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## A ten years survey on the causes of tooth extraction: A review of retrospective studies

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### Abstract

Dental extraction also known as tooth extraction or exodontia; is the removal of a tooth from the dental alveolus in the alveolar bone. A retrospective study was carried out to ascertain the various reasons for tooth extractions among patients at the University of Nigeria Teaching Hospital, Enugu. Data was obtained using a datasheet, and the data was sourced solely from the hospital's records department. A total of twelve (12) different causes of tooth extraction were recorded for 16136 cases of extraction used for the study. Out of the 81160 patients that attended the clinic in the year 2015 -2022, the causes of tooth extraction were as follows; dental caries 2740 (16.98%), periodontal diseases 2632 (16.31%), tooth impaction 1305 (8.09%), dento alveolar abscess 1460 (9.05%), irreversible pulpitis 863 (5.35%), pericoronitis 1201 (7.44%), tooth fracture 1229 (7.62%), retained root 1748 (10.83%), tooth mobility 1073 (6.65%), Ludwig angina 41 (0.25%), supernumerary 860 (5.33%), overcrowded teeth 964 (5.97%) and other causes 20 (0.12%). Among the 16136 cases, males were 7547 (46.75%) and females were 8589 (61.13%). The age group mostly affected was 16-30 year with cases accounted for 5220 (32.35%). The data analyzed further revealed that the most extracted tooth was the first molar 3967 (24.58%). The test statistic value  $Z_c = -12585.63$  was gotten against  $Z_t = -1.96$  or  $+1.96$ . The result of the decision rejected the  $H_0$  and accepted the  $H_a$ ; which indicates that there are significant reasons for tooth extraction among patients. The study found that dental caries, and periodontal disease are the primary causes of tooth extractions. To prevent these issues, good oral hygiene, more screening procedures and improved accessibility to oral healthcare facilities are needed. Increasing awareness campaigns on preventing dental caries and assessing and treating periodontal disease is also crucial. Further research should consider non-dental and nonmedical variations leading to tooth extraction.

**Keywords:** Tooth extraction, causes, caries, periodontal, retrospective studies

### Introduction

Tooth extraction also referred to as tooth extraction, exodontia, or informally, tooth pulling) is the removal of teeth from the dental alveolus (socket) in the alveolar bone. Extraction of teeth is the most common surgical procedure carried out in the dental surgery setting and is usually considered when other methods of tooth conservation have failed [1].

Dental extractions are routine procedures performed by dentists all over the world; estimates of the proportion of tooth extractions in the total number of dental treatments vary by country and may differ between regions of the world. According to a Brazilian study, dental extractions of permanent teeth accounted for 10.2% (n = 161,812,852) of all dental treatments performed between 1998 and 2012 [2]. An earlier survey of 17,784 patients in Switzerland between the ages of 15-74 years revealed that extractions accounted for 5.4% of all dental procedures [3]. Many factors that can lead to a decrease in the number of teeth, such as dietary habits, oral hygiene, and quality of life [4, 5, 6]. Occasionally patients request that their dentist or oral (and maxillofacial) surgeon remove their teeth based on dental fear or due to financial, religious, or cultural reasons. Although these requests may be incompatible with the "standard of care" provided by a good health care provider, the pressure on the practitioner to fulfil such requests can be high [7]. The number of extracted teeth is an indicator of socio-economic and oral hygiene levels [8]. Even though the advancement in preventive and conservative dentistry teeth extraction

percentage has come down, but still, there are various reasons that lead to permanent loss of teeth. These reasons may be caries, periodontal disease, endodontic failures, orthodontic treatment, trauma, prosthetic procedures and other medical reasons that would justify treatment (e.g., elimination of dental foci before immunotherapy or radiotherapy treatment). [8, 9, 10, 11, 12]

It is important to understand the consequences of tooth loss on dentition, oral functions, and possibilities for future treatments: after the extraction of a tooth, the alveolar ridge undergoes progressive bone resorption, and this can lead to functional and aesthetic deficits in the patients [13, 14].

Numerous precautionary steps have been implemented since 1970 to bring the frequency of tooth loss down to a reasonable level. Fluoride-containing toothpaste has been widely distributed, and public water systems have been fluoridated. Tooth loss in younger individuals is often due to poor hygiene education and self-care [12, 15]. Tooth loss events lead to substantial direct costs for tooth replacement and should be an appropriate outcome for the effectiveness of long-term oral disease prevention measures [16].

