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Comprehensive Analysis of Pediatric Pathology Cases (2022-2024): A Retrospective Study

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ABSTRACT

Background: Pediatric pathology cases encompass a wide spectrum of lesions, ranging from odontogenic cysts to benign tumors and fibro-osseous conditions. Understanding the prevalence, distribution, and treatment approaches is crucial for accurate diagnosis and effective management.Objective: This study aims to analyze pediatric pathology cases from 2022 to 2024, focusing on lesion types, patient demographics, laterality trends, and surgical interventions.Methods:A retrospective analysis was conducted on pediatric pathology cases reported between 2022 and 2024. Data on age, gender, diagnosis, laterality, affected regions, radiographic findings, and surgical interventions were collected and statistically analyzed.Results: A total of 87 pediatric cases were analyzed. Odontogenic cysts (32.2%) were the most frequently diagnosed lesions, followed by benign odontogenic tumors (12.6%), fibro-osseous and bone pathologies (10.3%), and soft tissue/salivary gland tumors (13.8%). A slight right-side predominance (50.6%) was noted, with the sexant five regions being most commonly affected (25.3%). Excision was the preferred treatment approach (79.3%). A subset analysis of the 2022(40 cases) and the 2023 dataset (36 cases) revealed a higher female predominance in 2023 (60%) and a greater incidence of fibro-osseous and soft tissue/salivary gland tumors compared to 2022. Conclusion :Odontogenic cysts remain the most prevalent pediatric pathology, with benign tumors and fibro-osseous lesions also contributing significantly. Laterality trends varied across subsets, and excision was the dominant treatment approach. A multidisciplinary correlation of clinical, radiographic, and histopathological findings is essential for accurate diagnosis and management.

1. INTRODUCTION

Oral health plays a crucial role in the overall well-being of children, with pathological conditions in the oral cavity potentially affecting nutrition, speech, development, and quality of life. Pediatric oral pathologies encompass a wide range of conditions, including cysts, tumors, inflammatory lesions, developmental anomalies, and reactive changes. Although the prevalence of serious oral diseases in children is lower than in adults, the clinical and histopathological diagnosis of pediatric oral lesions remains a fundamental area of concern due to their potential implications for long-term oral function and aesthetics (1,2).

Retrospective studies are instrumental in identifying patterns, prevalence, and demographic characteristics of oral lesions in the pediatric population. Over the past few years, multiple institutional studies have shed light on the types and distributions of oral pathologies among children (3,4). The age distribution of pediatric oral lesions often reveals higher prevalence rates in older children, typically between 10–14 years (4,5). The lip and labial mucosa were common sites for soft tissue lesions, while the mandible was more frequently involved in intraosseous lesions (1,3). These anatomical and age-related trends underscore the importance of age-specific diagnostic approaches in pediatric oral health.

Histopathological diagnosis continues to be the gold standard for confirming the nature of oral lesions. It facilitates the differentiation between benign, reactive, and neoplastic processes, thereby guiding appropriate treatment planning (1,6,8).

Despite similarities in overall lesion types across countries, regional variations in lesion prevalence and anatomical site involvement suggest the influence of environmental, genetic, dietary, and cultural factors (5,7). For instance, the role of trauma and habits in reactive lesions like mucoceles and fibrous hyperplasias may be more pronounced in populations with limited access to preventive dental care (2,5). Moreover, the gender distribution observed in many studies shows a slight female predilection, possibly influenced by hormonal or behavioral factors (3,6). In the years following 2014, there has been insufficient research on juvenile oral pathology. As a result, it was thought to be valuable to look into whether the prevalence and pattern of childhood oral illnesses in the state of Tamil Nadu varied by race and geography in the current situation (2,4).

This study aims to provide a comprehensive retrospective analysis of pediatric oral pathology cases diagnosed between 2022 and 2024. By evaluating the types, frequencies, demographic characteristics, and histopathological diagnoses of lesions, the study seeks to contribute to the growing body of literature on pediatric oral health and support better clinical decision-making in the management of oral diseases in children.

