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ORIGINAL RESEARCH

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# Evaluation of benign oral and maxillofacial lesions in the pediatric population

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## Abstract

**Background**: The aim of this study was to evaluate and compare the prevalence of benign lesions in the bone and soft tissues of children and adolescents who were treated at the oral and maxillofacial surgery clinic. **Methods**: The data were compiled from records from Eskişehir Osmangazi University. The lesions were divided into 5 main groups: odontogenic cysts, odontogenic tumors, giant cell lesions, fibroosseous lesions and soft tissue lesions. Patients were grouped into children (0–9 years) and adolescents (10–17 years) according to the developmental stage in their first and second decades to evaluate the distribution of lesions according to age. The jaw quadrant was divided into 2 groups: lower jaw and upper jaw. Jaw location was divided into 2 groups: anterior and posterior. **Results**: The most common pathologies were odontogenic cysts (64.7%), followed by odontogenic tumors (21.4%), giant cell lesions (7.1%), fibroosseous lesions (2.1%) and soft tissue lesions (4.6%). The distributions of lesions according to jaw quadrant, jaw location and age group were significantly different. More lesions were observed in the lower jaw ($p < 0.01$), posterior region ($p = 0.020$) and 10–17 years of age ($p = 0.015$). **Conclusions**: This study helps improve the differential diagnosis of jaw and gingival lesions by highlighting the prevalence of odontogenic cysts and tumors in pediatric patients. This finding highlights the need to increase awareness of these lesions, as they are more common in the 10–17 years age group. Education given to parents about early detection of lesions increases the rate of early diagnosis and enables comparative studies with the data collected. The findings also draw attention to the evaluation of genetic, environmental and lifestyle factors in the distribution of pathology.

## Keywords

Biopsy; Oral pathology; Pediatric; Prevalence

## 1. Introduction

Oral and maxillofacial surgery in children is especially intriguing within dentistry because to the distinct anatomical and physiological factors, as well as the age-specific prevalence of certain conditions. Pediatric patients often present with oral and maxillofacial diseases that differ significantly from those seen in adults. These discrepancies extend to histopathological characteristics, clinical progression and treatment approaches. As children grow and develop, the nature of these lesions can undergo marked changes, necessitating careful consideration and tailored management strategies [1–3]. Lesions occurring in the mouth, jaw and face regions can be affected by various conditions. These lesions can be developmental and neoplastic but can also be affected by various factors, such as infectious, inflammatory and reactive factors. Therefore, the diagnosis of pathologies in the mouth, jaw and face regions can be quite complicated because of the various structures it contains and the nonspecific characteristics of the region where it is located [4].

To confirm the definitive diagnosis of pathologies seen in the gums and bones, an incisional or excisional biopsy must be performed [5]. This procedure helps confirm the exact nature of the condition. Assessing the distribution of oral and maxillofacial lesions is crucial for estimating their prevalence within a community, identifying high-risk subpopulations and optimizing healthcare resource allocation. Additionally, understanding the age, gender and site preferences of various oral disorders can provide valuable insights into their demographics and aid in better managing these conditions [6]. Scientific evidence, including histopathology of sections taken from lesions in the oral and maxillofacial regions, can reveal the prevalence, incidence and prognosis of various lesions. Although there is a negligible bias in obtaining these data, they provide accurate data. This approach also provides important features and information, such as geographical referencing of the local population being investigated [7].

Owing to the environmental differences and lifestyles of each group, the occurrence of these lesions varies considerably around the world. The World Health Organization (WHO) has


  

made recommendations regarding the epidemiological evaluation of oral lesions, stating that most of the studies on the evaluation of lesions are limited to studies such as those on caries, periodontal disease, malocclusion and dental trauma [8]. Since retrospective studies of large series of oral lesions in children and adolescents are rare in the literature, these data may contribute to the understanding of oral pathologists, dentists and other medical professionals regarding oral diseases affecting different child and adolescent populations [9]. There are a few studies examining benign pediatric lesions and discussing these findings [10, 11]. The distribution of lesions treated in various settings, such as tertiary oral and dental clinics, dentistry faculties and private clinics, may vary due to the heterogeneous study population [12].

