DOI: 10.7860/JCDR/2026/84016.23459

Original Article

Dentistry Section

Epidemiological Assessment of Permanent Tooth Extraction: A Retrospective Cross-sectional Study from Hail Dental Centre, Saudi Arabia

ABDULLAH ALQHTANI[1], FAHAD BAKITIAN[2], HATEM D ALSHAMMARI[3], ABDULMAJEED O ALOTAIBI[4], ALI ALTAMIMI[5], HATIM ALSHAMMARI[6], MOHAMED ELBORAEY[7]

ABSTRACT

Introduction: Tooth loss affects quality of life by impairing chewing, speech, and appearance, and is associated with psychological and nutritional issues. Although the prevalence has declined in developed countries because of improved dental care, permanent tooth extraction remains a common occurrence, primarily caused by dental caries and periodontal disease. Demographic and behavioural factors- such as age, gender, socioeconomic status, smoking, and systemic health conditions- also influence extraction rates. In Saudi Arabia, national studies have explored these causes; however, data from the northern regions, particularly Hail, are limited. Given Hail's unique demographics and healthcare access, understanding local patterns of tooth loss is essential for targeted public health strategies.

Aim: To determine the primary causes of permanent tooth extraction and examine associated demographic and clinical factors.

Materials and Methods: A cross-sectional study was conducted at the Department of Oral Surgery Clinics of Hail Dental Centre from May 2025 to July 2025, Saudi Arabia. Data on 381 permanent teeth extracted from 254 patients were retrospectively collected from clinical records. Demographic variables, including age, gender, smoking status, medical history, antibiotic use, the number and type of teeth extracted, reasons for extraction, and and procedural complexity were assessed. Associations between variables were assessed using the Chi-square test, Fisher's-exact test, and the Monte Carlo correction. Multinomial logistic regression analysis was performed to identify independent predictors.

Results: Dental caries (59.3%) was the leading cause, followed by orthodontic treatment (25.7%) and periodontal disease (11.4%). Surgical extractions accounted for 24.8%. Antibiotic use correlated with extraction reasons and medical status (p-value <0.05). Smokers demonstrated higher rates of periodontitis and failed root canal extractions. Multivariate analysis identified age ≥60 years, diabetes, smoking, and female gender as significant predictors.

Conclusion: Dental caries and orthodontic treatment were the leading causes of tooth loss in the Hail region of Saudi Arabia. Factors such as age, systemic health conditions, and smoking status were significantly associated with the reasons for tooth extraction, underscoring the need for preventive and integrated oral systemic health strategies in this population.

Keywords: Dental health services, Dentition, Epidemiologic studies, Oral health, Preventive dentistry, Risk factors

INTRODUCTION

Tooth loss is a significant indicator of oral health worldwide, as it strongly affects individuals' quality of life by impairing mastication, compromising speech, and altering facial appearance [1]. In addition to functional and aesthetic challenges, tooth loss has been associated with adverse psychological outcomes and an increased risk of nutritional deficiencies [2]. Despite these concerns, the incidence of tooth loss has noticeably decreased in many developed countries. This improvement is mainly due to advancements in preventive dental measures and restorative treatments [3], which have not only reduced the rate of tooth loss but also decreased the frequency of permanent tooth extractions in populations of both developed and developing nations [1,4].

