ORIGINAL RESEARCH

Uncovering Pediatric Oral Pathologies: A 16-year Institutional Archival Study in Jabalpur District, India

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Abstract

Aim and objectives: This pioneering study aimed to retrospectively assess pediatric oral biopsies received by the Department of Oral and Maxillofacial Pathology, focusing on age, sex, site, and pathology type.

Methods: Biopsy archives between March 2009 and 2025 were reviewed, revealing 2,523 cases. Following application of the age criterion (≤16 years), 169 cases were identified for analysis and summarized using descriptive statistics.

Results: Out of 2,523 biopsies analyzed, 169 cases (6.69%) involved pediatric patients. Of these, 96 (56.80%) were intraosseous, and 73 (43.20%) were soft tissue biopsies. The study found that out of the total intraosseous biopsies, 80 cases (83.33%) were identified as odontogenic lesions, while 16 cases (16.67%) were classified as nonodontogenic lesions. Odontogenic lesions were categorized into developmental, 59 (73.75%), and inflammatory, 21 (26.25%), types. Mucocele was the most common soft tissue lesion (13.61%). Oral pathologies showed a male predilection and were more frequent in the mandible than in the maxilla.

Conclusion: This study identified the most prevalent pediatric oral pathologies in Jabalpur district, highlighting their correlation with age, sex, and site. The most common diagnoses were mucocele (n = 23, 13.61%), followed by dentigerous cyst (n = 18, 10.65%), and odontogenic keratocyst (n = 16, 9.47%).

Clinical significance: Our findings can enhance early diagnosis and effective management of oral lesions in children, ultimately improving oral healthcare outcomes and filling a critical knowledge gap in this region.

Keywords: Biopsy, Odontogenic cyst, Retrospective studies.

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Introduction

Pediatric patients exhibit a diverse array of oral and maxillofacial lesions affecting both hard and soft tissues. The underlying causes of these issues in children are distinct and differ significantly from those seen in adults.[1] Pediatric oral and maxillofacial pathologies pose a significant concern, emphasizing the need for timely diagnosis and prompt intervention to deliver optimal patient care.[2]

There is a scarcity of studies investigating the prevalence of distinct oral pathologic conditions, such as cysts, tumors, and oral mucosal lesions, among the Indian population. However, there is limited data available on biopsied oral lesions in the pediatric population in India.[3]

To date, this is the first study to report on the frequency of histologically diagnosed oral pathological lesions in pediatric patients in Jabalpur, Madhya Pradesh. The objective of this study is to conduct a retrospective analysis of pediatric oral biopsies received by the Department of Oral and Maxillofacial Pathology, Hitkarini Dental College and Hospital, Jabalpur, spanning from March 2009 to 2025, with a focus on demographic and clinical parameters, including age, sex, biopsy site, and type of pathology.

Methods

The study was conducted after obtaining approval from the Institutional Ethics Committee, which determined that the research proposal qualified for exemption due to its minimal risk category (HDCH-IEC 23/2025).

All biopsy records from March 2009 to 2025 for patients aged 16 or younger were retrieved and analyzed. The study involved a comprehensive analysis of the entire target population, utilizing a census approach that encompassed every relevant case without applying any sampling methods. This methodology effectively eliminated sampling errors, providing a precise and detailed characterization of all pediatric biopsy specimens received by the institute during the defined period. By including all eligible records, the study ensured a thorough examination of the full dataset.

The study included cases with comprehensive pathological records, biopsy reports from patients aged 16 or younger, and all oral and maxillofacial biopsies collected between 2009 and

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March 2025, encompassing both soft tissue and bony pathologies. Excluded were biopsies of nonoral lesions and reports with incomplete data.

Among 2,523 cases, 169 (6.7%) were pediatric biopsies. These cases were assessed based on age, gender, site, and pathological diagnosis. Patients were grouped into three age categories: primary dentition (0–5 years), mixed dentition (6–10 years), and permanent dentition (11–16 years). Biopsies were classified as intraosseous or extraosseous, with intraosseous further categorized as nonodontogenic or odontogenic, and odontogenic lesions subdivided into developmental and inflammatory types.