Previous studies have had a limited scope in the evaluation of oral and maxillofacial lesions in pediatric and adolescent populations and have generally focused on adult patients or specific types of pathologies. This situation has created a lack of detailed information on the distribution of lesions in pediatric patients, their prevalence according to age groups and their anatomical localization. The present study aims to fill this gap and provides a more comprehensive assessment for the pediatric population in Turkey. This comprehensive assessment of oral pathologies in the Turkish pediatric population will be an important reference point for both the development of local health policies and global comparative studies. The obtained data aim to optimize the treatment management of pediatric and adolescent patients by developing early diagnosis and treatment strategies. In addition, it has created a pediatric population to ensure early diagnosis and effective use of health services in the early stages by providing the implementation of simple treatment approaches.

The aim of this study was to present the types, distributions and prevalence of oral and maxillofacial lesions confirmed by biopsy in children in the Eskişehir region in detail. Since such data are limited in the pediatric population in Turkey, this study aims to contribute to the early diagnosis of lesions that are more common in pediatric patients and to provide valuable information for clinical guidelines.

## 2. Materials and methods

### 2.1 Study design

Pediatric patients who underwent surgical treatment at the Oral and Maxillofacial Surgery Clinic at Eskişehir Osmangazi University Faculty of Dentistry between 01 January 2013 and 17 January 2024, and whose histopathological diagnosis was received at Eskişehir Osmangazi University Faculty of Medicine, Department of Pathology, were included in the study. The study was approved by the Non-Invasive Clinical Research Ethics Committee of Eskişehir Osmangazi University (decision no: 46, dated: 19 March 2024; ethics committee approval protocol number: 2024-101). The entire study was designed and carried out in accordance with the Declaration of Helsinki. Informed consent forms were obtained from all patients and their parents before biopsy.

### 2.2 Inclusion and exclusion criteria

Patients aged 17 years and under who were diagnosed histopathologically from biopsies taken into the study were included. Other benign and malignant pathological lesions in the maxillofacial region and patients with insufficient data (missing histopathological reports and demographic information) were excluded from the study. All patients were evaluated in terms of gender, anatomical location and histopathological diagnosis. Panoramic radiography, CBCT(Cone beam computed tomography) and clinical evaluations were performed to assist in histopathological diagnosis. Histopathological diagnoses were evaluated by a single experienced observer, and previously published reports were extracted from the archive and analyzed.

### 2.3 Data source

In this study, biopsies taken between the ages of 0 and 17 years were examined to examine pathologies in the pediatric population, and age subgroups were defined (0–9 years and 10–17 years) to investigate possible differences in the incidence of oral and maxillofacial lesions in the first and second decades of life. Therefore, prevalence the differences of pediatric lesions between two decades may be evident. Age ranges were established by reference to the age classification of Barros *et al.* [13] Diagnoses were categorized according to the WHO 2017 head and neck tumor classification [14]. In addition, soft tissue lesions were classified on the basis of the classification of Melo *et al.* [4] Lesions are grouped into diagnostic categories according to their pathogenesis and tissue of origin as follows: (1) Odontogenic cysts: dentigerous cyst, radicular cyst, Odontogenic keratocyst, Inflammatory collateral cyst; (2) Odontogenic tumors: Odontoma, Ameloblastoma, Adenomatoid odontogenic tumor, Cemento-ossifying fibroma; (3) Giant cell lesions : peripheral giant cell granuloma, central giant cell granuloma, aneurysmal bone cyst and traumatic bone cyst; and (4) Fibroosseous lesions: Fibrous dysplasia, Focal Peripheral ossifying fibroma, and (5) soft tissue lesions: focal inflammatory fibrous hyperplasia and pyogenic granulomas.

The jaw quadrant was divided into 2 groups: lower jaw and upper jaw. Jaw location was divided into 2 groups: anterior region was defined as the region between left and right canine teeth and posterior region was defined as the region between canine and third molar teeth. Representative microscopic slides from different cases are shown in Figs. 1,2,3. Fig. 4 shows panoramic and CBCT images of the odontogenic adenomatoid tumor.

### 2.4 Statistical analysis

Data were analyzed statistically using the IBM SPSS Statistics Version 22 program (BM Corp., Armonk, NY, USA). Categorical data were given as sampling frequency and percentage. The Chi-square test was used to determine the relationship of categorical variables with gender, jaw quadrant, jaw localization and age groups. Fisher's Exact Test was applied to evaluate the relationship between two categorical variables. Statistically significant level was determined as $p < 0.05$.