However, most hospitals in various regions of Nigeria lack current overviews/up-to-date, and estimations of the proportional volume of causes or indications for extractions in general. Recognizing the major causes of tooth extraction, may be able to limit future extractions while emphasizing the importance of prevention and improving oral health outcomes. With an excellent hospital-based review, it is feasible for us to draw conclusions from the data and be able to pay specific attention to the core cause of tooth extraction, with the hope of stopping the progression altogether instead of just managing the condition as symptoms arise.

**Materials and Methods**

**Research Design**

Ex post facto research design of patient's records in the dental record unit of the Department of Restorative Dentistry, Clinical Dental Services was used to determine the reasons for tooth extraction among patients that attended UNTH Enugu, from 2015-2022.

**Area of Study**

The research was carried out at the University of Nigeria Teaching Hospital, Ituku Ozalla with the geographical coordinate of 6°18'05.0"N latitude and 7°27'34.9"E longitude. It is a Federal government of Nigeria specialist Hospital that provides different medical services including preventive, curative, and restorative dental services among others to patients experiencing pain and discomfort or feeling the need for clinical care.

**Population of the Study**

The Dental Department of the University of Nigeria Teaching

Hospital in Enugu serves an estimated 10,145 patients every year. With an estimated 81,160 patients who visited from 2015 to 2022. The study's population consists of 16,160 recorded dental extraction cases from the specified years.

**Sample size and sampling Techniques**

All available case notes of patients that attended the Dental department of the hospital between 2015 -2022 were used.

**Instrument for Data Collection/Ethical Consideration**

The instrument for data collection was strictly a documentary source, that is, the case notes or files of patients who visited the dental department of the hospital within the period of study (2015-2022). Every fundamental study was done in accordance with the ARRIVE guidelines [17].

**Validity of the Instruments and Reliability of the instrument**

The validity of the instrument was based on the diagnosis made by professionals on the official records of patients who visited the Dental unit. Data collection was determined by the accuracy of the official records coupled with the assistance of two professionals who are in the field of dentistry and under the close supervision of the HOD, Oral and maxillofacial Surgery UNTH, Ituku-Ozalla, Enugu.

**Techniques of Data Analysis**

The data collected were analyzed and presented using frequency tables, simple percentages, charts and essay were also used for better understanding.

**Test of hypothesis**

**Ha:** The reason for tooth extractions was significantly adequate among patients that attended UNTH, Enugu from 2015-2022. Using the formula.

$$Z = \frac{X - \mu}{s/\sqrt{n}}$$

X = sample mean

μ = population mean

s = population standard deviation

n = sample size

The result of the test of hypothesis showed that a Zc Value of -12585.63 at a = 0.05 is against Zt -1.96 to 1.96. This showed that Zc lies outside Zt. As such, Ho is rejected and Ha is accepted. That is, causes of tooth extractions were significantly adequate among patients that attended UNTH, Enugu from 2015-2022.

**Results**

**Table 1:** Prevalence of Tooth Extraction from 2015-2022

Year	Total Number of Patients that attended the Dental Clinic	Percentage %	Patients who had Dental Extractions	Percentage (%)	Patients who came for other Oral needs /Treatments	Percentage (%)
2015	10708	13.19	2085	2.57	8623	10.62
2016	9995	12.32	1823	2.25	8172	10.07
2017	10678	13.16	2060	2.54	8618	10.62
2018	10721	13.21	2101	2.59	8620	10.62
2019	10865	13.39	2238	2.76	8627	10.63
2020	8463	10.43	1719	2.12	6744	8.31
2021	8810	10.86	1812	2.23	6998	8.62
2022	10920	13.45	2298	2.83	8622	10.62
	81160	100.0	16136	19.89	65024	80.11

Table 1 shows the total number of patients who attended UNTH Enugu from 2015-2022. It equally portrays the number of patients who had reasons for tooth extraction and those who came for other oral Treatment. The total number of patients that came to the clinic was 81160 out of which 16136 (19.89%) had reasons for tooth extraction and 65024 (80.11%) came for other

treatment options. 2022 recorded the highest number of patients that came to the clinic both for extraction (2.83%) and for other oral needs or treatment while 2020 had the lowest record of (2.2%) of extracted teeth and (8.31%) of other oral treatment needs.