2. MATERIALS AND METHODS

Study Design

A retrospective study was conducted using pathology records from 2022 to 2024. Data from 87 pediatric patients out of 1800 patients were collected and categorized based on gender, age group, lesion type, laterality, anatomical location, radiographic features, and treatment approach.

Data Collection

Cases were classified into Odontogenic cysts (e.g., dentigerous cyst, radicular cyst, odontogenic keratocyst), Benign odontogenic tumors (e.g., ameloblastoma, odontome, adenomatoid odontogenic tumor), Fibro-osseous and bone pathologies, soft tissue , salivary gland tumors and Non-specific lesions requiring further correlation

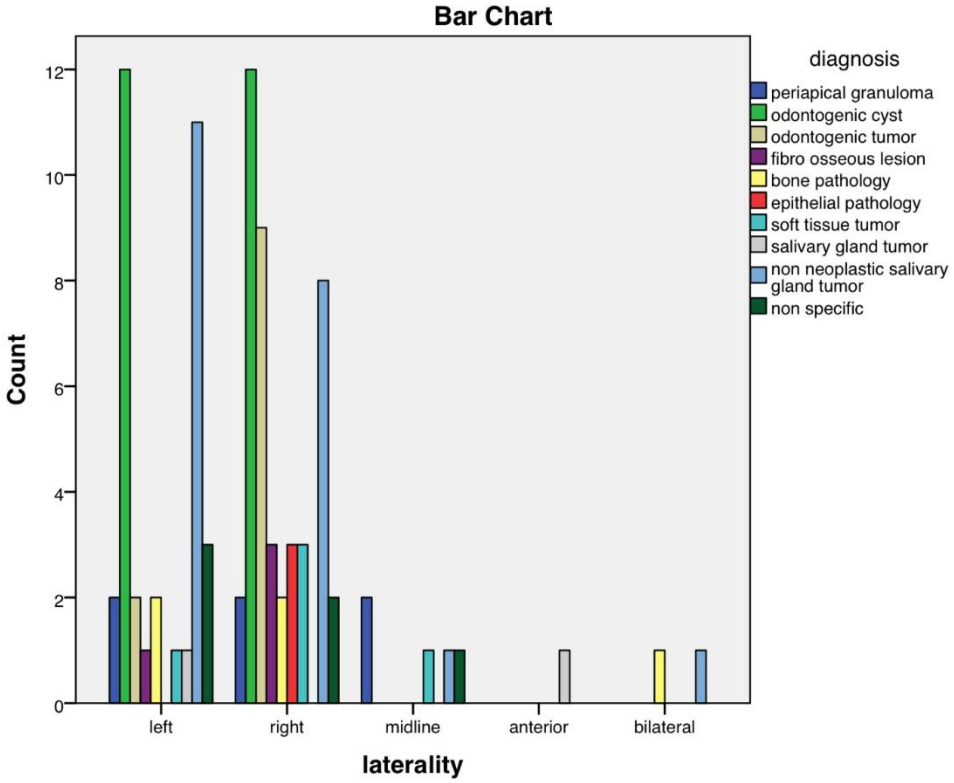
Statistical Analysis

Descriptive statistics were used to analyze gender distribution, lesion prevalence, laterality, and treatment trends. A comparative analysis of the first 40 cases and the 2023 dataset was conducted to identify variations.

3. RESULTS

The study analyzed 87 pediatric pathology cases, with a nearly equal gender distribution of 51.2% females and 48.8% males. The majority of cases (58.6%) occurred in the 11-18 years age group, while 40.2% were in younger children aged 1-10 years. Among the pathological findings, odontogenic cysts were the most prevalent (32.2%), followed by benign odontogenic tumors (12.6%), fibro-osseous and bone pathologies (10.3%), and soft tissue/salivary gland tumors (13.8%). A small percentage (6.9%) of cases were classified as non-specific lesions, requiring further clinical and radiographic correlation. In terms of laterality, right-sided lesions (50.6%) were more common than left-sided lesions (40.2%), with the most frequently affected regions being sexant five (25.3%) and sexant two (19.5%). Radiographic findings were unremarkable in 48.3% of cases, but when present, they typically revealed periapical radiolucencies or well-defined cystic lesions. Surgical excision (79.3%) was the preferred treatment approach, with incisional biopsy (20.7%) being used in select cases. These findings highlight the high prevalence of odontogenic cysts in pediatric patients and emphasize the importance of surgical intervention for definitive management.

