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Research Article

Prevalence and Distribution of Odontogenic Tumors: A Cross-Sectional Hospital-Based Study

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ABSTRACT

Odontogenic tumors (OTs) are uncommon neoplasms of odontogenic origin, representing a heterogeneous group with variable clinical behavior. Their prevalence and distribution show geographical and ethnic variation, emphasizing the need for hospital-based data to support accurate diagnosis and treatment planning. This study aimed to determine the prevalence, demographic distribution, and histopathological spectrum of odontogenic tumors in patients diagnosed at a tertiary care hospital. A hospital-based cross-sectional study was conducted from 2015 to 2024. A consecutive sampling technique was employed, and all oral and maxillofacial biopsy records received during the study period were screened. Out of 2,450 biopsies, 124 cases fulfilled the diagnostic criteria for odontogenic tumors and were included in the study. Data regarding patient age, gender, anatomical site, and histological subtype were extracted using a structured data extraction proforma. Age was recorded in years and categorized into groups (0–9, 10–19, 20–29, 30–39, 40–49, 50–59, ≥60 years). Data were analyzed using descriptive statistics, and associations were tested using chi-square where applicable. Among 2,450 biopsies, the

prevalence of odontogenic tumors was 5.1% (124 cases). The mean age of patients was 31.4 ± 12.6 years, with a male-to-female ratio of 1.3:1. The mandible was more commonly affected (72.5%) than the maxilla (27.5%), predominantly in the posterior region. Ameloblastoma was the most frequent tumor (54.8%), followed by odontogenic keratocystic tumor (22.6%), adenomatoid odontogenic tumor (10.5%), and less common variants such as odontoma, calcifying epithelial odontogenic tumor, and ameloblastic fibroma. Odontogenic tumors, though infrequent, show distinct demographic and anatomical patterns, with ameloblastoma being the most prevalent type and mandibular involvement being more frequent. The use of a structured proforma and consecutive sampling in this cross-sectional study provides reliable hospital-based evidence that may serve as baseline data for future epidemiological and clinical research.

Keywords: Odontogenic tumors, cross-sectional study, prevalence, ameloblastoma, mandible, histopathology

INTRODUCTION

Odontogenic tumors (OTs) are a diverse group of neoplasms originating from the tooth-forming apparatus or its remnants (dental lamina, enamel organ, odontoblasts, etc.). While many are benign, some demonstrate locally aggressive behavior or rare malignant potential. Their histopathological features, biological behavior, and presentation differ widely according to subtype, anatomical location, age, gender, and genetics. In oral and maxillofacial disease, correct epidemiological data steers diagnosis, treatment planning, prognosis, and resource allocation.

Modern changes in classification have helped to define odontogenic entities' diagnostic categories and clarify definitions, particularly the WHO Classification of Head and Neck Tumors (5th Edition, 2022). Newer studies on 10,907 biopsies carried out in 2022 with a WHO basis showed that 4.6% were odontogenic tumors, therefore changing how prevalence and distribution are reported. Roughly 98% of these are benign; ameloblastoma was by far the most frequent type (68.9%) and the mandible the principal location of appearance (Asnani, 2024).

Another recent study in an Iraqi population (2016–2021) employing the WHO 2022 classification revealed that odontogenic tumors constituted about 3.2% of all examined cases (1,869 Records with somewhat male-female parity and ameloblastoma remaining the most prevalent OT discovered mostly in the mandible (Ghazi, 2022).

These results correspond with other local analyses. For example, a study in three Saudi Arabian tertiary medical institutions (covering until 2021) observed a comparable pattern: ameloblastoma was the dominant tumor (~63%. Among OTs, the mandible was the most impacted region; male cases more than female ones (Almazyad, 2024).

Despite the existing literature, there is considerable variation in reported prevalence rates, demographic patterns, and histologic subtype distributions across different geographic regions. Some populations report higher frequencies of odontoma; others show ameloblastoma as most common. Differences can also arise from variations in case definitions, sampling frames, and adherence to the newer WHO classification. Additionally, many published works are limited to relatively short periods or small numbers of cases, and relatively few cover the most recent years since the 2022 WHO updates.

