | | | | | |
| Right (*N*=15790) | 305 (1.93) | 0.935 | 770 (4.88) | 0.528 | 302 (1.91) | 0.442 | 116 (0.73) | 0.308 |
| Left (*N*=15790) | 303 (1.92) | | 746 (4.72) | | 321 (2.03) | | 132 (0.73) | |

*N*: Total number of teeth examined

**Table 2: The data according to ages. Each column were evaluated within itself separately as adolescent and child**

| Age | *N** | Endodontically treated teeth | Teeth requiring endodontic therapy | Missing teeth | Teeth requiring extraction |
|---|---|---|---|---|---|
| | | *n* (%) | *n* (%) | *n* (%) | *n* (%) |
| Adolescent | | | | | |
| 16 | 2,016 | 106 (5.26)[a,b] | 150 (7.44)[a,b] | 118 (5.85)[a] | 45 (2.23)[a] |
| 15 | 2,144 | 150 (7.00)[b] | 204 (9.51)[b] | 140 (6.53)[a] | 25 (1.17)[a,b] |
| 14 | 2,116 | 88 (4.16)[a] | 98 (4.63)[c,d] | 81 (3.83)[b] | 21 (0.99)[b] |
| 13 | 2,748 | 101 (3.68)[a] | 111 (4.04)[d] | 94 (3.42)[b,c] | 31 (1.13)[b] |
| 12 | 3,068 | 72 (2.35)[c] | 173 (5.64)[a,c] | 68 (2.22)[c] | 35 (1.14)[b] |
| Child | | | | | |
| 11 | 3,332 | 35 (1.05)[a] | 175 (5.25)[a] | 53 (1.59)[a] | 33 (0.99)[a] |
| 10 | 4,084 | 28 (0.69)[a] | 209 (5.12)[a] | 50 (1.22)[a] | 36 (0.88)[a] |
| 9 | 4,020 | 22 (0.55)[a] | 179 (4.45)[a] | 16 (0.40)[b] | 15 (0.37)[b] |
| 8 | 3,760 | 5 (0.13)[b] | 162 (4.31)[a] | 3 (0.08)[c] | 5 (0.13)[b] |
| 7 | 2,752 | 1 (0.04)[b] | 45 (1.64)[b] | 0[c] | 1 (0.04)[b] |
| 6 | 1,540 | 0[b] | 10 (0.65)[b] | 0[c] | 2 (0.13)[b] |

*Total number of teeth examined. Means followed by the same letter did not differ statistically

**Table 3: The data according to side and jaw. Each column were evaluated within itself separately as adolescent and child**

| Tooth | *N** | Endodontically treated teeth | Teeth requiring endodontic therapy | Missing teeth | Teeth requiring extraction |
|---|---|---|---|---|---|
| | | *n* (%) | *n* (%) | *n* (%) | *n* (%) |
| Adolescent | | | | | |
| Right maxilla | 3,023 | 95 (3.14)[a] | 164 (5.43)[a,b] | 80 (2.65)[a] | 26 (0.86)[a] |
| Left maxilla | 3,023 | 96 (3.18)[a] | 140 (4.63)[b] | 71 (2.35)[a] | 32 (1.06)[a,b] |
| Left mandible | 3,023 | 168 (5.56)[b] | 199 (6.58)[a,c] | 196 (6.48)[b] | 55 (1.82)[b] |
| Right mandible | 3,023 | 158 (5.23)[b] | 233 (7.71)[c] | 157 (5.19)[b] | 44 (1.46)[a,b] |
| Chıld | | | | | |
| Right maxilla | 4,872 | 19 (0.39)[a,b] | 132 (2.71)[a] | 20 (0.41)[a]a | 11 (0.23)[a] |
| Left maxilla | 4,872 | 14 (0.29)[b] | 115 (2.36)[a] | 16 (0.33)[a] | 14 (0.29)[a,b] |
| Left mandible | 4,872 | 25 (0.51)[a,b] | 292 (5.99)[b] | 43 (0.88)[b] | 31 (0.64)[b,c] |
| Right mandible | 4,872 | 33 (0.68)[a] | 241 (4.95)[b] | 45 (0.92)[b] | 35 (0.72)[c] |

*Total number of teeth examined. Means followed by the same letter did not differ statistically

tooth loss and the endodontic status of the Turkish pediatric population and it included 31,580 teeth in 7,895 patients.