Permanent tooth extraction is a significant issue in dental health and is often considered a last resort when other treatment options have failed. The present study identified dental caries as the predominant cause of tooth extraction (68.9%), which is consistent with previous reports of a Brazilian population study, where dental caries accounted for approximately 63.3% of extractions [5]. Caries progressively destroys tooth structure, leading to pain, infection, and eventual loss if left untreated [6], while periodontal disease results in the breakdown of the periodontal tissues that support the teeth [7]. Failed endodontic treatments, persistent periapical pathologies, orthodontic or prosthetic requirements, trauma from accidents, root fractures, and impacted teeth are also other reported reasons for permanent tooth extraction [8]. Socioeconomic status plays a role, as individuals with limited financial resources may have reduced access to preventive care, leading to late-stage dental disease that necessitates extraction. Additionally, non-clinical factors such as cultural beliefs and patient preferences may sometimes influence the decision to extract rather than restore a tooth [9]. Age can be a crucial factor, with older adults more likely to require extractions due to cumulative oral health problems [10]. Gender differences have been observed, with males generally experiencing higher extraction rates, other contributing factors include smoking habits, which increase the risk of periodontitis, antibiotic use, and systemic health conditions such as diabetes, which can exacerbate oral health deterioration [11]. In Saudi Arabia, multiple studies have been conducted to identify the reasons for permanent tooth extraction, which is crucial for developing effective prevention strategies and improving oral health outcomes in the population [12,13]. However, the studies, particularly from the northern regions of Saudi Arabia, remain limited. The Hail region, the largest in northern Saudi Arabia, possesses distinctive demographic and socioeconomic features; however, it lacks specific epidemiological research on the reasons

for permanent tooth extraction, particularly within its population. Considering the regional differences in healthcare access, public awareness, and disease prevalence, it is crucial to investigate local patterns of tooth loss, which can aid in the improvement of public health planning and resource allocation. Therefore, the study aimed to determine the primary causes of permanent tooth extractions and to examine the related demographic and clinical factors.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Oral and Maxillofacial Surgery At Hail Dental Centre in Hail, Saudi Arabia, from May 2025 to July 2025, and included all eligible patients who attended the department during this time. The study protocol was reviewed and approved by the Research Ethics Committee of Umm Al Qura University (Approval No. HAPO-02-K-012-2025-06-2828), and all procedures were performed in accordance with the ethical standards of the Institutional and national research committees and the principles of the Declaration of Helsinki. Before enrollment, written informed consent was obtained from each participant. Patient confidentiality was strictly maintained throughout the study by assigning unique identification codes to participants, anonymising all records, and removing all personal identifiers from the data.

Inclusion criteria: Patients aged nine years and older who had at least one permanent tooth extracted during the study period and possessed complete and legible clinical and radiographic records.

Exclusion criteria: Patients who underwent extractions involving third molars or supernumerary teeth, or whose documentation was incomplete, unclear, or illegible.

Sample size calculation: The sample size was calculated using the following formula for cross-sectional studies:

$$n = \frac{Z^2 \times p \times (1 - p)}{d^2}$$

Where:

n = sample size;

Z = standard normal deviate at 95% confidence level (1.96);

p = prevalence of caries as a reason for extraction=70% from a previous study [4];

d = margin of error (5%);

$n = (1.96)^2 * 0.70 * (1 - 0.70) / (0.05)^2 = 323$. To compensate for exclusions and incomplete records, a final sample of 381 extracted permanent teeth from 254 patients was selected using non probability consecutive sampling.

Study Procedure

Data from 254 patients were manually extracted from clinical records using a standardised data collection sheet. One examiner (AA) reviewed all records and collected relevant variables related to both patients and tooth extraction. Patient-related variables included age (categorised into: <20, 21-40, 41-60, >60 years), gender, systemic medical conditions, smoking status, and antibiotic use before and/or after extraction. The latter was documented from clinical records and included any antibiotic prescriptions before, after, or both before and after the extraction. However, the timing (pre- or post-) was not consistently documented in every case. Tooth-related variables included the primary reason for tooth extraction (e.g., caries, periodontal disease, periapical infection, failed endodontic treatment, orthodontic or prosthetic needs, trauma, impaction), number of teeth extracted, and type of extraction procedure (simple or surgical), and tooth position using the FDI numbering system. When multiple reasons were documented for a single extraction, the main reason was identified using clinical notes and radiographs.