There is a clear need to provide local, up-to-date data that reflects current diagnostic criteria, demographic shifts, and anatomical distributions. These data will help in benchmarking,

improving diagnostic sensitivity, guiding surgical and non-surgical management, and perhaps even identifying regional peculiarities in tumor subtype distribution.

Objectives

1. To determine the prevalence of odontogenic tumors among oral and maxillofacial biopsies in a tertiary care hospital over the period 2015-2024.
2. To describe the demographic distribution (age, gender) of patients with odontogenic tumors.
3. To document the anatomical site distribution (mandible vs. maxilla, anterior vs. posterior) of these tumors.
4. To analyze the histopathological spectrum of odontogenic tumors according to WHO classification, including common subtypes.

LITERATURE REVIEW

Overview of Odontogenic Tumors

Odontogenic tumors (OTs) comprise a heterogeneous collection of benign and (rarely) malignant neoplasms that arise from odontogenic epithelium, ectomesenchyme, or both. Although overall infrequent among oral and maxillofacial biopsies, OTs present a wide morphological spectrum and variable clinical behavior that make accurate epidemiological description important for clinical practice and planning of services. The World Health Organization's recent reclassification (WHO 5th Edition, 2022) refined diagnostic categories and introduced only a small number of new entities, but its consolidation of definitions has important implications for comparability of studies conducted before and after 2022. (Soluk,2022)

Epidemiology and Reported Prevalence

Reported prevalence of odontogenic tumors among oral and maxillofacial biopsy series varies by region and methodology, typically ranging from around 1.8% to approximately 9.6% in the last decade. Hospital-based studies from different geographic regions (Asia, Africa, the Middle East, South America) show that OTs typically constitute between ~3% and ~6% of biopsy specimens in many series, though higher proportions are reported in selected referral centers. A large institution-based analysis following the WHO 2022 criteria found OTs accounted for 4.6% of 10,907 biopsies, with nearly all cases benign and ameloblastoma dominating the spectrum. Regional studies published between 2020 and 2024 largely echo these figures but emphasize geographic variation: some series report higher proportions of odontoma, whereas others particularly from parts of Africa and Asia report a higher relative frequency of ameloblastoma (Almazyad,2024).

Classification Updates and Diagnostic Implications

The WHO 5th Edition (2022) of Head and Neck Tumours standardized several diagnostic terms and moved a few borderline entities; for example, adenoid ameloblastoma was introduced as a defined entity within benign epithelial odontogenic tumors. The digital WHO resource and accompanying reviews emphasize that although most categories are consistent with prior editions, the 5th edition's changes affect case grouping and, therefore, the interpretation of time-trends in epidemiologic data. Studies that reclassify older cases under the WHO 2022 scheme often report minor shifts in relative proportions of specific subtypes (for instance, ameloblastoma remaining the largest category among benign epithelial lesions). These changes underscore the importance of using consistent classification frameworks when comparing multi-period or multi-center datasets (Soluk, 2022).

Histopathological Spectrum and Common Subtypes (Ameloblastoma, OKC/OKT, AOT, Odontoma)

Across recent multi-center and single-institution reports, ameloblastoma remains the single most frequently reported odontogenic tumor in many hospital-based series, often representing over 40% of OT cases in regions where more aggressive tumors are common. The proportions vary by population some centers report odontoma as the leading lesion (particularly in populations with high rates of radiographically identified, asymptomatic odontomas), while others report odontogenic keratocyst/keratocystic odontogenic tumor (OKC/OKT) and adenomatoid odontogenic tumor (AOT) as frequent entities. A number of 2022–2024 institution-based studies highlight ameloblastoma's predominance (often concentrated in the third decade of life) and a consistent mandibular predilection for this subtype (Almazyad, 2024).

Demographic Patterns: Age and Sex Distributions

Most recent series report a peak incidence of odontogenic tumors in the second and third decades of life (roughly ages 10–39), though the modal age differs by tumor type: AOT and odontoma are more frequent in adolescents and young adults, whereas ameloblastoma typically peaks in the 20–40 age range. Sex ratios are variable; many studies show a slight male predominance overall, but certain tumor types (e.g., AOT, odontoma in some reports) show female predominance. These demographic differences are clinically useful because they contribute to differential diagnosis in radiographic and clinical assessment (Almazyad,2024).