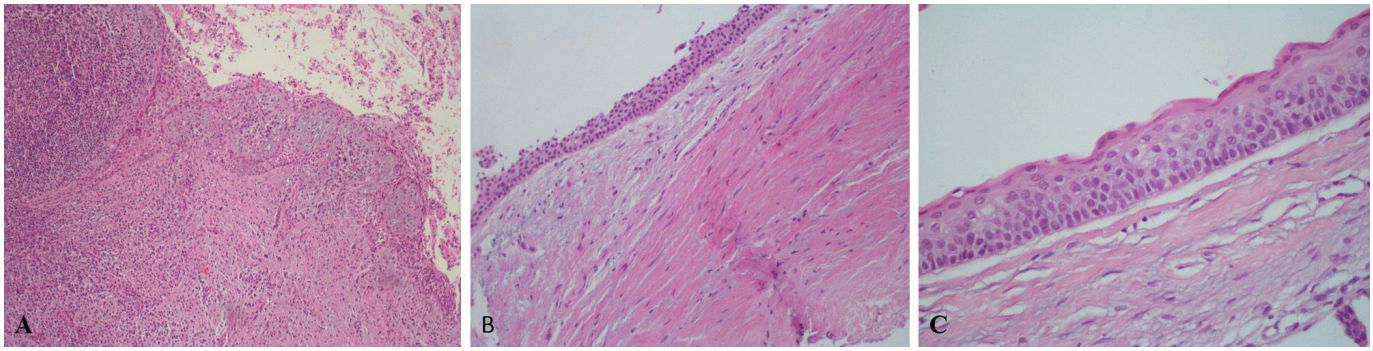


**FIGURE 1. Histopathologic examination of odontogenic cysts.** (A) Radicular cyst (H&E ×100): Histopathologic features showing an epithelial-lined cyst with inflammatory cell infiltration. (B) Dentigerous cyst (H&E ×200): Cystic lining attached to the crown of an unerupted tooth with non-keratinized epithelium. (C) Odontogenic keratocyst (H&E ×400): Stratified squamous epithelium with a corrugated parakeratinized surface and prominent basal cell layer.