STATISTICAL ANALYSIS

Data were analysed using IBM Statistical Package for Social Sciences (SPSS) statistic version 22.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, Standard Deviations (SD), medians, and Interquartile Ranges (IQR), were used to summarise the demographic and clinical data. Associations between the reason for extraction and categorical variables were tested using the Chi-square (χ^2) test. When more than 20% of the expected cell counts were below 5, the Monte Carlo correction was applied. A multivariate analysis of independent predictors of the different extraction reasons was conducted using a multinomial logistic regression model. A p-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 254 patients underwent extraction of 381 permanent teeth. The mean age was 36.84±16.52 years, with a median of 35 years (IQR 24-47). Most patients were female 145 (57.1%). Co-morbidities were present in 73 (28.7%) of patients; 10 (3.9%) were smokers and 18.1% received antibiotics, though the timing relative to extraction was variably documented. Most patients (72.4%) had one tooth extracted, and 24.8% of all procedures were surgical [Table/Fig-1].

Variables	Category	n (%)
Age (years)	Min-Max	9-81
	Mean±SD	36.84±16.52
	Median (IQR)	35 (24-47)
Gender	Male	109 (42.9%)
	Female	145 (57.1%)
Co-morbidities	Present	73 (28.7%)
	Absent	181 (71.3%)
Smoking status	Smokers	10 (3.9%)
	Non smokers	244 (96.1%)
Antibiotic use	Yes	46 (18.1%)
	No	208 (81.9%)
Number of teeth Extracted per patient	1	184 (72.4%)
	2	48 (18.9%)
	3-8	22 (8.7%)
Type of extraction	Simple	191 (75.2%)
	Surgical	63 (24.8%)

[Table/Fig-1]: Demographics and extraction characteristics (N=254 patients). IQR: Interquartile range; SD: Standard deviation

Dental caries was the leading cause of extraction, accounting for 226 teeth (59.3%), followed by orthodontic treatment (98 teeth, 25.7%) and periodontitis (40 teeth, 10.5%). Other less frequent causes included failed root canal treatment, prosthetic indications, periapical conditions, and impacted teeth [Table/Fig-2].

Reason for extraction	n (%)
Caries	226 (59.3%)
Orthodontic treatment	98 (25.7%)
Periodontitis	40 (10.5%)
Failed RCT	6 (1.6%)
Prosthetic indication	6 (1.6%)
Periapical infection	1 (0.3%)
Endoperio lesions	1 (0.3%)
Impacted teeth	3 (0.8%)

[Table/Fig-2]: Distribution of the main reason for permanent tooth extraction based on extracted teeth included in the study (n=381 teeth).

Among patients who received antibiotics, extractions due to periodontitis were significantly more common than in the non antibiotic group (23.9% vs 8.7%, p-value <0.001), possibly reflecting greater

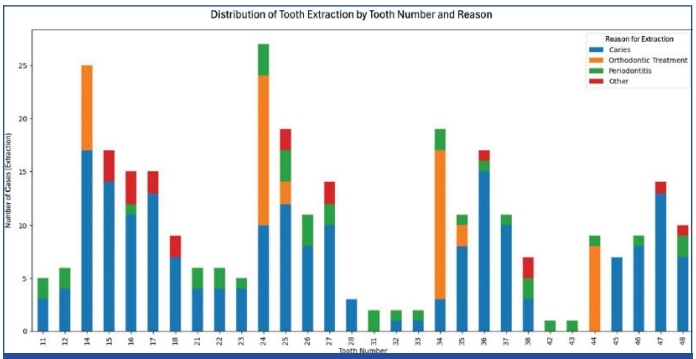
clinical severity [Table/Fig-3]. Tooth extractions were most frequent in the upper left quadrant (21-28), where orthodontic treatment was the leading cause. Caries predominated in all other quadrants [Table/Fig-4]. Tooth #24 was the most commonly extracted overall, while teeth #42 and #43 were the least frequently involved [Table/Fig-5]. These reasons were grouped due to low frequency.