Data were entered into Microsoft Excel 365 and subsequently analyzed statistically using version 23.0 of the Statistical Package for Social Sciences (IBM Corporation, Armonk, New York, USA). Frequencies, percentages, mean, standard deviation, and minimum and maximum values of variables were calculated. As data on pediatric oral pathologies were categorical (numbers and percentages), Pearson's Chi-square test was applied for further data analyses. In cases where the expected frequency in any cell was <5, the Chi-square test was applied with Yates' continuity correction to ensure accurate results. A *p*-value <0.05 was considered statistically significant.

Results

Among 2,523 biopsies received over 15 years, 169 (6.7%) were from pediatric patients, with a male predominance of 98 (57.99%) cases compared to 71 (42.01%) in females (Fig. 1). The majority of oral lesions, 117 (69.23%), occurred in children aged 11–16 years, whereas the lowest frequency, 9 (5.33%), was seen in children under 5 years (Fig. 2).

We categorized the total 169 histopathological biopsies into intraosseous, 96 (56.80%), and extraosseous lesions, 73 (43.20%). Among the intraosseous pediatric oral pathologies, 80 cases (83.33%) originated from odontogenic sources, whereas 16 cases (16.67%) had nonodontogenic origins (Fig. 3). Among a total of 80 odontogenic pediatric oral pathologies, 59 (73.75%) were developmental and 21 (26.25%) were inflammatory (Fig. 4). The most common diagnoses were mucocele ($n = 23$, 13.61%), followed by dentigerous cyst ($n = 18$, 10.65%), and odontogenic keratocyst ($n = 16$, 9.47%) (Table 1).

The findings of this study showed that the majority of intraosseous pathologies in pediatric patients occurred in the

Table 1: Distribution of pediatric oral pathologies according to histopathological examination

Histopathology		*n (%)*
Intraosseous	Dentigerous cyst	18 (10.65)
	Odontogenic keratocyst	16 (9.47)
	Ameloblastoma	8 (4.73)
	Hyperplastic dental follicle	8 (4.73)
	AOT	5 (2.96)
	Radicular cyst	14 (8.28)
	Periapical granuloma	6 (3.55)
	Ossifying granuloma	5 (2.96)
	Melanocytic neuroectodermal tumor	1 (0.59)
	Others	15 (8.88)
Extraosseous	Mucocele	23 (13.61)
	Pyogenic granuloma	9 (5.33)
	Traumatic fibroma	9 (5.33)
	Inflammatory gingival hyperplasia	8 (4.73)
	Neurofibroma	4 (2.37)
	Others	20 (11.83)
Total		169 (100.00)

