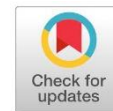


Research Article

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Prevalence and Distribution of Biopsied Oral Lesions in Pediatric Patients at the Faculty of Dentistry, University of Benghazi: A 20-Year Retrospective Study



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Abstract

Pediatric oral lesions comprise a diverse group of conditions with varying clinical behavior and histopathological characteristics. Despite extensive global research, epidemiological data from North African populations, including Libya, remain limited. To define the distribution of biopsy-confirmed oral lesions in Libyan pediatric patients and assess their associations with age, sex, and anatomical location. A retrospective descriptive study was conducted using archival records from the Department of Oral Pathology, Faculty of Dentistry, University of Benghazi. All biopsy-confirmed oral lesions in patients aged 0-14 years between January 2000 and December 2019 were included. Data collected included age, sex, lesion type, and anatomical site. Lesions were categorized into inflammatory/reactive, neoplastic, cystic, and miscellaneous groups. Statistical analysis was performed using Chi-square test, with significance set at $p < 0.05$. A total of 265 cases were analyzed. The majority of lesions occurred in patients aged 11-14 years (53.4%), with slight male predominance (52.5%). Inflammatory and reactive lesions were the most common category (53.9%), followed by neoplastic (23.7%), predominantly affecting the lip. Among individual lesions, extravasation mucocele was the most frequently encountered diagnosis, representing 63 cases (23.7%), with a clear predilection for the lower lip. A statistically significant association was observed between age and lesion category ($p=0.03$), whereas no significant association was found with sex. Inflammatory and reactive lesions formed the majority of biopsied oral lesions in Libyan pediatric patients, with extravasation mucocele being the most common diagnosis. These results provide regional epidemiological data and support the demand for histopathological assessment of persistent or atypical pediatric oral lesions.

Keywords: Pediatric oral lesions, Oral pathology, Mucocele, Retrospective study, Epidemiology, Oral Biopsy, Libya.

INTRODUCTION

Children present with a wide range of oral lesions, many of which differ in etiology and behavior and clinical presentation from those observed in adults. These lesions may affect the oral cavity, jaws and surrounding structures, and can be broadly classified as developmental, inflammatory, reactive, or neoplastic (Melo et al., 2023). Although many oral lesions in children are benign, accu-



rate diagnosis is crucial because some entities may need immediate treatment or further investigation (Manlove et al., 2024).

Diagnosis can be challenging due to the complex anatomy of the oral maxillofacial region and overlap in clinical features among different lesions. Histopathological examination remains the gold standard for diagnosis. Although many lesions are benign and self-limiting, distinguishing them from more serious conditions is essential to ensure appropriate management. In this context, dentists and pediatricians play a critical role in early detection, diagnosis, and management.

Oral lesions may arise from various tissues, including epithelium, connective tissue, bone, and salivary glands, and are influenced by both genetic and environmental factors. Understanding the distribution of these lesions can support more accurate clinical decision-making and improve patient care (Alhindi et al., 2019).

Several retrospective studies from different geographic regions have demonstrated considerable variation in the frequency and distribution of pediatric oral lesions. Reports from Brazil, Taiwan, Turkey, and the United Kingdom have consistently shown that inflammatory and reactive lesions represent the largest diagnostic category in children, although the relative prevalence of specific entities differs between populations (Sousa et al., 2002; Gultelkin & Turkseven, 2003; Jones & Franklin, 2006; Wang et al., 2009). Mucocele, pyogenic granuloma, and reactive fibrous lesions are considered some of the most reported diagnoses, likely related to trauma, oral habits, and inflammatory processes during childhood and adolescence. On the opposite side, odontogenic tumors and malignant neoplasms are overall uncommon in children, accounting for only a small proportion of biopsied lesions in the majority of previous studies.

Recent systematic reviews further show the predominance of benign inflammatory and reactive lesions in children and adolescents globally, while also revealing the deficiency of epidemiological data from Africa and Middle East (Melo et al., 2023). The scarcity of regional clinicopathological studies limits the understanding of the potential role of geographic factors in disease patterns. In Libya, studies on pediatric oral pathology remain scarce, despite the importance of early diagnosis of oral lesions in children. Building regional epidemiological profiles may help clinicians in achieving more accurate differential diagnoses, improving referral pathways, and increasing awareness of lesions that require histopathological assessment.

Therefore, this study aimed to evaluate the distribution of biopsied oral lesions in Libyan pediatric patients over a 20-year-old period and compare the findings with international data.