Reason for extraction	No antibiotics (n=208)	Yes antibiotics (n=46)
Caries	146 (70.2%)	29 (63.0%)
Orthodontic treatment	37 (17.8%)	2 (4.3%)
Failed RCT	2 (1.0%)	2 (4.3%)
Periapical infection	1 (0.5%)	0
Periodontitis*	18 (8.7%)	11 (23.9%)
Prosthetic indication	3 (1.4%)	0
Caries, periodontitis	0	1 (2.2%)
Impacted teeth	0	1 (2.2%)
Periapical disease	1 (0.5%)	0

[Table/Fig-3]: Association between antibiotic use and reason for permanent tooth extraction (N=254).
*Chi-square (χ^2) statistical test with Monte Carlo correction; a statistically significant association was found between antibiotic use and periodontitis-related extractions (p-value=0.001)

Jaw quadrant	Caries	Orthodontic treatment	Periodontitis	Other†	Total
Upper right (#11-18)	65	18	3	7	93
Upper left (21-28)	60	40	17	6	123
Lower left (31-38)	50	29	10	3	92
Lower right (41-48)	51	11	10	1	73
Total	226	98	40	17	381

[Table/Fig-4]: Distribution of extraction reasons by jaw quadrant and tooth, based on the total number of extracted teeth (n=381 teeth).
†Other reasons include failed RCT, periapical infection, prosthetic indication, periapical disease, and impacted teeth; #tooth number; These were grouped due to low frequency. These reasons were grouped due to low frequency



[Table/Fig-5]: Distribution of tooth extractions by individual tooth number and reason for extraction.
*Other reasons include failed RCT, periapical infection, prosthetic indication, periapical disease, trauma, anomalies, and impacted teeth. These were grouped due to low frequency

Fisher's-exact test revealed a significant association between diabetes mellitus and periodontitis as the primary reason for extraction (p-value=0.028). The majority of patients whose primary reason for extraction were caries or orthodontic treatment had no reported medical co-morbidities [Table/Fig-6].

Multivariate logistic regression confirmed that diabetes mellitus (AOR=2.97; p-value=0.021) and age ≥60 years (AOR=3.85; p-value=0.002) were significant predictors of periodontitis-related tooth extractions. Compared with the reference age group (21-40 years), patients aged ≤20 years demonstrated a markedly higher likelihood of undergoing orthodontic extractions (AOR=19.80; p-value <0.001), whereas those aged 41-60 years showed a lower likelihood of orthodontic-related extractions, although this association did not reach statistical significance. Additionally, female

Reason for extraction	No. medical condition	Diabetes mellitus	Hypertension	Other conditions*	Total patients
Caries	168	38	12	8	226
Orthodontic treatment	97	1	0	0	98
Periodontitis	21	13	4	2	40
Other**	13	2	1	1	17
Total	299	54	17	11	381

[Table/Fig-6]: Association between reason for tooth extraction and medical conditions (n=254 patients).
*Other conditions include hypothyroidism, cardiac disease, epilepsy, renal disease, and other rare conditions. **Other reasons for extraction include failed RCTs, periapical infection, prosthetic indications, and impacted teeth

gender was significantly associated with orthodontic extractions (AOR=1.94; p-value=0.034) [Table/Fig-7].

Variables	Outcome reason	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Age category	Orthodontic treatment			
(Ref: 21-40 years)	≤20 years	19.80	(8.52-46.10)	<0.001*
	41-60 years	0.04	(0.01-0.61)	0.021
	> 60 years	N/A†	—	—
	Periodontitis			
(Ref: 21-40 years)	≤20 years	0.18	(0.02-1.63)	0.128
	41-60 years	2.15	(0.89-5.16)	0.088
	>60 years	3.85	(1.61-9.20)	0.002*
Gender	Orthodontic treatment	1.94	(1.05-3.58)	0.034*
(Ref: Male)	Periodontitis	1.12	(0.61-2.05)	0.708
Diabetes (DM)	Periodontitis	2.97	(1.18-7.51)	0.021*
(Ref: No)	Orthodontic treatment	0.88	(0.33-2.37)	0.796
Smoking	Periodontitis	2.15	(1.04-4.45)	0.038*
(Ref: No)	Orthodontic treatment	0.45	(0.11-1.83)	0.262

[Table/Fig-7]: Multinomial logistic regression analysis for reasons for permanent tooth extraction (Reference Outcome: Caries).
* Statistically significant at p-value ≤0.05. † (N/A): No orthodontic cases in patients >60 (AOR not calculable). Ref: Reference Category. Caries is the reference for all outcomes.