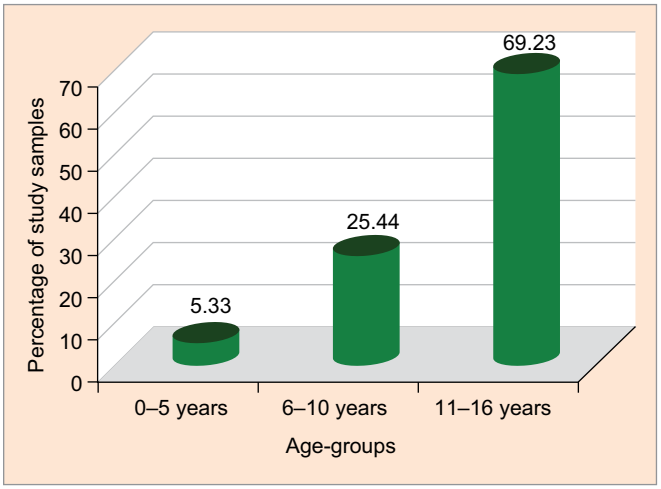

Fig. 2: Age-group-wise distribution of study samples

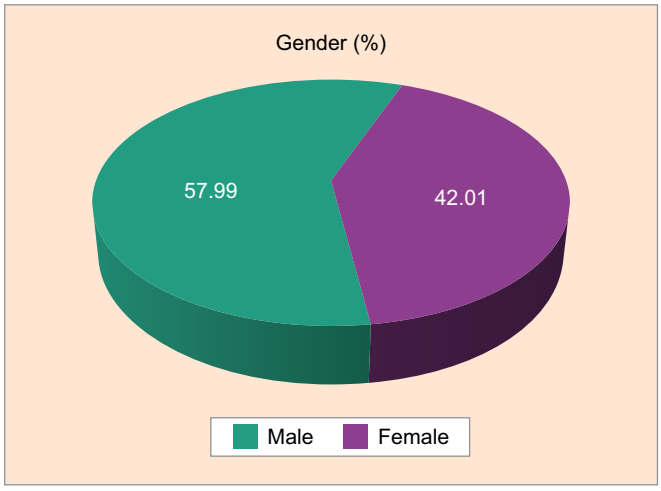

Fig. 1: Gender-wise distribution of study samples

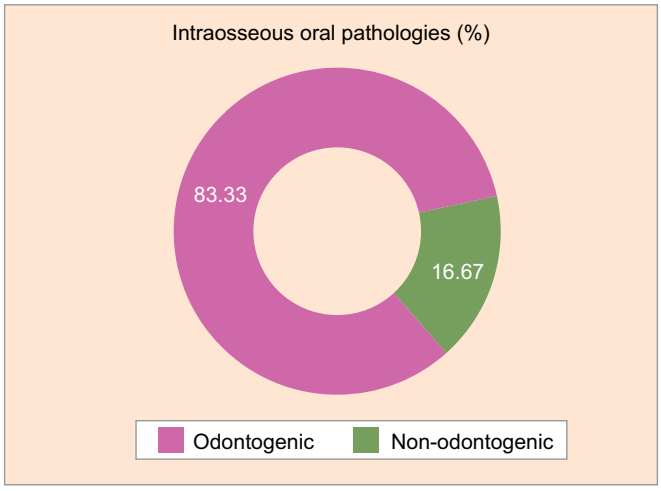

Fig. 3: Classification of intraosseous pediatric oral pathologies ($n = 96$)

Table 2: Age-wise comparison of intraosseous pathologies ($n = 96$)

Intraosseous pathologies	*Age-groups*			*Total*
	0–5 years n (%)	*6–10 years* n (%)	*11–16 years* n (%)	n (%)
Dentigerous cyst	0 (0.00)	9 (50.00)	9 (50.00)	18 (100.00)
Odontogenic keratocyst	0 (0.00)	2 (12.50)	14 (87.50)	16 (100.00)
Ameloblastoma	0 (0.00)	3 (37.50)	5 (62.50)	8 (100.00)
Hyperplastic dental follicle	1 (12.50)	0 (0.00)	7 (87.50)	8 (100.00)
AOT	0 (0.00)	1 (20.00)	4 (80.00)	5 (100.00)
Radicular cyst	0 (0.00)	2 (14.29)	12 (85.71)	14 (100.00)
Periapical granuloma	0 (0.00)	1 (16.67)	5 (83.33)	6 (100.00)
Ossifying granuloma	0 (0.00)	1 (20.00)	4 (80.00)	5 (100.00)
Melanocytic neuroectodermal tumor	1 (100.00)	0 (0.00)	0 (0.00)	1 (100.00)
Others	2 (13.33)	1 (6.67)	12 (80.00)	15 (100.00)
Total	4 (4.17)	20 (20.83)	72 (75.00)	96 (100.00)

Chi-square test: Yates' $\chi^2 = 18.535$, df = 18, $p = 0.421$ (>0.05); Not significant

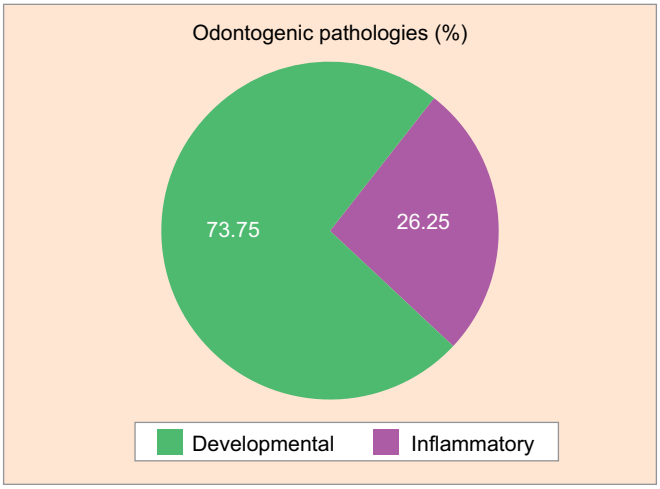

Fig. 4: Classification of odontogenic pediatric oral pathologies ($n = 80$)