**Table 2:** Causes of Tooth Extraction

Causes	Total Number of cases	Percentage (%)
Dental Caries	2740	16.98
Periodontal diseases	2632	16.31
Tooth impaction	1305	8.09
DAA (Dento-Alveolar Abscess)	1460	9.05
Irreversible Pulpitis	863	5.35
Pericoronitis	1201	7.44
Tooth Fracture	1229	7.62
Retained Root	1748	10.83
Tooth Mobility	1073	6.65
Ludwig Angina	41	0.25
Supernumerary	860	5.33
Over Crowded Teeth	964	5.97
Others	20	0.12
	16136	99.99

Table 2 shows the various causes of tooth extraction and their rate of occurrence with their percentages. Dental caries was prevalent with a total of 2740 (16.98%), followed by Periodontal diseases 2632 (16.31%), retained root 1748 (10.83%), dento alveolar abscess 1460 (9.05%), tooth impaction 1305 (8.09%), tooth fracture 1229 (7.62%),

pericoronitis 1201 (7.44%), tooth mobility 1073 (6.65%), Overcrowded teeth 964 (5.97%), irreversible pulpitis 863 (5.35%), supernumerary 860 (5.33%), Ludwig angina 41 (0.25%), other causes 20 (0.12). Dental caries was the major cause of tooth extraction, followed by periodontal diseases. These two are the major causes of tooth extraction.

**Table 3:** Age Distribution with Causes of Tooth Extraction

Causes	Total Number of cases	%	1-15 yrs	%	16-30 yrs	%	31-45yrs	%	46-60 yrs	%	61-75 yrs	%	76 yrs & above	%
Dental Caries	2740	16.98	635	3.94	787	4.88	683	4.23	400	2.48	148	0.92	87	0.54
Periodontal diseases	2632	16.31	394	2.44	192	1.19	308	1.91	530	3.28	658	4.08	550	3.41
Tooth impaction	1305	8.09	0	0	748	4.64	359	2.22	198	1.23	0	0	0	0
DAA (Dento-Alveolar Abscess)	1460	9.05	298	1.85	496	3.07	102	0.63	336	2.08	170	1.05	58	0.36
Irreversible Pulpitis	863	5.35	215	1.33	297	1.84	186	1.15	83	0.51	52	0.32	30	0.19
Pericoronitis	1201	7.44	0	0	846	5.24	277	1.72	78	0.48	0	0	0	0
Tooth Fracture	1229	7.62	357	2.21	445	2.76	326	2.02	71	0.44	20	0.12	10	0.06
Retained Root	1748	10.83	331	2.05	542	3.36	420	2.60	237	1.47	138	0.86	80	0.49
Tooth Mobility	1073	6.65	158	0.98	221	1.37	92	0.57	232	1.44	354	2.19	16	0.09
Ludwig Angina	41	0.25	3	0.02	19	0.11	8	0.05	2	0.01	4	0.02	5	0.00
Supernumerary teeth	860	5.33	560	3.47	262	1.62	15	0.09	12	0.07	10	0.06	0	0
Over Crowded Teeth	964	5.97	201	1.25	356	2.21	301	1.87	75	0.46	20	0.12	11	0.07
Others	20	0.12	4	0.02	9	0.06	3	0.02	2	0.01	1	0.00	1	0.00
	16136	99.99	3156	19.56	5220	32.35	3080	19.08	2256	13.96	1575	9.74	848	5.21

Key: %-percentage

**Table 4:** Causes of Tooth Extraction and Gender

Causes	Total number of cases	%	Male	%	Female	%
Dental Caries	2740	16.98	1252	7.76	1488	9.22
Periodontal diseases	2632	16.31	1436	8.89	1196	7.41
Tooth impaction	1305	8.09	503	3.12	802	4.97
DAA (Dento-Alveolar Abscess)	1460	9.05	680	4.21	780	4.83
Irreversible Pulpitis	863	5.35	416	2.58	447	2.77
Pericoronitis	1201	7.44	572	3.54	629	3.89
Tooth Fracture	1229	7.62	553	3.43	676	4.19
Retained Root	1748	10.83	788	4.89	960	5.95
Tooth Mobility	1073	6.65	438	2.71	635	3.94
Ludwig Angina	41	0.25	16	0.09	25	0.15
Supernumerary	860	5.33	418	2.59	442	2.74
Over Crowded Teeth	964	5.97	468	2.90	496	3.07
Others	20	0.12	7	0.04	13	0.08
	16136	99.99	7547	46.75	8589	61.13

