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Evaluation of oral cavity pathologies in pediatric dentistry patients: A 10-year retrospective study

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Abstract

This study examines oral cavity pathologies' prevalence and age distribution in pediatric patients. All biopsy records performed in Tokat Gaziosmanpaşa University Faculty of Dentistry, Oral and Maxillofacial Surgery clinic between 2013-2023 were obtained from patient files and electronic databases. The files of patients aged 0-18 were selected, and demographic data and biopsy results were examined. The study population was divided into three groups according to the condition of the dentition. Pathology results were analyzed in 4 groups: developmental odontogenic cysts, inflammatory odontogenic cysts, tumoral lesions, and others. Obtained data and classifications were subjected to statistical analysis. A total of 411 biopsy results in pediatric patients were included in the study. Compared to all biopsies taken, a rate of 17.5% was observed. Since only three patients in the 0-6 age group were observed, they were not included in the statistical analysis. 69.3% of all pathologies were observed in the 12-18 age group and 30% in the 6-12 age group. The most common pathologies were radicular cysts (37.9%), dentigerous cysts (17.9%), and giant cell granulomas (7%). An increase in the prevalence and diversity of pathologies was observed with increasing age. In addition, developmental odontogenic cysts had significantly larger lesion sizes compared to inflammatory odontogenic cysts and other groups in terms of pathology dimensions (p:0.001 and p:0.000). In patients under 18 years of age, the prevalence of pathologies and diagnostic diversity increase as age progresses. Radicular cysts, dentigerous cysts, and giant cell granulomas are among the most common lesions.

Keywords: child, odontogenic cysts, odontogenic tumors, pathology

1. Introduction

Oral and maxillofacial pathologies observed in pediatric dentistry patients differ from general populations. Oral and maxillofacial pathologies cover a broad spectrum and are diagnosed by clinical, radiological, and histopathological evaluations similar to adult patients. Incisional or excisional biopsies are often required. Studies have been carried out on evaluating oral and maxillofacial pathologies in pediatric patients in different geographical regions (1–7). Among the general criteria in the studies, age groups, gender, year intervals, diagnoses, and radiographic findings are observed. Pathology prevalences report different results in studies in other geographical regions (8). Although diagnosing various mucosal lesions observed in the oral cavity is essential in dental practice, the number of studies on the prevalence of such lesions in children and adolescents is insufficient (2,9). The frequency and probability of possible soft tissue lesions should be known to perform the appropriate diagnosis and treatment. Odontogenic cysts and tumors constitute an essential aspect of oral and maxillofacial pathologies. Although odontogenic tumors are relatively rare, odontogenic cysts are vital for dental practice. Only a few studies on oral and maxillofacial pathologies in pediatric populations in Turkey draw attention (4,10). Epidemiological data on oral and maxillofacial lesions in Turkey's pediatric populations are insufficient. The histopathological prevalence of the lesions is essential for oral and maxillofacial surgery, pedodontics and other dentistry branches, otolaryngologists, and pediatricians. The aims of this study are;

To evaluate pediatric oral cavity lesions treated at the Faculty of Dentistry in a province (Tokat) in Turkey over ten years,

To compare the prevalence of oral cavity lesions with similar studies in adult populations.

It compares the prevalence of pediatric lesions with similar studies performed on pediatric populations nationally and internationally.

2. Material and Method

The ethical suitability of this retrospective study was approved

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by the Tokat Gaziosmanpaşa University Clinical Research Ethics Committee (Registration Number: 23- KAEK- 107, Date: 27.04.2023). The study was carried out per the Helsinki Declaration of Ethics for Medical Research Involving Human Subjects. Verbal consent was obtained from all participants or their relatives in the study, and all participants or their relatives were informed in detail about the study.