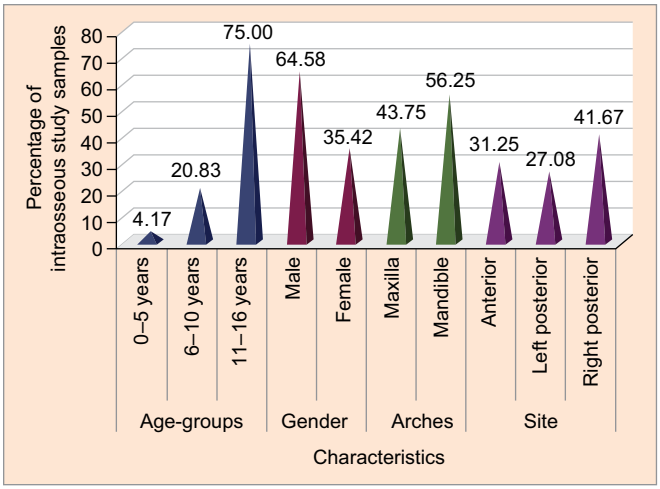

Fig. 5: Distribution of intraosseous pediatric oral pathologies according to age, gender, arches, and site ($n = 96$)

11–16-year age range (75.00%, $n = 72$) (Table 2), with males being disproportionately affected (64.58%, $n = 62$). Notably, the mandible

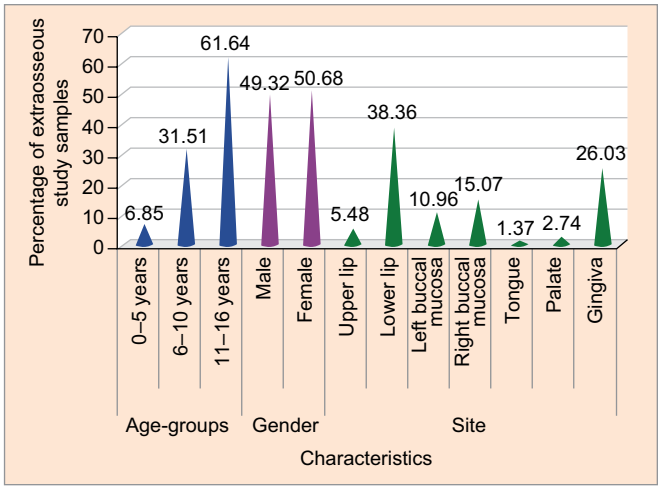

Fig. 6: Distribution of extraosseous pediatric oral pathologies according to age, gender, and site ($n = 73$)

was the most common site for these lesions (56.25%, $n = 54$), particularly the posterior right side (41.67%, $n = 40$) (Fig. 5).

Pediatric extraosseous pathologies peaked in the 11–16-year age-group (61.64%, $n = 45$) (Table 3) with a balanced gender distribution, and the lower lip was the most frequently affected site (38.36%, $n = 28$) (Fig. 6).

Discussion

As the sole dental institute in the district and a major referral center for oral lesion histopathology, our institution's data provide a representative snapshot of pediatric oral lesion prevalence in Jabalpur district.

Previous research suggests that pediatric oral biopsies account for 7–15% of all biopsies sent for histopathological examination. The variation in this percentage can be attributed to differences in study methodology, including the duration of the study and different age-groups examined.[3]

Our analysis revealed a pediatric biopsy prevalence of 6.69% among all biopsies received. This rate exceeds the findings of Lei et al. (2.77%) and Chaturvedi (4.18%), yet falls short of the rates

Table 3: Age-wise comparison of extraosseous pathologies ($n = 73$)