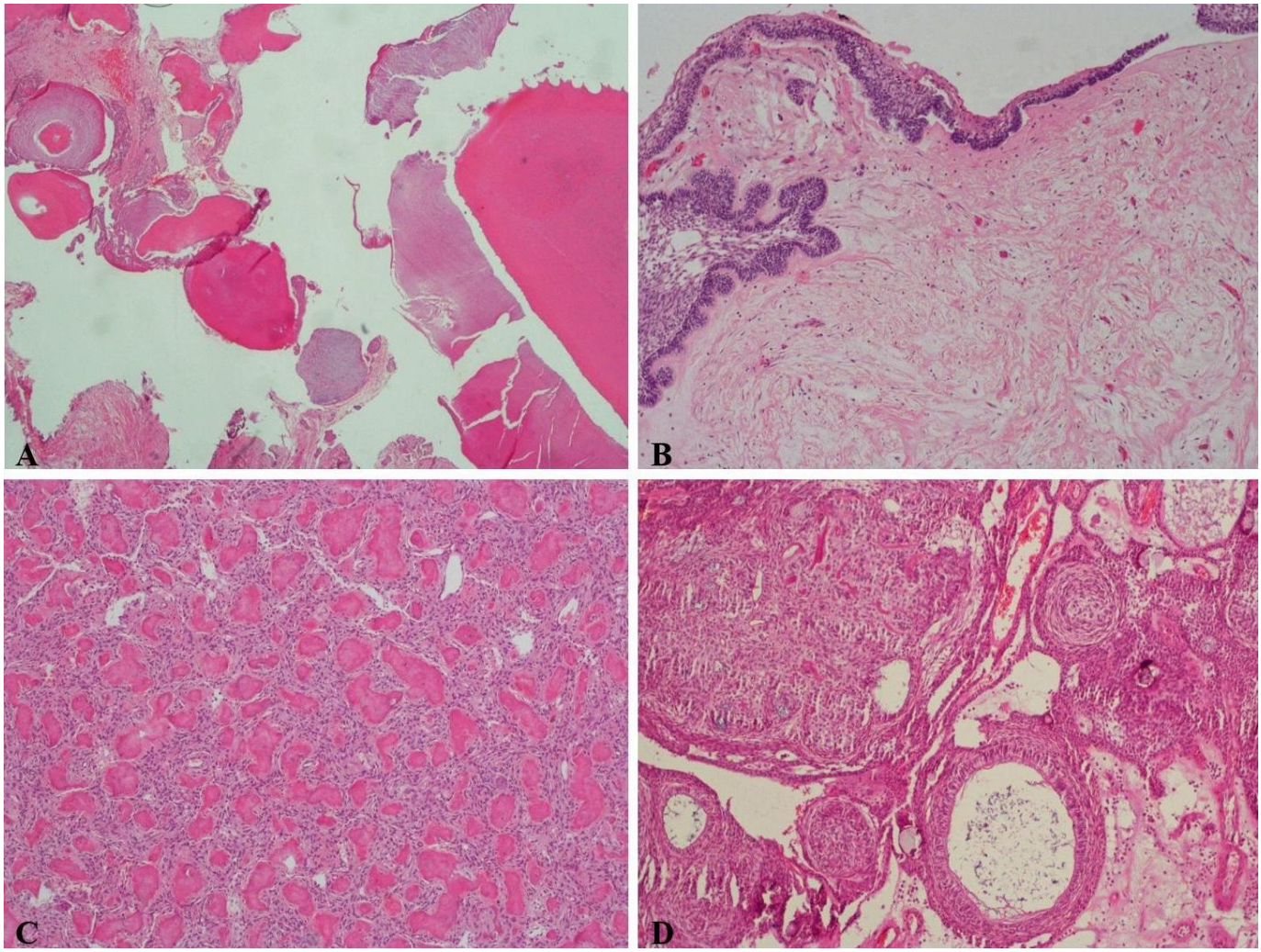


**FIGURE 2. Histopathologic examination of odontogenic tumors.** (A) Odontoma (H&E ×100): Mixed odontogenic tumor showing dentin, enamel, and pulp-like tissues. (B) Ameloblastoma, unicystic type (H&E ×100): A single cystic lesion with ameloblast-like cells lining the cyst wall. (C) Cemento-ossifying fibroma (H&E ×100): Fibrous stroma containing trabeculae of bone and cementum-like material. (D) Adenomatoid odontogenic tumor (H&E ×100): Lesion composed of duct-like structures and calcified material surrounded by spindle-shaped epithelial cells.

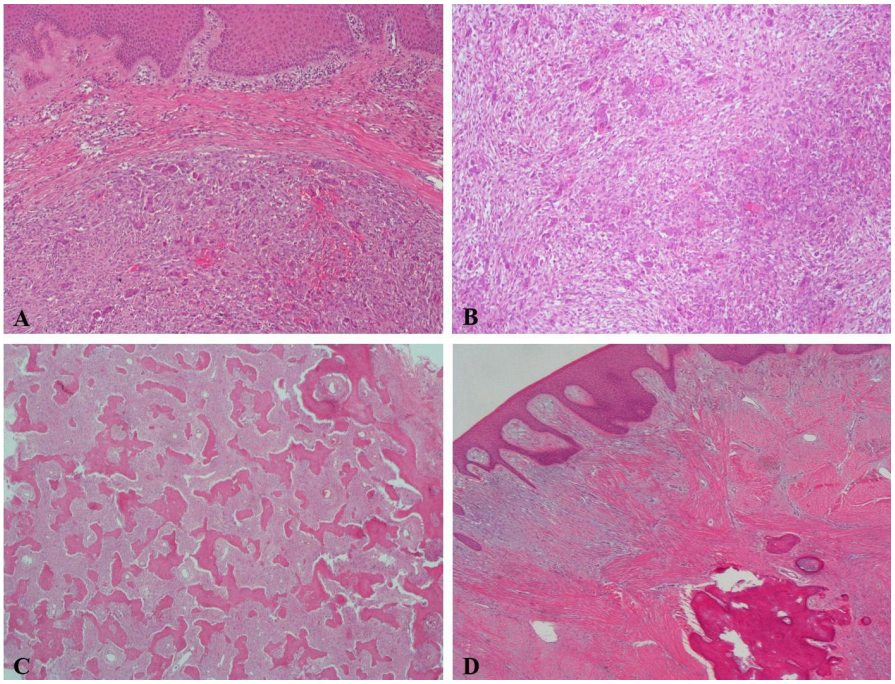


**FIGURE 3. Histopathologic examination of giant cell and fibroosseous lesions.** (A) Peripheral giant cell granuloma (H&E ×100): Proliferation of multinucleated giant cells within a fibrous stroma. (B) Central giant cell granuloma (H&E ×100): Intraosseous lesion with multinucleated giant cells and fibrovascular stroma. (C) Fibrous dysplasia (H&E ×40): Irregularly shaped woven bone trabeculae within a fibrous stroma. (D) Peripheral ossifying fibroma (H&E ×40): Fibrous tissue proliferation with focal calcifications and ossification.