Anatomical Distribution and Site Predilections

The mandible is the most commonly affected jaw in numerous hospital series, frequently with a predilection for the posterior region (molar–ramus area), especially for ameloblastoma. Maxillary involvement is less frequent overall but is relatively more common for tumors such as AOT and certain odontomas. The strong mandibular bias for ameloblastoma and the posterior mandible as the most common location are consistent findings across multiple datasets published from 2020 to 2024 and remain clinically relevant for imaging, biopsy planning, and surgical strategy (Almazyad ,2024).

Odontogenic Keratocyst / Keratocystic Odontogenic Tumor: Clinical Behavior and Management

The status of the odontogenic keratocyst (OKC) / keratocystic odontogenic tumor has been a subject of debate in classification and management literature. Recent systematic reviews and clinical studies (2020–2024) emphasize OKC's characteristic aggressive behavior, recurrence propensity, and association with nevoid basal cell carcinoma syndrome in some patients. Management strategies and recurrence-reduction measures (enucleation with adjunctive peripheral ostectomy, chemical cauterization, or more radical resection in recurrent/aggressive cases) continue to be discussed and refined, and trends reported in 2021–2024 reviews indicate ongoing variability in recurrence rates depending on treatment modality and lesion presentation (Dioguardi,2024).

Molecular Insights and Emerging Diagnostic Tools

Although histopathology remains the diagnostic gold standard, recent studies (2020–2024) have increasingly incorporated molecular and immunohistochemical markers to refine diagnosis and prognostication. For example, Ki-67 and other proliferation markers have been used in OKC/OKT research to describe proliferative activity and to explore correlations with clinical aggressiveness. Molecular characterization of ameloblastoma (e.g., BRAF V600E mutations in a subset of cases) and other odontogenic neoplasms has opened pathways for targeted therapies

and more individualized prognostic assessment, although routine therapeutic application remains limited and largely investigational as of 2024 (Panakkal,2025).

Reported prevalence of OTs among oral/maxillofacial biopsies shows regional variation: hospital series report rates from about 1–4% of biopsies, with many series noting >95% benign lesions and ameloblastoma or odontoma dominating depending on region and classification used (kokubun,2022). In Egypt, a 10-year hospital study revealed a prevalence of 2.56% among maxillofacial specimens, with 97.8% being benign and ameloblastoma the most common (Al-Aroomy et al., 2022). Similarly, in India, ameloblastoma accounted for nearly half of the cases, with unicystic and multicystic variants observed (Bhosale et al., 2025). Pakistani hospital-based studies also confirm ameloblastoma as the dominant OT, followed by odontogenic myxomas and keratocystic odontogenic tumors (Nishtar Institute of Dentistry, 2023). African hospital-based studies similarly report ameloblastoma as the predominant tumor, accounting for nearly three-fourths of OTs (Mutio et al., 2024). Pakistani hospital-based studies also confirm ameloblastoma as the dominant OT, followed by odontogenic myxomas and keratocystic odontogenic tumors (Arshad et al., 2023). In a 7-year retrospective study at AFIP Rawalpindi, 98.3% of odontogenic tumors were benign, with ameloblastoma accounting for 61.3%; mean age was 31.7 ± 16.7 years, and the posterior mandible was the most frequent site (Arshad et al., 2014). A recent hospital-based study at Nishtar Institute of Dentistry, Multan (2023–2024), reported ameloblastoma in 53.6% of cases (52/97), with a slight male predominance (54.6% males) and mandible being the most affected site (Rashid et al., 2025).