In the present study, panoramic radiographs and patient anamnesis forms that were already in the faculty archive were evaluated because examining these items was far easier than performing clinic examinations of this high number of patients. A periapical radiograph has a higher sensitivity than panoramic radiographs do for seeing pathologies and lesions,[21] but panoramic radiographs and anamnesis forms were adequate for the present study to see MT and determine whether a tooth had endodontic therapy. When a carious lesion is very close to the pulp, deciding on the presence of endodontic therapy is difficult looking only at the radiographs. In such situations, patient anamnesis forms were used for the final decision in this study.

In the present study, only first permanent molar teeth were examined because these teeth erupted first and were the only permanent teeth in individuals 6-12 years of age until eruption of the second permanent molars. For the standardization, the same type of tooth was examined in the 13-16-year-old adolescent group, too. The teeth were evaluated with regard to the number and percentage of MT, TRE, TRET and teeth treated endodontically.

According to the results of present study, the adolescent group had higher tooth loss than those of the child group. This is in agreement with a previous study that indicated that tooth loss increased with age.[1,7,22] Similarly, the TRE values were higher in the adolescent group than in the child group. George *et al*. performed an epidemiologic study among children and adults in a suburban area of Chennai.[23] It was observed that the percentage of tooth loss for groups of

6, 12 and 15 years was 5.7%, 22% and 28% respectively. In the present study; this data for permanent first molar was 0%, 2.22% and 6.53% respectively for the same age groups. This condition may be caused by differences of the health-care system of the countries. The percentage of permanent first molar loss among adolescents was 4.14%, which is relatively higher in comparison to study conducted in Brazil,[24] and Saudi Arabia.[25]

Gender may also influence tooth loss in a population. In a study, Al Shammary *et al*.[20] reported that females had 47.9% of tooth loss compared with 42,9 of males. These findings are similar to a study conducted in the South Brazilian elderly.[22] In contrast, the present study showed no statistically significant difference between males (1.84%) and females (2.09%). Al Shammary *et al*.[20] found that mean tooth loss for males and females was 2.6 and 2.9, respectively, which is lower than that of two studies conducted in Saudi Arabia[25] and Sri Lanka,[9] but higher compared with the present study. These differences may be due to elderly people's increasing the mean values of tooth loss because they had more MT than did children and adolescents. In the present study, only 6-16-year-old subjects who had few MT were evaluated.

In the literature, we could not found considerable results evaluating early tooth missing according to jaws and side in pediatric patients. Hand selection when tooth brushing may affect brushing ability of both right and left side. A patient using the right hand may more effectively brush left upper side than other parts of dental arch. Chewing habits may also affect tooth loss due to the formation of tooth caries. Mechanical cleaning effects of foods when chewing can effect formation of carious lesion. In the present study, we found that no significant difference existed between the right and left in terms of MT, TRE, ETT and TRET ($P > 0.05$). Al-Negrish[26] found that maxilla had higher ETT due to caries than mandible. In contrast, Su *et al*.[27] reported that there were more fillings due to caries in mandible than maxilla that is in agreement with present study. In the present study, we found that mandible had significantly higher values than maxilla ($P < 0.001$) in terms of MT, TRE, ETT and TRET. This may be due to different saliva effects or anatomical structures of different teeth.

In the present study, a statistically significant difference existed between adolescent and children in terms of both ETT and TRET. This situation is normal because the number of carious tooth increases with age progress.[28] In both adolescents and children, although the percentage of TRET was low, the percentage of ETT was high. This may be caused that patient neglect their routine dentist control appointment or they go to the dentist only when they had pain. This difference is higher in the 6-12 age child groups and this may be because they had fear of the dentist and needle.

The prevalence of a root-filled permanent first molar in a Turkish population studied here is similar to those of previous studies,[15,16,29,30] in which boys had significantly fewer ETT than girls ($P < 0.001$). This may be because the females have more esthetic concerns than males. However, no significant difference existed in terms of TRET ($P > 0.05$).

## CONCLUSION

Regarding the limitation of the present study, adolescents have higher values of MT, TRE, ETT and TRET than children. Gender can only affect the number of ETT. Furthermore, the mandible has higher values of MT, TRE, ETT and TRET than does the maxilla. No difference exists between the right and left side in terms of all data. Further clinical and radiological studies are necessary.

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