



## RESEARCH ARTICLE

### Evaluation of Tooth Extraction Indications of Patients Applying to Mersin University Faculty of Dentistry

### Mersin Üniversitesi Diş Hekimliği Fakültesi'ne Başvuran Hastaların Diş Çekim Nedenlerinin Değerlendirilmesi

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#### ABSTRACT

**Objective:** The aim of this study is to examine the main reasons for permanent and primary tooth extraction in patients who underwent tooth extraction at Mersin University, Faculty of Dentistry and its relationship with age, gender, education level and income level.

**Material and Methods:** This retrospective study included the records of 499 patients who underwent tooth extraction at Mersin University between January 2021 and March 2022. Demographic and clinical data were obtained through patient records and structured telephone interviews. Extraction indications were categorized into 13 groups: retained root, impacted tooth, mobility/periodontitis, root resorption, patient request, root caries, crown caries, non-functional third molar, failed root canal treatment, orthodontic treatment, tumor/cyst, prophylactic extraction, and other reasons. Statistical analysis was conducted using SPSS v23.0.

**Results:** In 499 patients (267 females, 232 male) with different ages, a total of 499 teeth were extracted. Crown caries was the most common reason for extraction (28.4%) followed by root resorption (20.6%), and periodontitis (10.6%). Extraction reasons were significantly associated with gender, education, income, residence, oral hygiene, and dental visit frequency ( $p < 0.05$ ). Periodontal-related extractions increased with age.

**Conclusion:** Crown caries, root resorption and periodontal disease were the main causes of tooth extractions. Socioeconomic status and behavioral factors such as poor oral hygiene influenced extraction patterns. To address disparities in oral health access, a well-structured care network should be established.

**Keywords:** Tooth extraction, indication, dental caries, periodontal disease, root resorption

#### ÖZET

**Amaç:** Bu çalışmanın amacı, Mersin Üniversitesi Diş Hekimliği Fakültesi'nde diş çekimi uygulanan hastalarda daimi ve süt dişi çekimlerinin başlıca nedenlerini incelemek ve bu nedenlerin yaş, cinsiyet, eğitim düzeyi ve gelir durumu ile olan ilişkisini değerlendirmektir.

**Gereç ve Yöntem:** Ocak 2021 ile Mart 2022 tarihleri arasında Mersin Üniversitesi, Ağız, Diş ve Çene Cerrahisi Anabilim Dalı'nda diş çekimi uygulanan 499 hastanın kayıtları retrospektif olarak incelenmiştir. Hastaların demografik ve klinik verileri hasta dosyalarından ve yapılan telefon görüşmelerinden elde edilmiştir. Diş çekim endikasyonları; kalmış kök, gömülü diş, mobilite/ periodontal hastalık, kök rezorpsiyonu, hasta isteği, kök ve kron çürüğü, antagonisti olmayan 3. molar, başarısız kanal tedavisi, ortodontik nedenler, tümör ve kist gibi patoloji ile ilişki, profilaktik çekim ve diğer nedenler olarak sınıflandırılmıştır. Veriler istatistiksel olarak analiz edilmiştir.

**Bulgular:** Çalışmaya dahil edilen 499 hastadan 267'si kadın, 232'si erkektir. En sık diş çekim nedeni %28,4 ile kron çürüğü olarak saptanmış; bunu %20,6 ile kök rezorpsiyonu ve %10,6 ile periodontal hastalıklar takip etmiştir. Diş çekim nedenleri ile cinsiyet, eğitim, gelir durumu, yaşanılan yer, ağız hijyeni alışkanlıkları ve diş hekimine başvuru sıklığı arasında istatistiksel olarak anlamlı ilişki bulunmuştur ( $p < 0,05$ ). Periodontal nedenlere bağlı çekimlerin yaşla birlikte arttığı gözlemlenmiştir.

**Sonuç:** Diş çekimlerinin en yaygın nedenleri kron çürüğü, kök rezorpsiyonu ve periodontal hastalık olarak belirlenmiştir. Sosyoekonomik durum ve bireysel ağız hijyeni alışkanlıkları çekim endikasyonunu etkilemektedir. Diş kaybını önlemeye yönelik koruyucu hizmetlerin yaygınlaştırılması ve ağız sağlığı okuryazarlığının artırılması gerekmektedir.