Key: %-Percentage

Table 3 portrays the reported cases for tooth extraction in line with their age group ratios. The age group 16-30 years has the highest record for causes for tooth extraction, followed by those within 1-15 years with a total of 5220 (32.35%) and 3156 (19.56%) respectively. While those that had the lowest record were 76 years and above with a total of 848 (5.21%).

Table 4 above shows the various reasons for tooth extraction and their rate of occurrence. For males: dental caries recorded 1252 (7.76%) periodontal diseases 1436 (8.89%), tooth impaction 503 (3.12%), dento alveolar abscess 680 (4.21%), Irreversible Pulpitis 416 (2.58%), pericoronitis 572 (3.54%), Tooth fracture 553 (3.43%), retained root 788 (4.89%), tooth mobility 438 (2.71%), Ludwig angina 16(0.09%), supernumerary 418 (2.59%), Overcrowded teeth 468 (2.90%), other causes 7(0.04%).

For females: dental caries records 1488 (9.22%) periodontal diseases 1196 (7.41%), tooth impaction 802 (4.97%), dento alveolar abscess 780 (4.83%), Irreversible Pulpitis 447 (2.77%), pericoronitis 629 (3.89%), Tooth fracture 676 (4.19%), retained root 960 (5.95%), tooth mobility 635 (3.94%), Ludwig angina 25 (0.15%), supernumerary 442 (2.74%), overcrowded teeth 496 (3.07%), other causes 13 (0.08%). Causes for tooth extraction are most prevalent in females. However, periodontal diseases were most prevalent in males.

**Table 5:** Distribution of types of tooth extracted

Type of tooth Extracted	Frequency	Percentage (%)
Central incisors	1983	12.29
Lateral incisors	1038	6.43
Canine	82	0.51
First premolar	1412	8.75
Second premolar	1706	10.57
First molar	3967	24.58
Second molar	3317	20.56
Third molar	2631	16.31
	16136	100

Table 5 above shows the occurrence of types of teeth extracted. Central incisors 1983 (12.29%), lateral incisors 1038 (6.43%), canine 82 (0.51%), first premolar 1412 (8.75%), second premolar 1706 (10.57%), first molar 3967 (24.58%), second molar 3317 (20.56%) and third molar 2631 (16.31%). The first molar (6) was mostly extracted because they are more prone to dental caries and periodontal diseases which are the major causes for tooth extraction.

## Discussion

The total number of patients that came to the clinic was 81160 out of which 16136 (19.89%) had reasons for tooth extraction. In two studies patients who had tooth extraction were 3.6% (95% CI, 2.9-4.4; n = 100) to 5.9% (95% CI, 4.9-7.1; n = 89) [18, 19]. Tooth extraction is one of the major treatment modalities provided worldwide in dentistry, but the low data reported from tooth extraction between the ten-year reviews may occur from adequate interest in adhering to dental maintenance.

Dental caries was prevalent with a total of 2740 (16.98%). The causes of extraction in our study fell into several groups, the largest portion being dental caries and its sequelae at 16.98%, followed by periodontal diseases with a percentage of 16.31%. A lot of our peer researchers have found identical or similar results. In a systemic review of reasons for tooth extraction, Broers *et al.* [9] found the most common reason reported for extraction was caries with the proportions of 36.0% (95% CI, 33.8-38.3), 45.6% (95% CI, 43.7-47.6), and 55.3% (95% CI,

49.0-61.4), and periodontitis with the proportions of 24.8% (95% CI, 19.7- 30.5), 32.1% (95% CI, 30.3-34.0), and 38.1% (95% CI, 35.8-40.4). Also, a cohort study in Rome, Italy revealed that caries (52.2%) was the most common reason for extraction along with periodontal disease 35.7% [12]

For example, research done in Pakistan has found that dental caries is the leading cause of tooth extraction. It contributes more than half the causes of all tooth extraction recorded for the research at 63.1%, followed by periodontitis at 26.2%, restoration failure at 4.6%, trauma at 3.2% and miscellaneous local pathologies [20]. Moreover, several other researchers have found that caries is the prime villain of a tooth's morbidity, closely followed by periodontitis. Every other reason comes second to it and their percentage is less than 10%. The study on the reasons for extraction of permanent teeth in general dental practices in Tehran, Iran by Mohammad and Arghavan [21] found in their research that tooth loss due to caries was more than 50% as well. In India, 39% and 25.4% of caries and periodontal diseases were reported respectively [10].