A comparative analysis of the 2022 and 2023 pediatric pathology datasets revealed notable variations in gender distribution, lesion prevalence, laterality trends, and treatment approaches. In 2022, males were more prevalent (55.8%), whereas 2023 showed a shift toward female predominance (60%). Age distribution also differed, with a more balanced split in 2022 (46.2% in 1-10 years vs. 53.8% in 11-18 years), while 2023 had a higher concentration of older children (68.6% in 11-18 years). Odontogenic cysts remained the most common pathology, but their prevalence was slightly higher in 2023 (31.4%) compared to 2022 (25.0%). Interestingly, fibro-osseous (20%) and soft tissue/salivary gland tumors (22.9%) were more frequent in 2023 than in 2022 (3.8% and 7.7%, respectively), indicating a shift in lesion types. Laterality trends also varied, with 2022 showing a right-sided dominance (59.6%), while 2023 exhibited more left-sided lesions (51.4%). Excision remained the preferred treatment in both years, but its rate increased in 2023 (100%) compared to 2022 (80%), suggesting a stronger emphasis on complete lesion removal. These findings highlight evolving patterns in pediatric pathology cases, emphasizing the need for continued monitoring and a multidisciplinary approach to diagnosis and management.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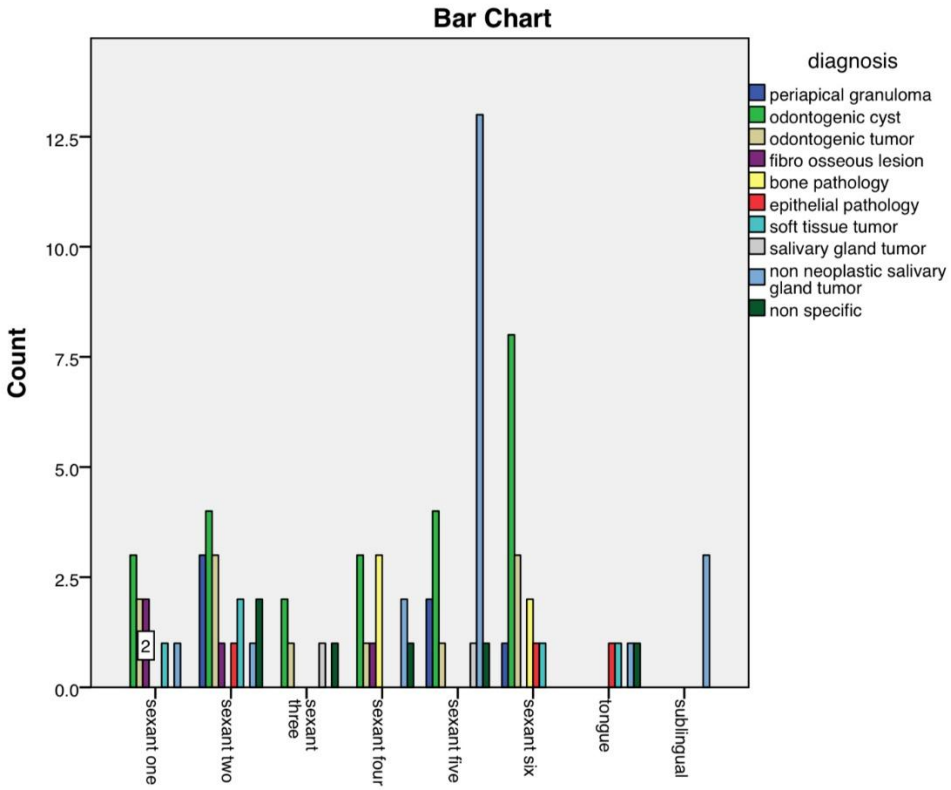
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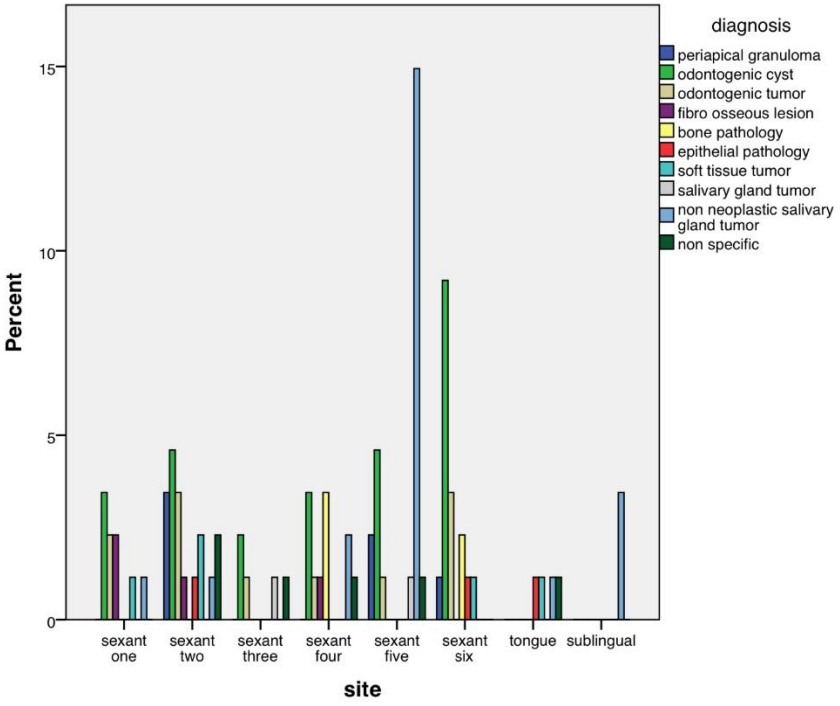
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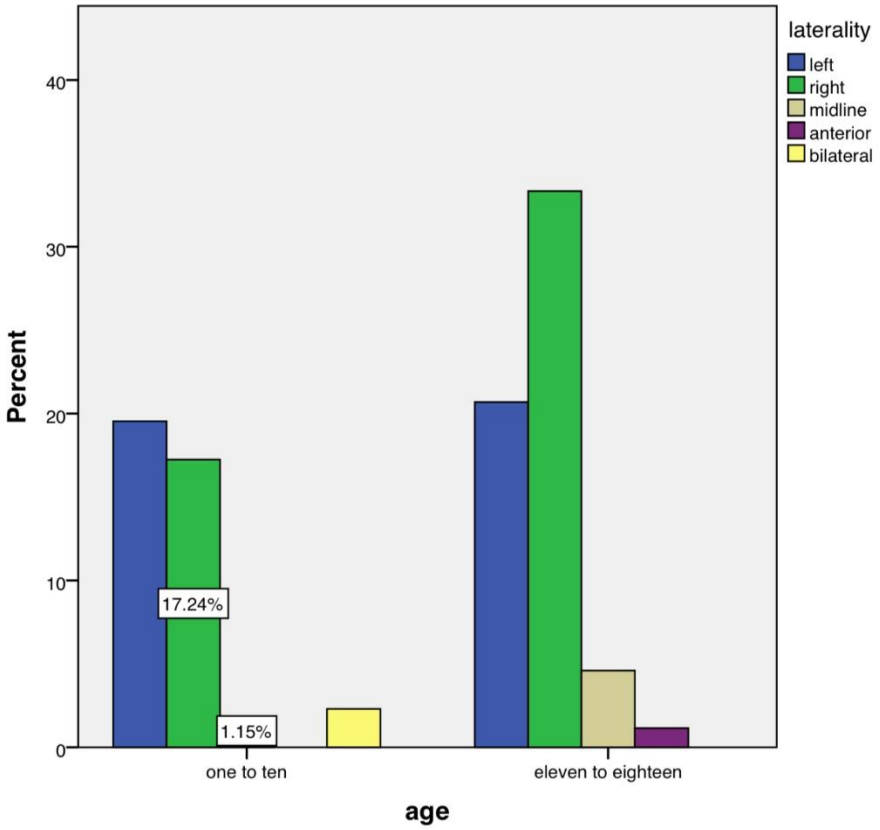
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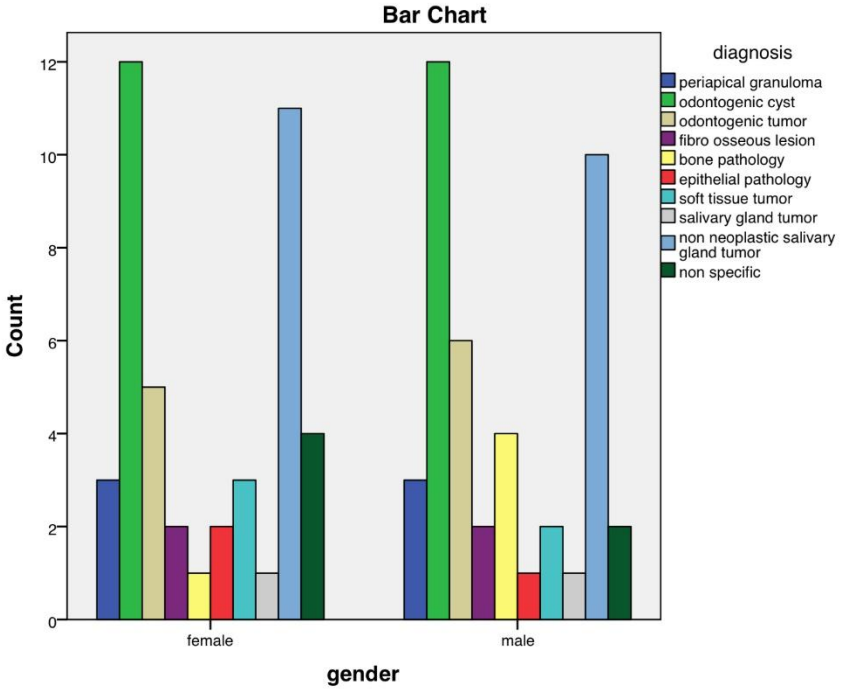