Geographic Variation and Gaps in the Literature

Differences in OT prevalence and subtype distribution across regions are influenced by referral bias, radiographic screening practices (which affect detection of asymptomatic odontomas), and classification applied (pre- versus post-WHO 2022). While recent multi-center studies and systematic reviews have expanded knowledge, notable gaps remain: (1) population-based incidence data are scarce because most literature is hospital-based; (2) long-term outcome data for many benign tumors (especially recurrence risk by subtype and treatment) are heterogeneous; and (3) comprehensive molecular epidemiology across diverse populations is limited. These gaps justify well-designed, long-period institution-based series (such as the present 2015–2024 dataset) that apply standardized classification and can serve as local benchmarks (Almazyad,2024).

Summary and Implications for the Current Study

The preponderance of evidence from 2020–2025 indicates that odontogenic tumors remain rare but clinically important lesions with marked variation by geography and tumor subtype. The WHO 2022 classification provides a contemporary framework that improves comparability among newer studies, but regional differences in tumor frequency especially the dominance of ameloblastoma in many referral series and variable contributions from odontoma and OKC highlight the need for updated local data. The present hospital-based series spanning 2015–2024 will therefore contribute meaningful, contemporaneous evidence on prevalence, demographic and anatomical patterns, and histopathological spectrum in the study population, while allowing comparison with other recent regional and international reports (Soluk, 2022).

METHODOLOGY

Study Design: This research employed a hospital-based cross-sectional study design to determine the prevalence, demographic distribution, and histopathological spectrum of

odontogenic tumors. A cross-sectional approach was selected as it allowed for the analysis of all biopsy records over a defined period, providing reliable prevalence estimates within the target population.

Study Setting and Duration: Research was conducted at a Bhitai Dental and Medical College served as a referral center for a study, extensive patient population. Data were collected retrospectively over 10 year period from January 2015 to December 2024.

Study Population and Sampling Technique: All patients who had oral and maxillofacial biopsy during the chosen study period made up the study population. Using a consecutive sampling technique that is, every accessible biopsy records were examined and odontogenic tumor diagnostic criteria cases were included. In this manner, inclusion was guaranteed and bias in Choice was diminished. The investigation comprised histopathologically classified odontogenic malignancies biopsy samples. Non-odontogenic lesions, cysts, inflammatory conditions, and instances with inadequate clinical Alternatively, pathological data were rejected. From a total of 2,450 oral and maxillofacial biopsies, 124 instances were verified as odontogenic tumors and included in the final analysis.

Data Collection Tools and Variables

Data for this study were obtained using a structured data extraction proforma. The proforma documented demographic data including patient age and gender as well as anatomical site of the lesion including jaw involvement (mandible or maxilla) and Further grouping into anterior or posterior regions, and histopathological type as verified by microscopic investigation. For study, age was logged as both a continuous variable and categorised into categories: 0–9, 10–19, 20–29, 30–39, 40–49, 50–59, and ≥60 years. Uniformity and accuracy in data gathering across all biopsy records were guaranteed by this uniform instrument.

Data Analysis

Statistical Package for the Social Sciences (SPSS), version 25.0 was used to gather and analyze the descriptive statistics including frequencies, percentages, means, and standard deviations. Cross-tabulation Links were explored; results were summarized with deviations; the prevalence of odontogenic malignancies was calculated as a percent of all biopsies between different Types of malignancies and population or anatomical features. Wherever practical, the Chi-square test was used; p-<0.05 seemed statistically significant.

Patient confidentiality was maintained by anonymizing all biopsy records, and no personal identifiers were included in the dataset. The study adhered to the ethical principles of the Declaration of Helsinki (2013 revision).

RESULTS

Table 1: Prevalence of Odontogenic Tumors among Biopsies (2015–2024)

Variable	n	%
Total biopsies examined	2450	100.0
Odontogenic tumors (OTs)	124	5.1
Non-OT lesions	2326	94.9

Out of 2,450 biopsies, odontogenic tumors represented 5.1% of cases, indicating that OTs are relatively uncommon but still clinically significant lesions. This proportion is consistent with global reports, highlighting their rarity compared to other oral and maxillofacial pathologies.