DISCUSSION

The current study results revealed that over two-thirds of the extracted teeth were due to extensive dental caries, highlighting the ongoing prevalence and severity of this oral health issue as the leading cause of dental extractions in permanent teeth. Many of these teeth were not just slightly decayed the damage was so extensive that nearly 25% required surgical removal, implying the presence of severe structural destruction, root involvement, or deep infection that rendered simple extraction impossible. This considerable proportion aligns with findings from other studies conducted in government hospitals, where the burden of severe dental disease is similarly high [13-15]. For instance, Alaboudi AK et al., documented that, among 949 individuals in Madinah, Saudi Arabia, a striking 89.1% of extractions were attributed to caries, underscoring the widespread and aggressive nature of tooth decay in that region [13]. In a separate study, Ullah A et al., investigated the causes of extraction in a population from Al Jouf city in northern Saudi Arabia, revealing that 70% of all extracted teeth had succumbed to caries [14]. Supporting this pattern, Shareef RA et al., examined the reasons for tooth loss in Aseer province, finding caries as the predominant cause at 68.1%, followed by periodontal disease at 17.6% [15]. These numbers suggest a persistent trend across the country, although the current study's findings seem even higher compared to other reports from both urban and rural settings in Saudi Arabia. For example, Preethanath RS, in a study involving 820 individuals and 2,800 extracted teeth, observed that half of the extractions were due to dental caries, with periodontitis being the second most common cause, at nearly 11%

[16]. Similarly, Alesia K and Khalil HS reported that dental caries accounted for 50.2% of all extractions in a specific Saudi population over a three-month period, while periodontitis contributed to 8.2% of the extractions [6]. Furthermore, data from the eastern province of Saudi Arabia consistently show that dental caries is responsible for almost half of all tooth extractions, painting a clear picture of a nationwide challenge dominated by persistent and destructive tooth decay [17].

The World Health Organisation (WHO) estimates that 60% to 90% of children worldwide are affected by dental caries [18]. This chronic infectious disease involves progressive demineralisation and destruction of dental hard tissues, resulting in cavities, pain, infection, and potential tooth loss, if untreated [9]. Dental caries significantly contributes to the global disease burden and adversely affects the oral health-related quality of life of children by causing discomfort, difficulty with eating, speaking, and sleeping, as well as missed school days and reduced academic performance [19]. In Saudi Arabia, a recent systematic review reported that the prevalence of dental caries in primary teeth ranges from 21% to 100%, and in permanent teeth from 5% to 99% [20]. These broad ranges indicate substantial variability, attributed to differences in study methodologies, diagnostic criteria, sample sizes, and the populations studied, such as urban versus rural communities or age-based cohorts. Despite this variability, evidence from multiple cross-sectional studies confirms that dental caries remains a widespread and persistent issue in Saudi Arabia [16]. These data highlight the urgent need for comprehensive and sustained national oral health programs. Such programs should include preventive strategies, public awareness campaigns, routine dental screenings, and improved access to dental care services across all regions. Prioritising school children is essential, as early intervention establishes lifelong oral hygiene habits, prevents future complications, and reduces the overall burden of dental diseases.

Other neighbouring countries have reported high percentages of dental extractions due to caries. For instance, in Kuwait, Alshammari KF et al., reported that caries caused 43.7% of extracted teeth, while periodontitis accounted for 37.4% of all extractions [21], which is higher than the rate reported here or in other studies in Saudi Arabia. Studies from other Middle Eastern countries have reported similarly high percentages; for example, a study from Yemen showed that 69% of dental extractions were due to caries, while rates were 56.4% in Jordan, 41.2% in Sudan, and 81.5% in the United Arab Emirates [22-24]. These alarming figures demand immediate attention and urgent action to address this important issue.