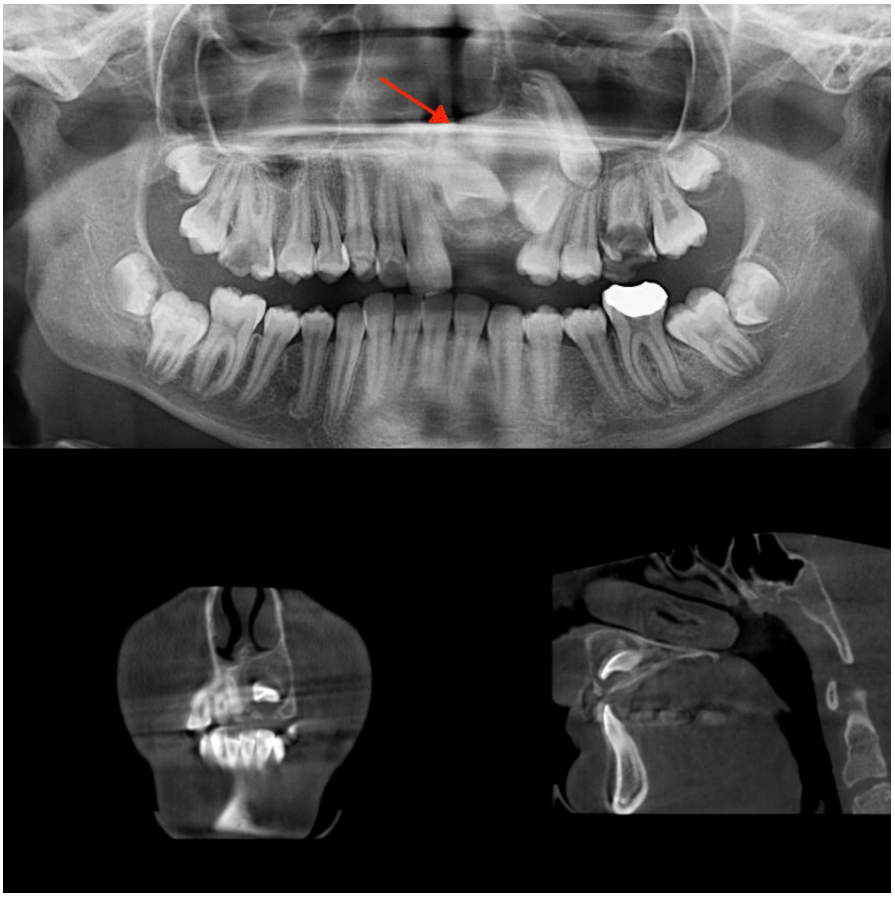

**FIGURE 4. Panoramic and CBCT showing an adenomatoid odontogenic tumor on the left side in the anterior region of the maxilla.** The lesion is indicated by a red arrow.

## 3. Results

A total of 721 pathological lesions were diagnosed in the oral region. The number of patients with benign lesions under the age of 18 was 285, and the number of patients who could be examined due to data loss and anatomical formations was 238. A total of 238 patients constituted 33% of the lesions. The ages of the patients were between 4 and 17 years old, and the average age was 12.57 ± 3.18 years. Among the 238 patients with lesions, 136 were male and 102 were female. The male to female ratio was 1.3 to 1. The diagnostic category with the highest number of cases was odontogenic cysts (64.7%), followed by odontogenic tumors (21.4%), giant cell lesions (7.1%), soft tissue lesions (4.6%) and fibroosseous lesions (2.1%). Dentigerous cyst was the most frequently diagnosed lesion, accounting for 29.4% of the total, followed by radicular cyst (27.3%), odontomas (16.4%), and odontogenic keratocyst (7.6%). The least diagnosed lesions were inflammatory collateral cyst (0.4%), aneurysmal bone cyst (0.4%) and fibrous dysplasia (0.4%). Radicular cysts, ameloblastomas, peripheral giant cell granulomas and focal inflammatory fibrous hyperplasia were more common in female patients. Inflammatory collateral cyst, aneurysmal bone cyst, fibrous dysplasia and pyogenic granuloma were never seen in female patients (Table 1).