**Anahtar Kelimeler:** Diş çekimi, endikasyon, diş çürüğü, periodontal hastalık, kök rezorpsiyonu

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## INTRODUCTION

Tooth extraction is generally regarded as a treatment of last resort in contemporary dental practice. Nevertheless, it remains a common and routine procedure performed daily in both public and private dental clinics. Tooth loss following extraction may adversely affect patients' quality of life, affecting masticatory function, facial aesthetics, speech, and psychosocial well-being.<sup>1-4</sup> Previous studies have demonstrated that the reasons for tooth extraction differ across geographic, socioeconomic, and cultural contexts.<sup>5-10</sup> While the incidence of tooth extractions has decreased in many developed countries due to advances in conservative dental treatment, it remains a common practice in developing and under-resourced settings.<sup>9,10</sup> In developing countries, limited access to preventive services, inadequate oral health behaviors, and various socioeconomic barriers contribute substantially to the prevalence of extractions.<sup>9-11</sup>

Tooth loss due to extractions necessitates significant effort, expertise, cost, time, and resources to restore patients to their pre-disease oral health status.<sup>3,4,11</sup> Therefore, understanding the indications for tooth extraction may inform governmental strategies aimed at enhancing oral health literacy and encouraging early engagement with dental care services.<sup>1-3</sup> Numerous studies have been conducted in various countries and regions to investigate the factors contributing to tooth extraction. The present study aims to retrospectively evaluate the reasons for tooth extraction among patients who presented to the Department of Oral and Maxillofacial Surgery at the Faculty of Dentistry, Mersin University. Furthermore, the study seeks to explore the associations between tooth loss and demographic variables such as age, gender, educational attainment, and income level. Identifying the primary causes and predisposing factors of tooth loss is critical for preventing avoidable extractions and developing effective preventive strategies.

## MATERIALS AND METHODS

This study was approved by the Clinical Research Ethics Committee of Mersin University (Protocol number: 2022/06/222). Between January 1, 2021, and March 1, 2022, clinical records of adult and pediatric patients who applied to the Department of Oral and Maxillofacial Surgery at Mersin University, Faculty of Dentistry for tooth extraction and had at least one tooth extracted for any reason were retrospectively

reviewed. Data on the reason for extraction, the extracted tooth, patient age, and gender from the archive were recorded on the data collection form.

Tooth extraction indications were categorized as follows: retained root, impacted tooth, mobility/periodontitis, root resorption, patient request, root caries, crown caries, non-functional third molar, failed root canal treatment, orthodontic treatment, tumor/cyst, prophylactic extraction, and other reasons (e.g., pressure on opposing alveolar crest, prosthetic treatment, trauma, ectopic eruption).

After the data were collected, adult patients and parents of pediatric patients with complete clinical records were contacted by phone and asked to complete a structured questionnaire. The questionnaire consisted of closed-ended and multiple-choice items designed to evaluate demographic and behavioral characteristics. The questionnaire (Figure 1) was administered by trained personnel via telephone and all responses were recorded using a standardized survey form. Patients who could not be reached or refused participation were excluded from the study.

The questionnaire included items assessing education and income levels of adult patients and of parents of pediatric patients. Patients with incomplete records, those who could not be reached by phone, and those who declined to participate in the questionnaire were excluded from the study. Similarly, Pediatric patients were excluded if their parent's declined participation. The survey instrument encompassed variables such as frequency of dental visits, oral hygiene practices (i.e., tooth brushing habits), residential status, and socioeconomic indicators, including the educational attainment and income levels of adult participants and the parents or legal guardians of pediatric patients.

Data were analyzed using IBM SPSS Statistics for Windows, Version 23.0 (Chicago, USA). The normality of the data distribution was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. For comparisons involving three or more groups with non-normally distributed data, the Kruskal-Wallis H test was applied, and post-hoc analyses were conducted using the Dunn test. Categorical variables were compared using the Pearson chi-square test, and multiple comparisons of proportions were evaluated using the Bonferroni-adjusted Z test. Results were presented as mean  $\pm$  standard deviation and median (minimum-maximum). A significance level of  $p < 0.05$  was considered statistically significant.