It is important to recognise that dental and periodontal conditions often develop gradually, with their damaging effects becoming more noticeable over time and eventually leading to tooth loss, as shown by the present study. Despite these age-related differences, periodontitis consistently remains a significant risk factor for tooth loss across all groups; therefore, it should be a primary focus in developing public oral health strategies.

The use of multinomial logistic regression provided deeper insights into the independent determinants of permanent tooth loss in Hail. Notably, age, DM, and smoking status emerged as significant risk factors for extraction due to periodontitis when compared to caries. These findings are consistent with previous large-scale consensus reports, which emphasised the systemic role of DM. and smoking in periodontal breakdown and tooth loss [25,26]. Specifically, the present study found that DM increased the likelihood of periodontitis-related extractions by nearly threefold (AOR=2.97), consistent with prior joint consensus guidelines that advocated integrating dental screening into diabetes care protocols [27,28]. The significantly higher proportion of periodontal-related tooth extractions among patients receiving antibiotics may reflect more severe infections or greater clinical intervention needs in this group. This aligns with prior observations suggesting that periodontal disease often requires adjunctive antibiotic use in advanced cases, though causality cannot be inferred from the current design [27]. Furthermore, although gender-based differences in total extractions were relatively modest, female gender was independently associated with orthodontic-related extractions (AOR 1.94). This may reflect greater aesthetic awareness and increased demand for elective orthodontic treatment among females in the region. The study findings align with previous studies highlighting the influence of socioeconomic and aesthetic motivations on orthodontic treatment uptake, particularly among younger females [29,30]. Turning to the study's methodology, it is important to acknowledge that this research used a cross-sectional design and non probability convenience sampling. Nevertheless, given that the Hail region has only one specialised dental centre serving the entire population, the study's results can be considered reasonably representative. Looking ahead, prospective studies with larger, more diverse sample sizes are recommended to further clarify preventive approaches for dental extractions due to caries and periodontal diseases in Saudi Arabia.

Limitation(s)

The study has several limitations that should be acknowledged. First, its retrospective design relies on existing clinical records, which may contain inconsistencies or incomplete information, particularly regarding the timing of antibiotic prescriptions (pre- or post-extraction). Second, although the study aimed to categorise the primary reason for each extraction, cases involving multiple reasons may have been subject to interpretation bias during classification. Third, the third molars were excluded from the analysis to focus on disease-related extractions, which may have affected the true proportion of surgical extractions and potentially underrepresented common indications such as impaction. Additionally, no inter- or intra-examiner calibration was conducted to assess reliability, although one trained examiner collected all data to maintain consistency. Lastly, as this was a single-centre study based in Hail, Saudi Arabia, the findings may not be generalisable to other regions or populations with different oral health practices or access to care.

CONCLUSION(S)

Dental caries and orthodontic treatment were the leading causes of tooth loss in the Hail region of Saudi Arabia. Factors such as age, systemic health conditions, and smoking status were significantly associated with the reasons for tooth extraction. The present study findings highlight the importance of implementing enhanced preventive strategies and targeted public health initiatives to reduce avoidable tooth loss in the region.

REFERENCES

[1] Miller Y, Locker D. Correlates of tooth loss in a Canadian adult population. J Can Dent Assoc. 1994;60(6):549-55. PMID: 8032998.
[2] Scott BJ, Leung KC, McMillan AS, Davis DM, Fiske J. A transcultural perspective on the emotional effect of tooth loss in complete denture wearers. Int J Prosthodont. 2001;14(5):461-65. PMID: 12066643.
[3] Hiidenkari T, Parvinen T, Helenius H. Missing teeth and lost teeth of adults aged 30 years and over in south-western Finland. Community Dent Health. 1996;13(4):215-22. PMID: 9018886.
[4] Caldas AF, Jr. Reasons for tooth extraction in a Brazilian population. Int Dent J. 2000;50(5):267-73. Doi: 10.1111/j.1875-595X.2000.tb00564.x.
[5] Jovino-Silveira RC, Caldas Ade F, de Souza EH, Gusmão ES. Primary reason for tooth extraction in a Brazilian adult population. Oral Health Prev Dent. 2005;3(3):151-57. PMID: 16355648.
[6] Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, et al. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol. 2018;45(20):162-70. Doi: 10.1002/JPER.17-0721.
[7] Marcus SE, Kaste LM, Brown LJ. Prevalence and demographic correlates of tooth loss among the elderly in the United States. Spec Care Dentist. 1994;14(3):123-27. Doi: 10.1111/j.1754-4505.1994.tb01117.x.
[8] Alesia K, Khalil HS. Reasons for and patterns relating to the extraction of permanent teeth in a subset of the Saudi population. Clin Cosmet Investig Dent. 2013;5:51-56. Doi: 10.2147/CCIDE.S49403.