A study on the pattern and etiology of tooth extraction in Northwestern Nigeria found that dental caries and its sequelae 54.1% were the most common reasons for extraction, followed by periodontal disease 16.5% [22].

In another cross-sectional study in a tertiary care hospital at Dow University of Health Sciences, Pakistan by Syed *et al.* [23] the percentage was seen to be as high as 77.5% for caries. However, in a retrospective study on pattern and reasons for Permanent Tooth Extractions at Dental Clinics of the University of Science and Technology of Fujairah, UAE in the year 2020, Alsaegh and Albadrani, [24] found that the main reason for extraction was dental caries 44.6%, but the difference is that the second highest cause is not our usual periodontal condition but third molar related extraction at 23.4%, followed by periodontal disease 18.1%. This could be because the population group which is composed of younger patients, essentially around 20-40 years old, will tend to have greater third molar related problems compared to periodontal disease which is more frequently seen in older age group patients.

The age group 16-30 years has the highest record for causes for tooth extraction. Patients in the age group of 16-30 underwent extraction mainly due to several dental conditions highlighted in our study. Additionally, 1-15 years had 19.56% cause of tooth extraction respectively. Earlier studies have indicated dental caries as the cause of tooth extraction among this age group; Ozveren *et al.* [25] showed that most of the tooth extractions, which were mainly due to caries, belonged to the age group of 6-9 years 42%. Similarly, Bani *et al.* [26] have reported that the main reason for extraction in the age group of 2-5 was caries. Burdurlu *et al.* [27] examined children aged 2-14 years and reported the highest number of tooth extractions in the age group of 6-9 years. They stated that most of the extractions in this age group was significantly due to caries.

Unlike the present study, Alsheneifi and Hedges. [28] have reported orthodontic extractions and Samuel *et al.* [29] have reported over-retention as the second most common reason for primary teeth extractions.

Females 61.13% over Males 46.75%. Similar to findings in other countries where females tend to have more tooth loss [10, 19, 23, 30, 31, 32, 33].

A similar study conducted by other researchers found that males had the highest number of tooth extractions due to a lack of interest in adhering to dental maintenance and missing periodic dental visits and because of smoking [8, 12, 32]. Some authors think this happens because males are less



interested in reconstructive therapies than females [32]. The minute predominance in females may be due to their better health-seeking behavior compared to males.

Regarding tooth type, first molars were the most extracted teeth 24.58%. These results were similar to previous studies from by other researchers [8, 25, 27, 29, 34]. Comparably, a study noted in Nigeria that the first and third mandibular molar as well as the maxillary first molar teeth were the most frequently missing teeth [35]. These results were confirmed by earlier published findings [12, 32], who concluded that the anatomy of the occlusal surface of molars increased their vulnerability to caries. Furthermore, it was found that the first and second molars were commonly extracted by dental patients. The fact that it is far harder to reach molar teeth during brushing than incisor teeth is another factor contributing to the early loss of primary molar teeth. Furthermore, the position of the initial permanent molar teeth and the mixed dentition that develops as the number of teeth in the mouth cavity rises might make it challenging to remove plaque from the primary molars. Earlier eruption of molar teeth in adolescent age, makes them more prone to periodontal and dental caries. Developing successful preventive and treatment methods for dental health initiatives can be aided by an understanding of the patterns of oral diseases in developing nations.

### Conclusion

Dental caries and periodontal disease were the most common causes of extraction in this retrospective review group. Additional screening methods may be required for the early diagnosis of caries and periodontal diseases. Improved accessibility to oral healthcare facilities, as well as increased awareness efforts, such as preventing dental caries and assessing and treating periodontal disease, are critical for maintaining good and functioning oral health. Subsequently, non-dental and non-medical variance leading to tooth extraction should be the basis for future research.

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