The table compares lesion groups with respect to gender distribution, anatomical localization within the jaw (maxilla or mandible), specific quadrants (anterior, posterior, *etc.*) and categorized age groups (Table 2). When the lesions were compared between genders, although they were more common in male patients, no statistically significant difference was found ($p = 0.755$). The distribution of gender by age groups does not show any significant difference ($\chi^2(F)$(Fisher Exact Test) = $p = 0.614$). The distribution of lesions observed in the jaw localizations differs significantly according to gender ($\chi^2(F) = p = 0.034$). Anterior localization was observed 1.804 times higher in boys than in girls compared to Posterior localization (OR (Odds Ratio) = 1.805, $p = 0.034$, Sensitivity ratio ($p$(S) = 65.69%). When the lesions were evaluated according to the jaw localization, there were significant differences and a higher rate of lesions were seen in the lower jaw ($p < 0.001$). The distribution of lesions observed in the jaw localizations according to age groups is not significantly different ($\chi^2(F) = p = 0.402$). No significant difference was observed between the lesions in the upper and lower jaw according to age groups ($\chi^2(F) = p = 0.736$). Lesions are 1.13 times more likely to be seen in the upper jaw quadrant than in the lower jaw quadrant (OR = 1.130, $p = 0.736$, $p$(S) = 48.18%). The distribution between gender is not significant when lesions are observed in the lower and upper jaw quadrants ($\chi^2(F) = p = 0.508$). The observation of lesions in the lower jaw quadrant is 0.833 times smaller than in the upper jaw quadrant (OR = 0.833, $p = 0.508$, $p$(S) = 38.24%). The distribution of the lesions differed significantly according to their jaw quadrant and was greater in the posterior region ($p = 0.020$). Posterior localization is 1.365 times higher than anterior localization in the 10–17 age group (OR = 1.365, $p = 0.402$, $p$(S) = 63.64%). The distribution of lesions according to age groups differed significantly and more lesions were detected in the 10–17 age range ($p = 0.015$).

## 4. Discussion

Most studies on the prevalence of oral and maxillofacial lesions in patients under the age of 18 report that these cases constitute between 5.5% and 24.8% of all cases referred to pathology departments [15, 16]. This may be attributed to differences in inclusion criteria such as age range or location, genetic background of the population, geographical area, study period and type of institution [17]. In this study, this percentage was higher than the rates reported in the literature, and lesions in the pediatric population constituted 30% of all lesions. The differences observed in the results of various studies may stem from the use of different inclusion criteria. For example, studies have been conducted on children in different age ranges (15, 16, 18 and under 19 years old). Barros *et al.* [13] used the age range of 0–19 years as a reference to emphasize the frequency of oral and maxillofacial lesions in the first (0–10 years) and second (10–19 years) decades of life and to observe the distribution of lesions. Unlike other studies, Patil *et al.* [18]. The authors did not make any subclassifications in the age range and compared the lesions according to gender by choosing the age range 0–17. Tekkesin *et al.* [19] also evaluated patients with lesions (odontogenic cysts and odontogenic tumors) at the age of 17 and younger and divided the patients into three age groups according to their dentition. These include primary dentition (0–5 years), mixed dentition (6–12 years) and permanent dentition (13–17 years). Since retrospective studies and comparisons of large series of oral lesions in children (0–9 years) and adolescents (10–17 years) are rare in the literature, these data may contribute to the understanding of oral pathologists and dentists regarding oral diseases affecting child and adolescent populations [9]. In this study, the patients were divided into subage groups, namely, children and adolescents (0–9 years and 10–17 years), and comparisons were made between them.

Odontogenic tumors and odontogenic cysts represent important aspects of oral and maxillofacial pathology [19]. Fibroosseous lesions of the jaw represent a group of rare, benign lesions characterized by the progressive and variable replacement of healthy bone tissue by fibrous connective tissue, sharing similar clinical, radiological and histopathological features [20]. Giant cell lesions are defined as nonneoplastic osteolytic pathologies that include hemorrhage foci in fibrovascular tissue, have multinucleated osteoclast-like giant cells, and may contain bone trabeculae [21]. According to the literature review, the variety and distribution of lesions in pediatric patients are not clear. The heterogeneous population of jaw pathologies diagnosed in the study locations (university hospitals, private clinics, state hospitals, *etc.*) may vary [22]. Ha *et al.* [23] evaluated patients aged 16 years and under in a study conducted in a pediatric population in Australia. The authors organized the diagnostic subcategories according to Jones and Franklin [24] and reported that the most common oral and maxillofacial lesions in the pediatric population were dentigerous cysts, followed by fibrous hyperplasia and radicular cysts. Other studies have reported that radicular cysts and odontogenic keratocysts are the most common cysts, whereas ameloblastoma is the most common odontogenic tumor [22].