[9] Borg-Bartolo R, Roccuzzo A, Molinero-Mourelle P, Schimmel M, Gambetta-Tessini K, Chaurasia A, et al. Global prevalence of edentulism and dental caries in middle-aged and elderly persons: A systematic review and meta-analysis. J Dent. 2022;127:104335. Doi: 10.1016/j.jdent.2022.104335.
[10] Passarelli PC, Pagnoni S, Piccirillo GB, Desantis V, Benegiamo M, Liguori A, et al. Reasons for tooth extractions and related risk factors in adult patients: A cohort study. Int J Environ Res Public Health. 2020;17(7):2575. Doi: 10.3390/ijerph17072575.
[11] Broers DLM, Dubois L, de Lange J, Su N, de Jongh A. Reasons for tooth removal in adults: A systematic review. Int Dent J. 2022;72(1):52-57. Doi: 10.1016/j.identj.2021.01.011.
[12] Almarghlani A. Prevalence, predictors, and reasons for permanent tooth extraction among high school students in Saudi Arabia: A national cross-sectional study. Cureus. 2022;14(9):28687. Doi: 10.7759/cureus.28687.
[13] Alaboudi AK, Aboalshamat KT, Mahfouz A, Alobodi A, Abualfaraj A. Reasons for teeth extraction in governmental hospitals in Madinah City, Saudi Arabia. IOSR Journal of Dental and Medical Sciences. 2016;15(7):01-05. Doi: 10.9790/0853-1507110105.
[14] Ullah A, Ullah F, Alkhamis A, Alnusairy M, Aldhali M, Ullah U, et al. Reasons of teeth extraction in patients seen at dental clinics of college of dentistry, Al Jouf University, Kingdom of Saudi Arabia. Pakistan Oral & Dental Journal. 2020;40(1):37-39.
[15] Shareef RA, Chaturvedi S, Suleman G, Elmahdi AE, Elagib MFA. Analysis of Tooth extraction causes and patterns. Open Access Macedonian Journal of Medical Sciences. 2020;8(D):36-41. Doi: 10.3889/oamjms.2020.3784.
[16] Preethanath RS. Reasons for tooth extraction in urban and rural populations of Saudi Arabia. Pakistan Oral & Dental Journal. 2010;30(1):199-204.
[17] Aljafar A, Alibrahim H, Alahmed A, AbuAli A, Nazir M, Alakel A, et al. Reasons for permanent teeth extractions and related factors among adult patients in the eastern province of Saudi Arabia. Scientific World Journal. 2021;2021:5534455. Doi: 10.1155/2021/5534455.
[18] Kale S, Kakodkar P, Shetiya S, Abdulkader R. Prevalence of dental caries among children aged 5-15 years from 9 countries in the Eastern Mediterranean Region: a meta-analysis. East Mediterr Health J. 2020;26(6):726-35. Doi: 10.6719/emhj.20.050.
[19] Matthews P. Prevention of dental caries in children and young people. Nurs Child Young People. 2023;35(3):22-27. Doi: 10.7748/ncyp.2022.e1451.
[20] Alshammari FR, Alamri H, Aljohani M, Sabbah W, O'Malley L, Glenny AM. Dental caries in Saudi Arabia: A systematic review. J Taibah Univ Med Sci. 2021;16(5):643-56. Doi: 10.1016/j.jtumed.2021.06.008.
[21] Al-Shammari KF, Al-Ansari JM, Al-Melh MA, Al-Khabbaz AK. Reasons for tooth extraction in Kuwait. Med Princ Pract. 2006;15(6):417-22. Doi: 10.1159/000095486.
[22] Alhadi Y, Rassem AH, Al-Shamahy HA, Al-Ghaffari KM. Causes for extraction of permanent teeth in general dental practices in Yemen. Universal Journal of Pharmaceutical Research. 2019;4(2). Doi: 10.22270/ujpr.v4i2.249.