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**Table 1.** Distribution of tooth extractions according to sociodemographic variables

		Number of Tooth Extractions (n=499)	%
<b>Gender</b>	Female	267	53.6
	Male	232	46.4
<b>Marital Status</b>	Single	261	52.3
	Married	238	47.7
<b>Education Level</b>	PhD/Master's degree	10	2.1
	University	81	1.2
	College	34	6.8
	High School	97	19.4
	Middle School	77	15.4
	Elementary School	175	35.1
	Illiterate	25	5
<b>Income Levels</b>	>10,000	2	0.4
	5.000-10.000	50	10.1
	3,000 to 5,000	103	20.6
	2,000 to 3,000	87	17.4
	1.000-2.000	51	10.2
	Less than or equal to 1000	3	0.6
	No source of income	203	40.7
<b>Residence</b>	City center	320	64.1
	District center	169	33.9
	Village	10	2
<b>Tooth Brushing Habits</b>	Less than once a week	76	15.2
	1-2 times a week	39	7.8
	Once every 2-3 days	60	12
	Once a day	182	36.5
	2 times a day	132	26.5
	More than 2 times a day	10	2
<b>History of Tooth Extraction in the Last Year</b>	Yes	242	48.5
	No	257	51.5
<b>Dentist Visit Frequency</b>	More than twice a year	36	7.2
	Twice a Year	29	5.8
	Once a Year	48	9.6
	Less than once a year	2	0.4
	Presence of Symptoms	383	76.8
	Never	1	0.2





**Table 3.** Comparison of age distribution according to extraction indications

The reason for extraction	Age		Test statistics	p*
	Mean ± SD	Median (min-max)		
Retained root	50.63 ± 23.96	55 (10 - 79) <sup>d</sup>	188.798	<0.001
Impacted tooth	29.91 ± 9.98	26 (9 - 57) <sup>ac</sup>		
Mobility/Periodontitis	46.77 ± 20.55	51 (7 - 80) <sup>cd</sup>		
Root resorption	12.48 ± 13.06	10 (3 - 79) <sup>b</sup>		
The patient's request	24.5 ± 8.49	23 (8 - 35) <sup>abcd</sup>		
Root caries	37.92 ± 24.52	44 (8 - 73) <sup>acd</sup>		
Crown caries	32.59 ± 16.84	32 (6 - 80) <sup>a</sup>		
Non-functional third molar	33.66 ± 9.89	35 (20 - 56) <sup>acd</sup>		
Canal treatment failure	38 ± 17.05	44.5 (8 - 57) <sup>acd</sup>		
Orthodontic treatment	18.13 ± 16.73	12.5 (10 - 59) <sup>ab</sup>		
Cyst/tumor	46.5 ± 11.5	46.5 (27 - 69) <sup>acd</sup>		
Prophylactic extraction	32 ± 14.7	28.5 (10 - 51) <sup>abcd</sup>		
Other reasons	29 ± 14.38	27 (8 - 51) <sup>acd</sup>		

\* Kruskal-Wallis H test; a-d: Different letters indicate statistically significant differences between groups (p<0.05).

SD: Standard Deviation

## RESULTS

Between January 1, 2021 and March 1, 2022, a total of 499 extractions were performed, including 267 in female patients and 232 in male patients. The major indications for tooth extraction were crown caries (28.4%), root resorption (20.6%) and mobility/periodontal disease (10.6%) (Table 1, 2).

There were statistically significant differences in the distribution of extraction reasons and variables such as gender, marital status, and educational level (p=0.005, p<0.001, and p<0.001, respectively). A statistically significant association was also observed between gender and extractions due to retained roots, crown caries and root caries (Table 2).

Statistically significant differences were observed between extraction indications and patients' income level and place of residence (p<0.001 and p<0.001, respectively). Similarly, patients' history of tooth extraction within the past year was significantly associated with the distribution of extraction reasons (p<0.001).

There was also a statistically significant relationship between tooth brushing habits and frequency of dental visits and their association with extraction indications (p<0.001 and p<0.001, respectively).

The mean ages corresponding to each extraction indication are presented in Table 3. The mean age for crown caries, which is one of the most common indications, was 32.59 ± 16.84 years, and the mean age for root resorption was 12.48 ± 13.06 years. A statistically significant difference was found between the median ages across different extraction reason groups (p<0.001).

Among the 499 extracted teeth, 148 (29.7%) were primary teeth and 351 (70.3%) were permanent teeth. Crown caries was the most common reason for extraction in permanent teeth (n = 127), followed by mobility/periodontal disease (n=47) and impacted teeth (n=47). In primary teeth, root resorption was the leading indication (n=87), followed by crown caries (n = 14) and retained root (n = 8). The remaining indications were distributed on Table 4.