While radicular cysts are the most commonly encountered

**TABLE 1. Distribution of jaw pathologies by gender and age.**

| Pathology | Male | Female | M:F ratio | Total | The percentage from the total population (%) | Mean age ± (SD) (yr) |
|---|---|---|---|---|---|---|
| Odontogenic cysts | 87 | 67 | 1.3:1 | 154 | 64.7 | 12.92 ± 2.97 |
| Inflammatory cyst | 32 | 34 | 1:1.1 | 66 | 27.7 | 14.56 ± 2.28 |
| Radicular cyst | 31 | 34 | 1:1.1 | 65 | 27.3 | 14.57 ± 2.29 |
| Inflammatory collateral cyst | 1 | 0 | Male | 1 | 0.4 | 14.00 |
| Developmental cyst | 55 | 33 | 1.7:1 | 88 | 37.0 | 11.68 ± 2.84 |
| Dentigerous cyst | 45 | 25 | 1.8:1 | 70 | 29.4 | 11.49 ± 2.81 |
| Odontogenic keratocyst | 10 | 8 | 1.25:1 | 18 | 7.6 | 12.44 ± 2.89 |
| Odontogenic tumors | 31 | 20 | 1.6:1 | 51 | 21.4 | 12.45 ± 3.31 |
| Odontoma | 24 | 15 | 1.6:1 | 39 | 16.4 | 12.69 ± 3.41 |
| Ameloblastoma | 2 | 3 | 1:1.5 | 5 | 2.1 | 12.40 ± 2.07 |
| Adenomatoid odontogenic tumor | 2 | 1 | 2:1 | 3 | 1.3 | 12.67 ± 3.21 |
| Cemento-ossifying fibroma | 3 | 1 | 3:1 | 4 | 1.7 | 10.00 ± 3.74 |
| Giant cell lesions and simple bone cyst | 8 | 9 | 1:1.1 | 17 | 7.1 | 10.41 ± 3.76 |
| Central giant cell granuloma | 3 | 1 | 3:1 | 4 | 1.7 | 14.00 ± 2.44 |
| Peripheral giant cell granuloma | 2 | 7 | 1:3.5 | 9 | 3.8 | 7.78 ± 2.16 |
| Traumatic bone cyst | 2 | 1 | 2:1 | 3 | 1.3 | 12.33 ± 4.04 |
| Aneurysmal bone cyst | 1 | 0 | Male | 1 | 0.4 | 14.00 |
| Fibroosseous lesions | 4 | 1 | 4:1 | 5 | 2.1 | 14.20 ± 2.17 |
| Fibrous dysplasia | 1 | 0 | Male | 1 | 0.4 | 15.00 |
| Peripheral Ossifying fibroma | 3 | 1 | 3:1 | 4 | 1.7 | 14.00 ± 2.44 |
| Soft tissue lesions | 6 | 5 | 1.2:1 | 11 | 4.6 | 10.82 ± 3.40 |
| Focal inflammatory fibrous hyperplasia | 1 | 5 | 1:5 | 6 | 2.5 | 10.67 ± 4.08 |
| Pyogenic granuloma | 5 | 0 | Male | 5 | 2.1 | 1.00 ± 2.82 |
| All Pathologies | 136 | 102 | 1.3:1 | 238 | 100 | 12.57 ± 3.18 |

*SD: Standard deviation.*

**TABLE 2. Comparison of lesion groups according to gender, jaw localization, jaw quadrant and age groups.**

| | Gender (N = 238) | | Statistical | Jaw Localization (N = 238) | | Test[C] *p* |
|---|---|---|---|---|---|---|
| Lesion Type | Male | Female | | Upper Jaw | Lower Jaw | |
| Odontogenic cysts | 87 | 67 | | 46 | 108 | |
| Odontogenic tumors | 31 | 20 | | 30 | 21 | |
| Giant cell lesions | 8 | 9 | 0.755 | 6 | 11 | <0.001 |
| Fibroosseous and soft tissue lesions | 4 | 1 | | 5 | 0 | |
| Total | 136 | 102 | | 97 | 141 | |
| | Jaw Quadrant (N = 238) | | Statistical | Age Groups (N = 238) | | Test[C] *p* |
| | Anterior | Posterior | | 0–9 Age | 10–17 Age | |
| Odontogenic cysts | 54 | 100 | | 21 | 133 | |
| Odontogenic tumors | 29 | 22 | | 21 | 40 | |
| Giant cell lesions and simple bone cyst | 9 | 8 | 0.020 | 8 | 9 | 0.015 |
| Fibroosseous and soft tissue lesions | 2 | 3 | | 0 | 5 | |
| Total | 101 | 137 | | 44 | 194 | |