Composite bar charts representing the distribution of pediatric oral pathology cases by various parameters:

- (A) Distribution by laterality (left, right, midline, anterior, bilateral).
- (B) Age-wise laterality distribution (1–10 years vs. 11–18 years).
- (C) Distribution by anatomical site (sextants one to six, tongue, sublingual).
- (D) Percentage-wise distribution by anatomical site and diagnosis.
- (E) Gender-wise distribution of cases across diagnostic categories.

4. DISCUSSION

Our study of 87 pediatric patients with jaw lesions provides critical epidemiological insights into lesion prevalence, distribution, and management. When compared with findings from other regions, variations emerge in gender distribution, lesion prevalence, laterality, and treatment approaches. These differences highlight the importance of regional, genetic, and environmental factors in pediatric oral pathology.

Odontogenic cysts were the most prevalent lesions in our cohort (32.2%), consistent with earlier studies from Brazil, India, and Saudi Arabia where mucoceles, dentigerous cysts, and radicular cysts were commonly observed (10,11,15) Odontogenic tumors were also observed, including odontomas and ameloblastomas. While most literature cites odontoma as the most common odontogenic tumor, Dhanuthai et al. reported dentigerous cysts to be more frequent, suggesting regional or institutional differences in diagnostic thresholds and patient referral patterns(21)

Soft tissue tumors, particularly hemangiomas, emerged as the most prevalent connective tissue tumors in our data, followed by fibromas, ossifying fibromas, and giant cell lesions. These findings are congruent with Maia et al., who also reported hemangioma as the most common pediatric soft tissue tumor, and with Jones and Franklin, who reported similar prevalence rates of benign mesenchymal tumors in children. (17,19)The diversity in tumor types including rare presentations such as eosinophilic granuloma, osteoma, and neurofibroma highlights the importance of a comprehensive diagnostic approach incorporating histopathology, imaging, and clinical data.