Table 2: Age Distribution of Patients with Odontogenic Tumors (n = 124)

Age Group (years)	n	%
0–9	4	3.2
10–19	16	12.9
20–29	34	27.4
30–39	32	25.8
40–49	20	16.1
50–59	12	9.7
≥60	6	4.9
Mean ± SD	31.4 ± 12.6	-

The mean age of OT patients was 31.4 years, with the highest frequency in the 20–39 age range (53.2%). Very few cases were observed in children (0–9 years, 3.2%) and elderly patients (≥60 years, 4.9%). This suggests that odontogenic tumors predominantly affect young and middle-aged adults.

Table 3: Gender Distribution of Odontogenic Tumors (n = 124)

Gender	n	%	Male:Female Ratio
Male	71	57.3	
Female	53	42.7	1.3 : 1

A slight male predominance was observed (57.3% males vs. 42.7% females), with a male-to-female ratio of 1.3:1. This indicates that while both genders are affected, males appear to have a somewhat higher risk.

Table 4: Anatomical Site Involvement of Odontogenic Tumors (n = 124)

Site	n	%
Mandible total	90	72.5
• Anterior	22	17.7
• Posterior	68	54.8
Maxilla total	34	27.5
• Anterior	11	8.9
• Posterior	23	18.6

The mandible was more frequently involved (72.5%) than the maxilla (27.5%). Within the mandible, the posterior region accounted for the majority of cases (54.8%). This finding emphasizes the predilection of OTs for the mandibular posterior region, especially in relation to molar and ramus areas.

Table 5: Histopathological Subtypes of Odontogenic Tumors (n = 124)

Tumor Type	n	%
Ameloblastoma	68	54.8
Odontogenic keratocystic tumor (OKC)	28	22.6
Adenomatoid odontogenic tumor (AOT)	13	10.5
Odontoma	6	4.8

Calcifying epithelial OT (CEOT)	5	4.0
Ameloblastic fibroma	4	3.2

Ameloblastoma was the most common tumor (54.8%), followed by odontogenic keratocystic tumor (22.6%) and adenomatoid odontogenic tumor (10.5%). Less frequent tumors included odontoma, CEOT, and ameloblastic fibroma. This distribution shows that ameloblastoma continues to dominate OT patterns in hospital-based studies.

Table 6: Age Group vs. Histopathological Subtypes of Odontogenic Tumors (n = 124)

Age Group (years)	Ameloblastoma	OKC	AOT	Odontoma	CEOT	Ameloblastic Fibroma	Total n	%
0–9	0	0	1	2	1	0	4	3.2
10–19	2	5	7	1	1	0	16	12.9
20–29	18	7	4	2	2	1	34	27.4
30–39	20	8	1	0	2	1	32	25.8
40–49	14	5	0	1	0	0	20	16.1
50–59	9	2	0	0	0	1	12	9.7
≥60	5	1	0	0	0	1	6	4.9
Total	68	28	13	6	5	4	124	100

Ameloblastoma peaked in the 20–39 age group, whereas AOT was more frequent in teenagers (10–19 years). Odontoma cases were seen mainly in younger patients (<30 years). CEOT and ameloblastic fibroma appeared sporadically across age groups. This indicates that certain OT subtypes have age-specific predilections, useful for diagnostic consideration.

Table 7: Anatomical Site vs. Histopathological Subtypes of Odontogenic Tumors (n = 124)

Site	Ameloblastoma	OKC	AOT	Odontoma	CEOT	Ameloblastic Fibroma	Total n	%
Mandible – Anterior	10	3	5	2	1	1	22	17.7
Mandible – Posterior	46	18	2	1	1	0	68	54.8
Maxilla – Anterior	4	2	4	1	0	0	11	8.9
Maxilla – Posterior	8	5	2	2	3	3	23	18.6
Total	68	28	13	6	5	4	124	100

Ameloblastoma was predominantly located in the mandibular posterior region (46/68 cases), while AOT showed a stronger association with anterior regions (especially maxilla and mandible anterior). Odontoma and CEOT were distributed between both jaws without a strong site preference. This reinforces the site-specific tendencies of certain tumors, especially the mandibular predilection of ameloblastoma.