The primary aim of this study was to assess the frequency, along with the age, sex, and location, of biopsied oral lesions in Libyan pediatric patients. Furthermore, our findings were compared with those reported in previous studies conducted in other regions.

MATERIALS AND METHODS

Study design and setting

This retrospective descriptive study was conducted using archival records from Department of Oral Pathology, Faculty of Dentistry, University of Benghazi, a major referral center for oral maxillofacial pathology in eastern Libya.

Ethical approval was obtained for this study from the Ethics and Research Committee of the Faculty of Dentistry, University of Benghazi. All data was anonymized and the need for individual patient consent was waived by the ethics committee.

Study population

All biopsy-confirmed oral lesions in pediatric patients aged 0-14 years diagnosed between January 2000 and December 2019 were included in this study. Cases with incomplete demographic or diagnostic information were excluded. Only histopathologically confirmed lesions were included to ensure accurate diagnosis.

Data collection

Data were extracted using a standardized data collection form. The variables recorded included age, sex, histopathological diagnosis, and anatomical location of the lesion. Age was categorized into three groups: 0-5 years, 6-10 years, and 11-14 years.

For the analysis, lesions were classified into four major categories: inflammatory/reactive lesions, neoplastic lesions, cystic lesions, and miscellaneous conditions. Anatomical sites included the lip, gingiva, buccal mucosa, palate, tongue, maxilla, and mandible.

Pathological classification of lesions: Lesions were categorized according to standard histopathological classification based on the WHO/IARC framework and published pediatric oral pathology classifications.

Benign soft tissue tumors included

lipoma, neurofibroma, pleomorphic adenoma, papilloma, fibrous histiocytoma, myxofibroma, and diffuse lipomatosis.

Odontogenic tumors included

adenomatoid odontogenic tumor (AOT), ameloblastoma, ameloblastic fibroma, calcifying epithelial odontogenic tumor (CEOT), and odontomas.

Malignant tumors included

Burkitt lymphoma, rhabdomyosarcoma, and malignant pleomorphic adenoma.

Vascular/intermediate tumors included

hemangioma, lymphangioma, hemangioendothelioma, and aggressive juvenile hemangioendothelioma.

Tumor-like/reactive lesions included

eosinophilic granuloma, fibromatosis, bony exostosis, congenital epulis, and selected fibro-osseous/reactive lesions depending on classification criteria.

Note: A statistically significant association was observed between **Age Category** and **Pathological Category** ($\chi^2=18.4$, $df=9$, $p\approx 0.03$), whereas no significant association was found between **Gender** and **Pathological Category** ($p=0.28$).

Other: neuroma, non-specific sialadenitis, non-caseating granuloma.

**Includes cases identified as infected dentigerous cysts.*

OKC = Odontogenic keratocyst

AOT = Adenomatoid odontogenic tumor

CEOT = Calcifying epithelial odontogenic tumor

Statistical analysis

Data were analyzed using descriptive and inferential statistics. Frequencies and percentages were used to summarize categorical variables. The association between categorical variables, including sex and lesion category, as well as age group and lesion category, was assessed using the Chi-

square test. Statistical significance was set at $p < 0.05$. All analyses were performed using Jamovi software (version 2.3.28.0).

RESULTS

A total of 265 pediatric patients with biopsy-confirmed oral lesions were included in this study. The majority of cases were observed in the 11–14 year age group ($n=142$, 53.5%), followed by the 6-10-year group ($n=95$, 36.1%), while the least affected group was 0-5 years ($n=28$, 10.5%). Overall, a slight male predominance was observed, with 139 males (52.5%) and 126 females (47.5%). This distribution was consistent across most age groups.

Table: (1). Age and sex distribution of pediatric patients with biopsy-confirmed oral lesions ($n=265$).

Age (years)	Female	Male	Total	P. value
0-5	17	11	28(10.5%)	
6-10	46	49	95(36.1%)	
11-15	63	79	142(53.5%)	
Total	126	139	265	

When classified by pathological category, inflammatory and reactive lesions were the most frequent, accounting for 143 cases (53.9%). This was followed by neoplastic lesions ($n=63$, 23.7%), cystic lesions ($n=45$, 16.9%), and miscellaneous conditions ($n=14$, 5.2%).

Table: (2). Distribution of pathological categories among pediatric patients and sex distribution.

Pathological Diagnosis	F	M	Total n (%)	P. value
Inflammatory and reactive	70	73	143(53.9%)	
Neoplastic	28	35	63(23.7%)	
Cystic	19	26	45(16.9%)	
Other	9	5	14(5.2%)	
Total	126	139	265	

Statistical analysis revealed a significant association between age group and lesion category ($\chi^2=18.4$, $df=9$, $p=0.03$), indicating that certain lesion types were more common in specific age groups. In contrast, no statistically significant association was found between sex and lesion category ($p=0.28$).