Malignant neoplasms were rare, accounting for less than 5% of our cases comparable to previous reports by Jones and Franklin (1%) and Maia et al. (8.2%)(17,19). Diagnosed cases included parosteal low-grade osteosarcoma, mucoepidermoid carcinoma, and Ewing's sarcoma, consistent with earlier observations in studies examining malignant neoplasms in pediatric oral regions (28) While rare, these findings stress the necessity of early biopsy and specialist consultation when malignancy is suspected.

Fibro-osseous lesions represented another notable subset, with fibrous dysplasia and cemento-ossifying fibromas reported. These were especially frequent in 2023 and were similarly observed by Das et al. in their series on pediatric mandibular

tumors(18) Interestingly, our study saw a shift in lesion prevalence across the two years analyzed. In 2023, soft tissue/salivary gland tumors and fibro-osseous lesions increased significantly, contrasting with the higher cyst prevalence in 2022. Such year-to-year fluctuations may reflect changes in referral practices, diagnostic tools, or broader epidemiological trends.

In our study, we observed a slight female predominance (51.2%), which contrasts with the findings of Dhanuthai et al., in a large-scale study of nearly 2500 pediatric oral biopsies from Thailand, found a male-to-female ratio of 1.2:1, indicating a higher male prevalence.(21) In contrast, Jones and Franklin, in a 30-year retrospective study from the UK, found an almost equal gender distribution, similar to our study(17)This variation in gender distribution across different populations suggests multiple potential influencing factors, such as ,Hormonal differences that may affect tissue response to pathological processes.Genetic predisposition leading to higher susceptibility in certain populations.Behavioral and environmental factors, such as trauma incidence or dietary influences.While some reports suggest that males experience higher rates of trauma-related jaw lesions, others, like our study, indicate no significant gender-based risk. Future studies should analyze hormonal and genetic markers to explore gender differences further.

In terms of gender and age, our findings showed a near-equal gender split overall but a year-wise shift from male to female predominance. The majority of cases occurred in children aged 11–18, consistent with data from studies in Brazil and Malaysia, which also reported a higher incidence of lesions in adolescents (12,13)

Surgical excision was the primary treatment modality in our cohort (79.3%), increasing to 100% in 2023. This reflects growing clinical preference for complete lesion removal over diagnostic biopsy alone. This trend is supported by best practices established by the American Academy of Pediatric Dentistry(16) which recommend surgical intervention for definitive management of most benign and cystic lesions in children.Surgical excision was the primary treatment modality in our study (79.3%), aligning with Yasothkumar et al., who reported 70% excisional biopsies(22) Jones and Franklin, however, found a lower excision rate (65%), possibly due to institutional policies favoring incisional biopsy for diagnostic confirmation before complete removal(17)

A unique challenge in pediatric pathology remains the issue of non-specific histopathological diagnoses, observed in 18% of our cases. This is often due to a lack of clinical data, imaging, or insufficient biopsy samples. Similar diagnostic limitations were reported in other institutional studies, reinforcing the importance of interdisciplinary coordination between pedodontists, oral pathologists, and radiologists. Measures such as digital data management systems, like DIAS, have been implemented in our institution to capture and back up essential diagnostic details for future review and learning.