**Table 4.** Distribution of tooth extraction indications according dentition type

Extraction Indications	Primary Teeth (n)	Permanent Teeth (n)
Root resorption	87	15
Mobility/Periodontitis	5	47
Retained root	8	32
Impacted tooth	0	47
Canal treatment failure	0	12
Root caries	5	19
Patient's request	2	6
Orthodontic treatment	9	2
Non-functional third molar	0	29
Cyst / Tumor	1	7
Prophylactic extraction	1	7
Other reasons	4	12

## DISCUSSION

Several survey-based studies have been conducted in different countries and regions to investigate the reasons for tooth extraction.<sup>2,12-22</sup> Some studies have found that tooth caries is the primary cause of tooth extraction, while others have found that periodontal disease is more<sup>2-12</sup> or equally common.<sup>20-22</sup> Overall, these studies indicate that the vast majority of tooth extractions are due to either dental caries or periodontal disease. To the best of our knowledge, there is no previous study conducted in Türkiye that specifically investigates the reasons for tooth extraction. The findings of the present study revealed that crown caries was the leading indication for extraction, followed by root resorption and periodontal disease. These results are consistent with the findings reported in previous studies.<sup>4,11,15,16, 23, 24</sup> Anyanechi et al.<sup>6</sup> reported that the increasing rates of tooth extraction caused by dental caries and periodontal disease in Nigerian populations may be attributed to a shift from a traditional high-fiber diet to a Western-style diet, rich in refined sugars, sweetened beverages, and desserts.

In the present study, approximately 2% of extractions were performed at the patient's own request. Notably, 75% of these patients were university graduates, 75% had no source of income, and all resided in urban areas. Although the reasons behind extractions performed solely upon patient request—without a medical indication—were not explored in this study, a systematic review by Lee et al.<sup>23</sup> reported that nearly 5%

of extractions were performed upon patient request. The authors noted that financial and cultural factors, as well as psychological causes such as dental fear, may contribute to such decisions.<sup>23</sup>

Variations in the etiological factors responsible for tooth extraction have been observed across different studies. Furthermore, caution should be exercised when generalizing these findings, as some studies evaluated only permanent teeth, while others included both primary and permanent dentitions.<sup>6</sup> In our study, both primary and permanent teeth were evaluated, making it one of the few studies to analyze the reasons for tooth loss in both pediatric and adult populations. This study included both primary and permanent teeth, with 29.7% of extractions involving primary dentition. While crown caries (n = 127) and periodontal disease (n = 47) were the most common causes in permanent teeth, root resorption (n = 87) was most frequently observed in primary teeth.

The significant associations identified between extraction indications and variables such as tooth brushing frequency and dental visit habits highlight the importance of preventive oral health services in public health planning.

In this study, a higher number of extractions were performed in females (53.6%) compared to males (46.4%). This may be attributed to the general belief that women are more likely than men to seek dental care and are more aware of their health-related needs.<sup>6</sup>



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It was observed that indications such as caries, orthodontic reasons, and trauma-related extractions decreased with age, whereas extractions due to periodontal disease increased. In our study, the mean age of patients undergoing extraction due to crown caries was  $32.6 \pm 16.8$  years, and for orthodontic indications,  $18.1 \pm 16$  years. In contrast, the mean age for extractions due to mobility/periodontal disease was  $46.7 \pm 20.5$  years, and  $50.6 \pm 23.9$  years for retained root indications (Table 3). These results suggest that the cumulative and irreversible deterioration of periodontal structures increases with age, contributing to a higher prevalence of periodontitis-related extractions.

Similarly, as previously shown,<sup>2,20</sup> a significant increase in periodontal-related extractions with advancing age has also been reported. These findings are in line with the results of our study. A recent meta-analysis confirmed this trend also supports the global trend of caries being the leading cause of tooth loss in adults.

## CONCLUSION

The findings of the present study revealed that the most common reasons for tooth extraction were crown caries, root resorption and periodontitis. The higher extraction rates observed among individuals with lower socioeconomic and educational levels highlight the limited access to oral health services and the insufficiency of preventive dental care.

There is a need for more comprehensive, multicenter studies in Türkiye that consider regional disparities. The data obtained from this study may serve as a valuable foundation for developing strategies aimed at preventing tooth loss, improving oral health services, and promoting early-stage dental treatments.

## ETHICS COMMITTEE APPROVAL

This study was approved by the Clinical Research Ethics Committee of Mersin University, [Approval number: 2022-06-222].

## FUNDING

This study received no funding.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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