[23] Quteish Taani DS. Periodontal reasons for tooth extraction in an adult population in Jordan. J Oral Rehabil. 2003;30(1):110-12. Doi: 0.1046/j.1365-2842.2003.00981.x.
[24] Hashim R, Salah A, Hamid A, Hamad A, Slieby K. Reasons for permanent teeth extraction in the United Arab Emirates. Journal of International Oral Health. 2019;11(5):304-08. Doi: 10.4103/jioh.jioh_95_19.
[25] Chapple ILC, Mealey BL, Van Dyke TE, Bartold PM, Dommisch H, Eickholz P, et al. Periodontal health and gingival diseases and conditions on an intact and a reduced periodontium: Consensus report of workgroup 1 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Clin Periodontol. 2018;45(20):68-77. Doi: 10.1111/jcpe.12940.
[26] Tonetti MS, Greenwell H, Kornman KS. Staging and grading of periodontitis: Framework and proposal of a new classification and case definition. J Periodontol. 2018;89(12):1475. Doi: 10.1002/jper.10239.
[27] Sanz M, Ceriello A, Buysschaert M, Chapple I, Demmer RT, Graziani F, et al. Scientific evidence on the links between periodontal diseases and diabetes: Consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. J Clin Periodontol. 2018;45(2):138-49. Doi: 10.1111/jcpe.12808.
[28] Graziani F, Gennai S, Solini A, Petrini M. A systematic review and meta-analysis of epidemiologic observational evidence on the effect of periodontitis on diabetes An update of the EFP-AAP review. J Clin Periodontol. 2018;45(2):167-87. Doi: 10.1111/jcpe.12837.
[29] Ghonmode S, Shrivastava S, Kadaskar AR, Bapat S. Socioeconomic burden of orthodontic treatment: A systematic review. Med Pharm Rep. 2023;96(2):154-63. Doi: 10.15386/mpr-2457.
[30] Sato H, Shimpo Y, Sekiya T, Rikitake H, Seki M, Wada S, et al. Correlation between dental health and aesthetic components of malocclusion in junior high and high school students: An epidemiological study using item response theory. J Clin Med. 2025;14(13):4802. Doi: 10.3390/jcm14134802.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Preventive Dental Sciences, Taibah University, Medina, Saudi Arabia.
2. Associate Professor, Department of Restorative Dentistry, Umm Al-Qura University, Makkah, Saudi Arabia.
3. Assistant Professor, Department of Preventive Dentistry, University of Ha'il, Saudi Arabia.
4. Assistant Professor, Department of Prosthodontics, Taif University Taif, Saudi Arabia.
5. General Dentist, Riyadh Dental Centre, Ministry of Health, Riyadh, Saudi Arabia.
6. General Dentist, Ha'il Dental Centre, Ministry of Health, Ha'il, Saudi Arabia.
7. Assistant Professor, Department of Oral Medicine, Periodontology, Oral Diagnosis and Oral Radiology, Tanta University, Tanta, Egypt.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Fahad Bakitian,
Associate Professor, Department of Restorative Dentistry, Umm Al-Qura University
Makkah-21955, Saudi Arabia.
E-mail: fabakitian@uqu.edu.sa

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Sep 02, 2025
- Manual Googling: Feb 14, 2026
- iThenticate Software: Feb 17, 2026 (5%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Aug 31, 2025**
Date of Peer Review: **Dec 11, 2025**
Date of Acceptance: **Feb 21, 2026**
Date of Publishing: **May 01, 2026**