DISCUSSION

The present cross-sectional hospital-based study investigated the prevalence, demographic distribution, and histopathological spectrum of odontogenic tumors (OTs) over a nine-year period. Out of 2,450 biopsies, 124 cases were identified as OTs, yielding a prevalence of 5.1%. This finding aligns with recent reports that suggest OTs account for 3–6% of oral and maxillofacial biopsy specimens worldwide (Almazyad et al., 2024; Izgi et al., 2021). The prevalence is slightly higher than some Western series, where odontoma is more frequently reported due to early radiographic detection, but is comparable to African and Asian studies where ameloblastoma remains dominant (Vered & Wright, 2022).

Our finding of a 5.1% prevalence is consistent with recent multi-center reports applying the WHO 2022 classification, which recorded rates between 4.6% and 5.3% (Almazyad et al., 2024). The slight variation among studies may be attributed to differences in population characteristics, diagnostic criteria, and accessibility to oral pathology services. Hospital-based studies from developing countries tend to report a higher proportion of ameloblastoma cases due to late presentation and limited access to preventive dental care (Soluk-Tekkeşin & Wright, 2022).

Age and Gender Distribution

The mean age of patients in this study was 31.4 years, with most cases occurring in the second and third decades of life. This coincides with recent research demonstrating OTs reaching their peak between the ages of 20 and 39 (Panakkal et al., 2025; Izgi et al., 2021). Although some recent studies have found equal or female prevalence depending on. (Dioguardi et al., 2024). Because they mean that OTs affect people during their most productive years, these population changes have significant economic and societal repercussions.

Anatomical Condensation

With a definite preference for the posterior mandibular region, the mandible was (72.5%), more often affected than the maxilla (27.5%). The posterior mandible as the most frequent location of ameloblastoma and other OTs (Almazyad) coincides with findings from several contemporary studies. Vered & Wright, 2022; et al., 2024). By contrast, the anterior maxilla sees more AOT and odontomas, a trend also evident in the current series. Particularly for ameloblastoma, the strong mandibular dominance emphasizes how important a comprehensive radiological and clinical evaluation of posterior mandibular tumors is.

Histopathological Spectrum

Ameloblastoma was the most common tumor (54.8%), followed by odontogenic keratocystic tumor (22.6%), adenomatoid odontogenic tumor (10.5%), and other rare variants. The predominance of ameloblastoma is consistent with reports from Asia and Africa but differs from many Western studies, where odontoma is the most common odontogenic lesion (Vered & Wright, 2022; Izgi et al., 2021). This disparity may be explained by differences in diagnostic practices, as odontomas are often detected incidentally through radiographs in developed countries, whereas in developing regions, only symptomatic or clinically evident cases present for biopsy.

Our findings regarding OKC are noteworthy. Although its classification has been debated, most recent literature acknowledges its locally aggressive behavior and potential for recurrence (Dioguardi et al., 2024). Its significant representation in this study underscores the importance of long-term follow-up and appropriate surgical planning.

Clinical and Research Implications

This study contributes valuable hospital-based evidence on the demographic and histological trends of OTs in our region. The predominance of ameloblastoma and mandibular involvement

indicates a need for early detection strategies and timely surgical management to minimize morbidity. Furthermore, the structured use of WHO 2022 criteria ensures comparability with international literature and provides a reliable baseline for future epidemiological and molecular studies.

Limitations

As with all hospital-based retrospective studies, the findings may not fully represent the general population. Referral bias and reliance on biopsy specimens may under-represent asymptomatic lesions such as odontomas. Additionally, molecular and genetic analyses, which are increasingly reported in recent studies, were beyond the scope of this research but remain an important area for future exploration.

CONCLUSION

This hospital-based cross-sectional study demonstrated that odontogenic tumors are relatively uncommon, with a prevalence of 5.1% among oral and maxillofacial biopsies. Ameloblastoma was the most frequent tumor, predominantly affecting young adults and showing a strong mandibular predilection, followed by odontogenic keratocystic tumor and adenomatoid odontogenic tumor. The findings underscore the importance of early detection, accurate histopathological diagnosis, and timely intervention to reduce morbidity. By applying WHO 2022 classification, this study provides reliable baseline data that can inform both clinical decision-making and future epidemiological and molecular research.

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