2.1. Patient Population

The pediatric population who underwent incisional or excisional biopsy in Tokat Gaziosmanpaşa University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery between January 2013 and June 2023 was included in this retrospective study. Considering similar studies, the age limit was determined as 18, and the patients were divided into three groups according to their dentition periods 0-6 years, 6-12 years, and 12-18 years (3,11). Age, gender, localization, and dimensions of pathologies were recorded from patient files. Diagnoses were classified under three headings: odontogenic cysts, tumors, and other oral cavity lesions. Odontogenic cysts were also grouped under two subheadings as developmental and inflammatory odontogenic cysts. The study did not include patients with missing or suspicious demographic data or biopsy results. Results with histopathology indicating normal tissues or without diagnostic validity were excluded from the study. Patients over 18, recurrent biopsies, and malignant lesions were excluded from the study.

2.2. Statistical analysis

Continuous data was presented as mean±standard deviation and categorical data in n(%) format. Descriptive, comparative, and correlation statistics were applied. Data normality was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests, revealing that the data did not follow a normal distribution. Consequently, non-parametric tests were utilized. The Mann-Whitney U test was employed to evaluate the difference between means of continuous data obtained from two distinct groups. The Kruskal-Wallis H test was conducted for constant data obtained from more than two groups, and post hoc analyses were performed using the Games Howell test. The relationship between two or more categorical variables was assessed using the chi-square test. All statistical computations were utilized using IBM SPSS Statistics v26.00, and a p-value less than 0.05 was considered statistically significant.

3. Results

Included in the study were a total of 411 patients, 231 of whom were female (Mean age 14.43±3.303) and 180 were male (Mean age 14.09±3.580). The proportion of females and males did not differ significantly. Among the participants, 287 (69.3%) were in the age group of 12-18 years, and 124 (30%) were in the age group of 6-12 years. The distribution of pathological diagnoses based on age groups, gender, and localization is presented in Table 1a,1b,1c. Radicular cysts, constituting 37.9% of the pathological diagnoses, ranked first, followed by dentigerous cysts at 17.9% and giant cell granulomas at 7%.

Table 1a. Distribution of pathologies by age and gender

		Total	Age Range			Gender	
			0-6	6-12	12-18	Female	Male
DOC	Dentigerous Cyst	74	0	23	51	40	34
	Odontogenic Keratocyst	13	1	1	11	6	7
	Lateral Periodontal Cyst	1	0	0	1	1	0
	Calcified Odontogenic Cyst	2	0	0	2	1	1
IOC	Radicular Cyst	157	2	35	120	81	76
TUMORAL	Osteoid Osteoma	1	0	0	1	0	1
	Leiomyoma	1	0	1	0	1	0
	Compound Odontoma	24	0	15	9	11	13
	Complex Odontoma	10	0	5	5	6	4
OTHERS	Granulation	11	0	5	6	7	4
	Exogenous Pigmentation	1	0	1	0	1	0
	Squamous Papilloma	5	0	0	5	4	1
	Inflammatory Tissue	22	0	6	16	15	7
	Ulceration	1	0	1	0	1	0
	Traumatic Bone Cyst	2	0	1	1	2	0
	Pyogenic Granuloma	5	0	4	1	2	3
	Polyp	3	0	1	2	3	0
	Irritation Fibroma	4	0	0	4	4	0
	Mucocele	4	0	1	3	2	2
	Fibrotic Tissue	12	0	2	10	6	6
	Periapical Granuloma	3	0	2	1	3	0
	Tmj Ankylotic Joint Head	3	0	0	3	3	0
	Supernumerary Teeth	2	0	0	2	2	0
	Squamous Papilloma	6	0	3	3	4	2
	Simple Bone Cyst	4	0	0	4	1	3
	Retention Cyst	29	0	13	16	17	12
	Hemangioma	3	0	0	3	1	2
	Odontogenic Fibroma	4	0	2	2	4	0

	Ameloblastic Papilloma	1	0	0	1	1	0
	Odontogenic Myxofibroma	1	0	1	0	1	0
	Fibrous Dysplasia	2	0	0	2	1	1
	Cemento-Osseous Dysplasia	1	0	0	1	0	1