Table: (3). Distribution of the most frequent oral lesions and their predominant anatomical sites.

Pathological diagnosis	n (%)	Predominant site(n)
Extravasated mucocele	63(23.7%)	Lip (40)
Inflamed cyst wall	26(9%)	Maxilla (7)
Pyogenic granuloma	24(8.6%)	Maxilla (5)
Pleomorphic adenoma	8(3%)	Buccal mucosa (3)
Dentigerous cyst	8(3%)	Maxilla (3)
Total	129(47.3%)	-

Among individual lesions, extravasation mucocele was the most frequently encountered diagnosis, representing (63 cases (23.7%)), with a clear predilection for the lower lip. Inflamed cyst wall lesions ($n=26$, 9%) and pyogenic granuloma ($n=24$, 8.6%) were the next most common entities. Pleo-

morphic adenoma accounted for 8 cases (3%), while dentigerous cysts were also observed in 8 cases (3%), predominantly affecting the maxilla.

Malignant lesions were rare, comprising only a small fraction of the total cases. These included Burkitt's lymphoma and rhabdomyosarcoma, occurring across a broad age range but predominantly in younger and early adolescent patients.

Table: (4). Age and sex distribution of inflammatory and reactive oral lesions (n=143).

Pathological Diagnosis	0–5	6–10	11–15	Female	Male	Total
Extravasated mucocele	4	30	29	31	32	63
Pyogenic granuloma	4	10	10	15	9	24
Fibrous lesions (polyp, epulis, overgrowth)	3	5	10	7	11	18
Retention mucocele	0	1	5	3	3	6
Granulation / Inflamed fibrous tissue	0	2	4	4	2	6
Nonspecific inflammatory reaction	2	2	2	5	1	6
Giant cell granuloma	1	3	1	0	5	5
Chronic suppurative osteomyelitis	0	2	0	1	1	2
Frictional keratosis	0	1	1	0	2	2
Specific granulomatous reaction	0	0	1	1	0	1
Lichen planus	0	1	1	1	1	2
Periapical granuloma	0	0	2	0	2	2
Degenerative / Necrotic tissue	1	1	0	1	1	2
Others	0	2	2	2	2	4
Total	15	60	68	71	72	143

Table: (5). Age and sex distribution of cystic lesions (n=45).

Pathological Diagnosis	0–5	6–10	11–15	F	M	Total
Inflamed cyst wall	1	9	16	14	12	26
Dentigerous cyst*	0	4	4	1	7	8
Radicular cyst	0	2	1	2	1	3
Dental cyst	0	0	2	0	2	2
Odontogenic cyst wall	0	1	1	0	2	2
Dermoid cyst	1	0	0	1	0	1
Gorlin cyst	0	0	1	1	0	1
Odontogenic keratocyst	0	0	1	0	1	1
Traumatic bone cyst	0	1	0	0	1	1
Total	2	17	26	19	26	45

Table: (6). Age and sex distribution of neoplastic oral lesions (n=62).

Pathological Diagnosis	0–5	6–10	11–15	F	M	Total
Benign soft tissue tumors	4	6	13	11	12	23
Odontogenic tumors	1	2	8	5	6	11
Malignant	1	2	3	4	2	6
Vascular tumors	0	2	6	2	6	8
Tumor-like / reactive	4	4	6	6	8	14
Total	10	16	36	28	34	62

DISCUSSION

A wide spectrum of pediatric oral lesions has been reported across different geographic regions, with notable variation in their distribution and relative frequencies. These differences are likely due to variations in study design, population characteristics, diagnostic thresholds, and healthcare access

(Martins-Filho et al., 2015; Maaaita, 2000). Nevertheless, certain consistent patterns have been reported in the literature, particularly the predominance of inflammatory and reactive lesions in children (Sousa et al., 2002; Jones & Franklin, 2006).

The present study provides a 20-year retrospective overview of biopsied oral lesions in Libyan pediatric patients, contributing valuable epidemiological data from a region where such information remains scarce. The overall frequency of pediatric cases was relatively low, which is in agreement with previous large retrospective studies that included broader age ranges or mixed population (Sousa et al., 2002; Jones & Franklin, 2006; Lima et al., 2008; Chen et al., 1998). Since, these studies were biopsy-based, findings reflect the demand for pathology services rather than population prevalence. This likely reflects the fact that many pediatric lesions are managed clinically without biopsy unless atypical or persistent.