Our study found that 58.6% of cases occurred in the 11-18 years age group, with 40.2% in the 1-10 years group. This trend aligns with findings from the Bulgarian study, which reported a higher prevalence of jaw lesions in adolescents. Similarly, Das et al. observed an increase in pediatric jaw lesions with age, attributing it to Increased exposure to dental trauma and infections.Greater awareness and biopsy referrals in older children.Hormonal changes during adolescence that may influence lesion development(18)Tandon et al. (2020) conducted a 10-year study in Maharashtra, India, showing that 71.6% of pediatric jaw cysts occurred during the mixed dentition phase (7–15 years), supporting the observation that older children are more frequently affected due to increased dental development and potential for trauma This variation suggests that factors such as healthcare access and regional referral patterns may influence the observed age distribution.

In our study, odontogenic cysts were the most prevalent lesion type, accounting for 32.2% of cases. This is significantly higher than the 15% prevalence reported by Yasothkumar et al. A possible explanation for this discrepancy is that some institutions may report cystic lesions at later stages when surgical intervention is required, while others identify them earlier during routine radiographic evaluations.(22)

Our study reported odontogenic cysts in 32.2% of cases, closely aligning with findings from a comparative study involving Iranian data, which reported a 32.9% rate for dentigerous cysts as the most common subtype (26) Similarly, reported by Rezvani et al,found that radicular cysts (32.83%) and dentigerous cysts (31.34%) were the most prevalent odontogenic lesions in pediatric populations (27) These consistent patterns reinforce the importance of early detection and intervention in children with suspected jaw cysts.

Benign odontogenic tumors constituted 12.6% of cases in our study, similar to the 10.5% prevalence reported by Dhanuthai et al. However, Patil et al., in a 10-year study from Western India, found a higher prevalence (20%), with odontomas being the most commonly diagnosed tumor. (20,21)The differences in odontogenic tumor prevalence may be due to Referral bias (some centers receive more complex tumor cases).Variations in population genetics influencing tumor development.

Fibro-osseous and bone lesions accounted for 10.3% of cases in our study, aligning with findings from Iran, where Abbas et al. reported an 11% prevalence, with fibrous dysplasia being the most common subtype (25).In contrast, soft tissue and salivary gland tumors in our study were more frequent (13.8%) than in the Iranian cohort (6.1%), where mucoceles predominated (11). These variations may reflect differences in biopsy thresholds and diagnostic protocols between institutions.

Non-specific lesions in 6.9% of cases were reported in our study whereas the Iranian study reported a significantly higher

prevalence (25.1%) of reactive lesions, particularly pyogenic granuloma. The higher proportion of reactive lesions in their study suggests possible environmental or dietary factors influencing lesion development.

Our study reported a right-sided predominance (50.6%), whereas Yasothkumar et al. found a left-sided predominance (53%). However, both studies confirmed higher mandibular involvement, consistent with Maia et al., who found that the posterior mandible was the most frequently affected site in Brazilian pediatric patients.(22,19)The higher frequency of posterior mandibular lesions may be due to higher masticatory stress and increased retention of inflammatory triggers.Delayed symptom presentation in posterior regions may lead to more frequent biopsy and surgical interventions.

In our study we found unremarkable radiographic findings in 48.3% of cases, comparable to Silva et al., who found that nearly 45% of pediatric jaw lesions lacked radiographic abnormalities.(9,23) This highlights the importance of clinical evaluation for accurate lesion diagnosis.

This study, along with comparisons to multiple international reports, highlights the importance of accurate diagnosis, regional variations in lesion prevalence, and the need for a multidisciplinary treatment approach. Differences in lesion distribution, gender ratios, laterality, and surgical preferences underscore the influence of genetic, environmental, and healthcare accessibility factors. Future research should focus on larger, multicentric studies with standardized lesion classification systems to enhance the global understanding of pediatric oral pathologies.

5. CONCLUSION

This study provides a comprehensive analysis of pediatric pathology cases from 2022 to 2024, reinforcing the predominance of odontogenic cysts, the significance of benign tumors and fibro-osseous lesions, and the trend toward complete lesion excision. The subset analysis highlights variations in gender distribution, lesion types, and laterality trends, underscoring the importance of continued surveillance and multidisciplinary diagnostic approaches. Future research with larger datasets and longitudinal follow-ups can further enhance understanding and optimize management strategies.

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