DOC*: Developmental Odontogenic Cyst,* IOC*: Inflammatory Odontogenic Cyst*

Table 1b. Localizations of pathology in the jaws

	Maxilla Anterior	Maxilla Premolar	Maxilla Molar	Mandible Anterior	Mandible Premolar	Mandible Molar
Dentigerous Cyst	14	2	3	4	17	33
Odontogenic Keratocyst	0	0	2	1	0	8
Lateral Periodontal Cyst	0	0	0	1	0	0
Calcified Odontogenic Cyst	0	0	1	0	0	1
Radicular Cyst	20	12	43	4	19	57
Osteoid Osteoma	1	0	0	0	0	0
Leiomyoma	1	0	0	0	0	0
Compound Odontoma	16	2	0	3	0	2
Complex Odontoma	4	0	2	0	0	4
Granulation	3	0	0	0	5	1
Exogenous Pigmentation	0	0	0	0	0	0
Squamous Papilloma	1	0	0	0	0	0
Inflammatory Tissue	1	0	3	0	4	12
Ulceration	0	0	0	0	0	0
Traumatic Bone Cyst	0	0	0	0	2	0
Pyogenic Granuloma	2	1	0	0	1	0
Polyp	1	0	1	0	0	0
Irritation Fibroma	0	0	0	0	0	0
Mucocele	0	0	0	0	0	0
Fibrotic Tissue	0	0	0	0	1	0
Periapical Granuloma	0	1	0	0	0	2
Tmj Ankylotic Joint Head	0	0	0	0	0	1
Supernumerary Teeth	2	0	0	0	0	0
Squamous Papilloma	0	0	0	0	0	1
Simple Bone Cyst	2	0	0	0	0	2
Retention Cyst	4	2	5	2	12	4
Hemangioma	0	0	0	0	0	0
Odontogenic Fibroma	1	0	1	1	0	1
Ameloblastic Papilloma	0	0	0	0	0	1
Odontogenic Myxofibroma	0	0	0	0	0	1
Fibrous Dysplasia	0	0	0	0	0	2
Cemento-Osseous Dysplasia	0	0	0	0	0	1

Table 1c. Localizations of pathology outside the jaws

	Maxillary Sinus	Buccal Mucosa	Palatal Mucosa	Gingiva	Floor of Mouth	Lip	Tongue	Condyle Head
Dentigerous Cyst	1	0	0	0	0		0	0
Odontogenic Keratocyst	1	0	1	0	0		0	0
Lateral Periodontal Cyst	0	0	0	0	0		0	0
Calcified Odontogenic Cyst	0	0	0	0	0		0	0
Radicular Cyst	2	0	0	0	0		0	0
Osteoid Osteoma	0	0	0	0	0		0	0
Leiomyoma	0	0	0	0	0		0	0
Compound Odontoma	1	0	0	0	0		0	0
Complex Odontoma	0	0	0	0	0		0	0

Granulation	1	1	0	0	0	0	0
Exogenous Pigmentation	0	1	0	0	0	0	0
Squamous Papilloma	0	0	0	1	1	2	0
Inflammatory Tissue	0	0	0	2	0	0	0
Ulceration	0	0	0	1	0	0	0
Traumatic Bone Cyst	0	0	0	0	0	0	0
Pyogenic Granuloma	0	0	0	0	0	0	0
Polyp	0	0	0	1	0	0	0
Irritation Fibroma	0	1	0	0	0	3	0
Mucocele	2	0	0	0	0	0	0
Fibrotic Tissue	0	1	2	7	0	1	0
Periapical Granuloma	0	0	0	0	0	0	0
Tmj Ankylotic Joint Head	0	0	0	0	0	0	2
Supernumerary Teeth	0	0	0	0	0	0	0
Squamous Papilloma	0	0	0	1	2	1	0
Simple Bone Cyst	0	0	0	0	0	0	0
Retention Cyst	0	0	0	0	0	0	0
Hemangioma	0	0	0	0	0	3	0
Odontogenic Fibroma	0	0	0	0	0	0	0
Ameloblastic Papilloma	0	0	0	0	0	0	0
Odontogenic Myxofibroma	0	0	0	0	0	0	0
Fibrous Dysplasia	0	0	0	0	0	0	0
Cemento-Osseous Dysplasia	0	0	0	0	0	0	0

When evaluating the prevalence of the most common pathological formation, radicular cysts, it was found to be 41.8% in the 12-18 age group and 28.2% in the 6-12 age group. The proportion of females with radicular cysts was 41.8%, while for males, it was 34.9%. Radicular cysts accounted for 70.5% of pathologies from maxillary molars, 60% from maxillary premolars, and 42.5% from mandibular molars.