In terms of age distribution, the highest proportion of lesions was observed in the 11-14-year age group, followed by children aged 6-10 years. This pattern has been consistently reported in previous studies and may be attributed to increased exposure to local irritants, trauma, and oral habits during the mixed and permanent dentition stages (Lawoyin, 2000; Wang et al., 2009; Melo et al., 2023). Gender distribution in the present study showed a slight male predominance; however, the difference was not statistically significant. This finding is consistent with several published reports that have demonstrated minimal or no gender predilection in pediatric oral lesions. (Jones & Franklin, 2006; Dhanuthai et al., 2007; Wang et al., 2009).

Inflammatory and reactive lesions represented the most common diagnostic category in this study. This predominance is consistent with findings from systemic reviews, which report similar patterns across diverse populations (Melo et al., 2023). The high frequency of these lesions may be attributed to local irritative factors such as trauma, poor oral hygiene, and changes in dentition. This group also tends to be overrepresented in biopsy-based studies due to clinical uncertainty in persistent or atypical presentations.

Extravasation mucocele was the most frequent individual lesion in the present cohort, accounting for nearly one-quarter of all cases. This finding is strongly supported by the literature, where mucocele is consistently reported as the most common pediatric oral lesion across different populations (Wang et al., 2009; Melo et al., 2023). Its predilection for the lower lip is well documented and is generally attributed to repeated minor trauma, particularly lip biting habits in children and adolescents.

Neoplastic lesions constituted a smaller proportion of cases, with the majority being benign. This distribution is in agreement with previous pediatric oral pathology studies, which consistently report a low frequency of malignancy in children (Jones & Franklin 2006; Sousa et al., 2002). Although rare, the identification of malignant lesions such as Burkitt's lymphoma and rhabdomyosarcoma in this study highlights the importance of maintaining a high index of suspicion and ensuring timely histopathological evaluation of unusual or rapidly growing lesions.

Among benign neoplasms, the predominance of pleomorphic adenoma differs from several published studies, where odontogenic tumors such as odontomas are more frequently reported (Wang et al., 2009; Melo et al., 2023). This variation may reflect differences in referral patterns, diagnostic practices, or population-specific factors. Nevertheless, benign tumors in pediatric populations generally show diverse histological origins and wide anatomical distribution, as also observed in the present study.

Cystic lesions represented a smaller proportion of cases, with inflamed cyst wall lesions and dentigerous cysts being the most frequently encountered entities. This pattern is consistent with previous reports highlighting the role of odontogenic infections and developmental disturbances in cyst formation (Sousa et al., 2002). However, some studies have reported dentigerous cysts as the dominant cystic lesion, indicating possible regional or methodological differences in diagnosis and classification.

Overall, the findings of this study are consistent with global patterns in pediatric oral pathology, particularly the predominance of reactive and inflammatory lesions and the low frequency of malignancy. The consistency of these findings across geographically diverse populations has also been highlighted in systematic reviews, suggesting that common etiological factors such as trauma, oral habits, and developmental processes play a universal role in lesion development (Melo et al., 2023).

Despite these similarities, some differences were observed when compared with other regions, particularly in the distribution of specific benign tumors. These variations may be influenced by differences in healthcare access, biopsy practices, and population demographics. Such discrepancies highlight the importance of regional epidemiological studies in understanding local disease patterns.

This study has several limitations. Its retrospective nature depends on the accuracy and completeness of archived records. In addition, only biopsy-confirmed lesions were included, which may underestimate the true prevalence of oral lesions in the pediatric populations, as many are diagnosed clinically without histopathological confirmation. Finally, being a single-center study, the findings may not fully represent the broader Libyan pediatric population. This study spanned a period of 20 years, which means referral patterns and classification criteria may have changed over the time.

CONCLUSION

Inflammatory and reactive lesions were the most common biopsied oral lesions in Libyan pediatric patients, and extravasation mucocele was the most frequent diagnosis. This investigation provides regional epidemiologic data from Libya and highlights the importance of histopathological confirmation for persistent, atypical, or clinically questionable pediatric oral lesions.

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ETHICS

This retrospective study was approved by the Research Ethics Committee of the Faculty of Dentistry, Benghazi University (Approval NO 0423).

Duality of interest: There is no duality of interest associated with this manuscript.

Author contributions: 1 and 2 developed the theoretical formalism and data collection, 3 performed the statistical analysis. 1,2 and 3 contributed to the writing of the final version of the manuscript.

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