	Age-groups			
Extraosseous pathologies	*0–5 years n (%)*	*6–10 years n (%)*	*11–16 years n (%)*	*Total n (%)*
Mucocele	1 (4.35)	10 (43.48)	12 (52.17)	23 (100.00)
Pyogenic granuloma	0 (0.00)	3 (33.33)	6 (66.67)	9 (100.00)
Traumatic fibroma	1 (11.11)	3 (33.33)	5 (55.56)	9 (100.00)
Inflammatory gingival hyperplasia	0 (0.00)	2 (25.00)	6 (75.00)	8 (100.00)
Neurofibroma	0 (0.00)	0 (0.00)	4 (100.00)	4 (100.00)
Others	3 (15.00)	5 (25.00)	12 (60.00)	20 (100.00)
Total	5 (6.85)	23 (31.51)	45 (61.64)	73 (100.00)

Chi-square test: Yates' $\chi^2 = 3.213$, $df = 10$, $p = 0.976$ (>0.05); Not significant

reported by Shah et al. (7%), Krishnan et al. (10.48%), Skinner et al. (12.8%), and Das and Das (12.3%).[4–8]

This study encompasses subjects up to 16 years old, similar to the age range in Salian and Shetty's research.[2] The subjects were categorized into three groups based on dentition stage: primary (0–5 years), mixed (6–10 years), and permanent (11–16 years). Previous studies have utilized diverse age ranges, including Nithya et al. (0–13 years), Chaturvedi (0–14 years), Krishnan et al. (0–15 years), Mishra and Singh (0–17 years), and Das and Das (0–20 years), highlighting the variability in age classification.[3,6,8–10] Maximum pathologies (69.23%) were reported in higher age-group (11–16 years), similar to most of the previous research. The increased frequency could be linked to the body's rapid development, fostering an environment that impacts the growth potential of neoplasms, if existing. Moreover, the heightened odontogenic activity during this phase might also play a role in the elevated occurrence of lesions.

The study revealed a male preponderance, with males constituting 57.99% of cases and females accounting for 42.01%. This finding is in line with previous studies by Salian and Shetty, Chaturvedi, and Nithya et al., which also reported male dominance. However, it contrasts with Krishnan et al.'s study, which found a notable female predominance.[2,3,6,10]

The most frequently encountered pathology was mucocele, which accounted for 13.61% of cases, with the lower lip being the predominant site of occurrence. This finding is likely attributed to the high incidence of mechanical trauma in this area, which is consistent with the results reported by Skinner et al., Das and Das, and Chaturvedi in their respective studies.[3,7,8]

Intraosseous pathologies in this study were predominantly odontogenic cysts of developmental origin, with dentigerous cysts (10.65%) being the most common, followed by odontogenic keratocysts (9.47%) and then radicular cysts (8.28%). This order differs from previous studies, such as those by Krishnan et al., Mahmoudi et al., and Nithya et al., which reported radicular cysts as the second most common after dentigerous cysts, and odontogenic keratocysts as the least common.[6,9,11] In contrast, Salian and Shetty's study found radicular cysts to be the most prevalent, followed by dentigerous cysts and odontogenic keratocysts.[2] The higher prevalence of developmental cysts in this study may be attributed to underreporting of periapical cysts due to clinical diagnosis and potential loss of epithelial lining during specimen handling. Consistent with Mahmoudi et al.'s finding, the mandible was the most common site for dentigerous cysts and odontogenic keratocysts, while the maxilla was the most common site for radicular cysts.[11]

Odontogenic tumors in this study were led by ameloblastoma (4.73%), primarily affecting individuals aged 11–16 years, with a male predominance similar to the study by Yasothkumar et al.[1] Adenomatoid odontogenic tumor (AOT) (2.96%) was the second most common, also predominantly affecting the 11–16-year age-group, but found exclusively in females. This female exclusivity in AOT cases supports the existing evidence of its strong female predilection. Notably, this study also encountered two rare instances of melanotic neuroectodermal tumor of infancy, adding to the diversity of odontogenic tumor cases.

Conclusion

This pioneering study in Jabalpur district and Madhya Pradesh state sheds light on the prevalent oral pathologies affecting children in the region, exploring their correlation with age, sex, and site. The most common diagnoses were mucocele ($n = 23$, 13.61%), followed by dentigerous cyst ($n = 18$, 10.65%), and odontogenic keratocyst ($n = 16$, 9.47%). Given the scarcity of such research in India, particularly in this geographic zone, our findings provide valuable insights for pediatric dentists and clinicians. The study's results can inform early diagnosis and effective management, empowering healthcare professionals with crucial information on the prevalence and characteristics of these lesions.

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