As for the second most common pathological formation, dentigerous cysts, their prevalence was 17.8% in the 12-18 age group and 31.1% in the 6-12 age group. The proportion of females with dentigerous cysts was 17.2%, while for males, it was 18.7%. Dentigerous cysts represented 44.6% of pathologies from mandibular molars, 23% from mandibular premolars, and 18.9% from the maxilla anterior region.

Table 2. Pathology classification and distribution by age classification

		Diagnosis				P
		Developmental Odontogenic Cyst	Inflammatory Odontogenic Cyst	Tumoral	Others	
Age Range	6-12	24	35	7	58	.007
	13-18	65	120	6	96	

A chi-square analysis was employed to evaluate the effect of age groups on pathological diagnoses. Data from the 0-6 age group were excluded because only three patients (0.7%) fell into this category. The analysis results are summarized in Table 2, indicating a statistically significant difference among age groups concerning pathological diagnoses (P=0.007). Notably, 73.1% of developmental cysts were found in the 12-18 age group, while only 26.9% were in the 6-12 age group. Further detailed analyses were conducted using the Kruskal-Wallis H test (Table 3), revealing a statistically significant difference in pathological diagnoses based on age (P=0.003). The 'other diagnoses' group appeared in younger generations compared to developmental and inflammatory odontogenic cysts (P=0.023 and P=0.024, respectively). However, there was no statistically significant difference in age compared to the tumor and similar group (P=0.863).

Statistically significant differences among pathological diagnosis groups regarding lesion size (P=0.000) were also found. Developmental odontogenic cysts had significantly larger lesion sizes compared to inflammatory odontogenic cysts and other diagnoses groups (P=0.001 and P=0.000, respectively)

Table 3. Relationship between pediatric oral pathology groups and dependent variables

			Games-Howell					Kruskal-Wallis H
Dependent Variable	(I) Diagnosis	(J) Diagnosis	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		P
						Lower Bound	Upper Bound	
Age	DOC	IOC	.212	.438	.963	-.92	1.35	**.003**
		Tumoral	2.131	1.068	.233	-.94	5.21	
		Others	1.316*	.457	**.023**	.13	2.50	
	IOC	DOC	-.212	.438	.963	-1.35	.92	
		Tumoral	1.919	1.040	.295	-1.11	4.95	
		Others	1.103*	.386	**.024**	.11	2.10	
	Tumoral	DOC	-2.131	1.068	.233	-5.21	.94	
		IOC	-1.919	1.040	.295	-4.95	1.11	
		Others	-.815	1.048	.863	-3.86	2.23	
	Others	DOC	-1.316*	.457	**.023**	-2.50	-.13	
		IOC	-1.103*	.386	**.024**	-2.10	-.11	
		Tumoral	.815	1.048	.863	-2.23	3.86	
Diameter	DOC	IOC	.5094*	.1255	**.001**	.182	.837	**.000**
		Tumoral	-.2013	.3585	.942	-1.234	.832	
		Others	.6635*	.1245	**.000**	.339	.988	
	IOC	DOC	-.5094*	.1255	**.001**	-.837	-.182	
		Tumoral	-.7107	.3420	.213	-1.721	.299	
		Others	.1540	.0630	.071	-.009	.317	
	Tumoral	DOC	.2013	.3585	.942	-.832	1.234	
		IOC	.7107	.3420	.213	-.299	1.721	
		Others	.8647	.3416	.103	-.145	1.874	
	Others	DOC	-.6635*	.1245	**.000**	-.988	-.339	
		IOC	-.1540	.0630	.071	-.317	.009	
		Tumoral	-.8647	.3416	.103	-1.874	.145	

DOC: Developmental Odontogenic Cyst **IOC:** Inflammatory Odontogenic Cyst

4. Discussion

Similar studies examining the prevalence of oral and maxillofacial pathologies in pediatric populations report different prevalences of pathologies in the pediatric population compared to the general population, with rates varying between 2.48% and 20.6% (1,5,8,12). A similar study conducted in Chile observed this rate as 20.6%. In a similar study conducted in Thailand over a 15-year period, a rate of 15.05% was observed (11). In a similar study conducted in Turkey, which included odontogenic cysts and odontogenic tumors, this rate was 12.7%, but soft tissue lesions were not included (4). This study is generally similar to the literature, and a similar rate of 17.5% is observed in our study (2340/411).

A clear consensus on establishing study groups based on age needs to be established. The general idea is to classify age groups according to dentition periods. While some studies have evaluated pediatric patient populations as under 14 or 16, this limit has been accepted as 17 or 18 in some studies (1,3–7,11,12). In our current study, the age limit of 18 was determined. In our current study, this age limit was evaluated by considering the eruption times of the third molars. In the present study, the female-male ratio is generally similar to the literature (Female/Male: 1,2/1) (1,4,7,11). 69.3% of the total pathologies were observed in the 12-18 age group and 30% in the 6-12 age group. This result confirms that the frequency of pathology increases with age in pediatric populations in line with the literature (12–14). However, there are also studies in the literature stating that the prevalence of pathology is higher in different age ranges (11,15).

When the prevalences of pathologies were examined in our current study, the most common subtypes were radicular cysts (37.9%), dentigerous cysts (17.9%), and giant cell granulomas (7%). This result parallels a similar study conducted by Tekkesin et al. in Turkey (4). In the study of Tekkesin et al., the most frequently observed odontogenic lesions were radicular cysts at 48.4% and dentigerous cysts at 16.7%. Our present study and this study are similar in this respect. One of the main differences between these two studies is that soft tissue pathologies were not included in the study of Tekkesin et al. In a similar study conducted in Brazil with a much larger patient population (2,408 patients) covering 75 years, the most common pathologies were observed as salivary gland pathologies, reactive lesions, and odontogenic cysts (16). In similar studies performed in Chile and Brazil, the most frequently observed lesions were reactive soft tissue lesions (3,17); In a survey conducted in the USA, mucoceles (18); Reactive soft tissue lesions in a study conducted in Egypt (19); In a study conducted in South Africa(20), odontogenic cysts reported among the most common lesions. When different literature data are examined, different prevalences of pathology are observed in different geographies. This situation can be associated with various reasons, such as racial factors, socioeconomic status, awareness of dental treatment, routine dental check-ups, and environmental factors. Still, it isn't easy to make a definitive interpretation.

In our current study, the prevalence of radicular cysts was 28.2% in the 6-12 age group, while this rate was 41.8% in the 12-18 age group. This suggests that the prevalence increases with age, especially in inflammatory lesions. Adequate oral

hygiene education that can be given at an early age will be beneficial in reducing the incidence of dental caries and preventing the development of inflammatory lesions such as radicular cysts. Radicular cyst prevalence is 41.8% in women and 34.9% in men; the gender factor is insignificant. Radicular cysts in the maxillary molar (70.5%), maxillary premolar (60%), and mandibular molar (42.5%) regions constitute a serious pathology density.

Dentigerous cysts are odontogenic cystic lesions that start from the enamel-cementum junction of an unerupted tooth and involve the dental crown. It is usually observed around the lower third molars, upper canines, lower premolars, and upper third molars. Dentigerous cysts, one of the most frequently observed pathologies in our current study, constituted 17.8% (51 patients) of all pathologies in the 12-18 age group and 31.1% (23 patients) of the pathologies in the 6-12 age group. Although proportionally higher rates are observed in the 6-12 age group, this is the exact opposite numerically. As age progresses, the prevalence of dentigerous cysts decreases due to the increase in the majority and diversity of pathology.

Female/male ratios are similar in dentigerous cysts. Of the dentigerous cysts, 44.6% were observed in the mandible molar region, 23% in the mandible premolar region, and 18.9% in the maxilla anterior region. This condition can be associated with impacted mandibular third molars, mandibular premolars, and maxillary canines. Especially early loss of primary teeth may be related to an increase in the prevalence of impacted teeth in mandibular premolars and, accordingly, dentigerous cysts (Fig. 1). The fact that the data in the 0-6 age group is limited to only three patients prevents this group from being compared with other groups. When the developmental cystic lesions are examined, there is a similar result, and 73.1% of all developmental cysts are observed in the 12-18 age group and 26.9% in the 6-12 age group.

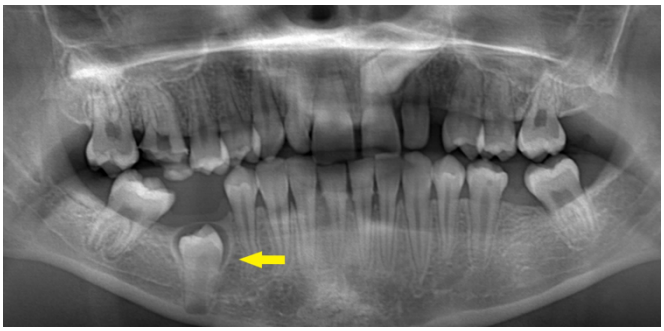

Fig. 1. Impacted premolar tooth and dentigerous cyst around the dental crown observed in the right mandible in a 15-year-old female patient (yellow arrow).

The high prevalence of dentigerous cysts among developmental cystic lesions is effective in this result. In addition, increasing the number and diversity of pathologies with increasing age is another factor. The "other" group, which includes soft tissue lesions, shows higher prevalences at younger ages than developmental and inflammatory odontogenic cysts, and these results are consistent with the literature (11,15). As another significant result, the size of cystic lesions can be evaluated. Developmental odontogenic cysts show larger dimensions than inflammatory odontogenic cysts and lesions in the other group. The nature and asymptomatic character of the developmental lesions usually cause the lesions to reach large sizes without symptoms. The fact that developmental odontogenic cysts, such as dentigerous cysts, are typically diagnosed during routine check-ups or when symptomatic reduces the chance of early intervention. At this point, the importance of regular dental check-ups emerges again.

In general, the limitations of the study include;

Short time interval (10 years)

Relatively low sample size compared to similar publications

There needs to be more observation of the number of patients in the 0-6 age group and the inability to include this group in the study entirely.

It can be considered as the exclusion of malignant lesions.

This study aimed to address a vast area that can attract the attention of dentistry professionals. The results describe the prevalence of pediatric oral cavity lesions over a period of time. The main criterion in the study is based on the histopathological examination results.

When the results of the study are evaluated, some basic conclusions emerge. In patients under 18, pathologies and diagnostic diversity prevalence increase as age progresses. Radicular cysts, dentigerous cysts, and giant cell granulomas are among the most common lesions. In the present study, the gender factor was not observed as an essential factor in the distribution of pathologies. Inadequate oral hygiene education and low socioeconomic status may be associated with inflammatory cystic or reactive soft tissue lesions. Premature loss of primary teeth, mainly observed in the mandible, may cause impacted mandibular teeth and increase the prevalence of dentigerous cysts. This case focuses on the personal experiences of the authors who have served in this region for a long time. In developmental odontogenic cysts, lesion sizes are observed at higher levels.

Conflict of interest
The authors declared no conflict of interest.

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None to declare.

Authors' contributions
Concept: S.Ç., Y.B., A.A., N.A., Design: S.Ç., Y.B., N.A., Data Collection or Processing: S.Ç., A.A., Analysis or Interpretation: Y.B., N.A., Literature Search: S.Ç., Y.B., Writing: S.Ç., A.A.

Ethical Statement

The ethical compliance of the study was approved by the Tokat Gaziosmanpaşa University Clinical Research Ethics Committee (Registration Number: 23- KAEK- 107, Date: 27.04.2023). The study was conducted per the Helsinki Declaration of Ethics for Medical Research Involving Human Subjects.

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