[C] *Statistical evaluation was carried out using Chi-Square test. N: Number of count. Statistical significance degree was accepted as $p < 0.05$.*

cysts in the literature, followed by dentigerous cysts, other cysts, such as lateral periodontal cysts and nasopalatine canal cysts, are reported to occur at different frequencies [25, 26]. In the study by Açikgöz *et al.* [25], the authors reported that the most common odontogenic cyst found was a radicular cyst (54.7%), followed by dentigerous cysts (26.6%), residual cysts (13.7%), odontogenic keratocysts (3.3%), and lateral periodontal cysts (0.2%). Baştoklu *et al.* [26] also examined 274 lesions in their study and reported that the three most common lesions were radicular cysts (54.7%), dentigerous cysts (17.8%), and odontogenic keratocysts (12.4%). In their study, Melo *et al.* [4] reported that odontogenic keratocysts are the most common type of cyst, with a notably higher prevalence among adolescents. These cysts are typically diagnosed between the second and third decades of life and predominantly occur in the mandible [27, 28]. Approximately 25–40% of these lesions are estimated to contain unerupted teeth. Historically, odontogenic keratocysts have been classified as either odontogenic cysts or odontogenic tumors [29]. In the present study, contrary to the literature, the most commonly encountered cyst was a dentigerous cyst, followed by a radicular cyst and an odontogenic keratocyst. It is thought that the reason why the most common cyst in the study, which is different from the literature, is the dentigerous cyst is that inflammatory conditions are rarely seen in pediatric patients. Consequently, depending on the classification system used at the time of various studies, this lesion may have been included in different diagnostic categories, leading to variability in prevalence data across studies. Additionally, lesions were statistically more common in the 10–17 years age range. This high frequency should be taken into consideration as a factor that may increase the frequency of developmental cysts in mixed dentition. Common lesions such as dentigerous cysts directly affect treatment planning in pediatric patients. Early diagnosis and appropriate management of such lesions may shape clinical practices, such as the need for surgical intervention. The reason for the greater frequency of these lesions in the 10–17 age group may be delayed diagnosis, greater dental development in this age group, and behavioral differences. This difference may be due to potential causes such as environmental or genetic factors.

The fact that lesions are more common in the 10–17 years old age group may be due to a preference to avoid invasive treatments in the treatment of pediatric patients and to monitor and biopsy suspected benign conditions later in life when the patient is more compliant.

Odontogenic tumors are common neoplasms. These tumors can arise from developing dental tissues, especially in the second decade of life, a phase characterized by the growth and development of maxillofacial structures [30, 31]. Barros *et al.* [13] reported in their study that odontomas constituted 26% of 289 neoplasm cases and that they were very common. In Jordanian children, odontogenic tumors are more frequently reported in the maxilla, whereas Japanese and Nigerian children have a slightly greater frequency of odontogenic tumors in the lower jaw [32]. In this study, odontogenic tumoral lesions were found more frequently in male patients, in the upper jaw, and in the anterior region, particularly in those aged 10–17 years. In the study of Skiavounou *et al.* [33], patients aged between 6 months and 18 years were classified into three age groups: 0–6 years, 7–12 years and 13–18 years, and it was reported that the majority of lesions (58.65%) occurred in the third age group. They also reported that lesions were more commonly observed in males than in females (1.25/1 ratio) and that the majority of lesions were predominantly observed in the lower jaw. Many studies in the literature note a slight predominance of boys in oral, soft tissue and intraosseous lesions, although some studies report an equal gender distribution between boys and girls [32, 34, 35]. In this study, although lesions were more frequently observed in male patients, the difference was not statistically significant, which is consistent with the literature. Similarly, in accordance with the literature, lesions were significantly more prevalent in the lower jaw and posterior regions, and they were more commonly observed in the age range of 10–17 years. It is thought that the presence of more lesions in the lower jaw and posterior region increases due to anatomical, functional or developmental factors. The results of the study are thought to form the basis for improving health policies. Special protocols can be developed for lesions that are more common in patients aged 10–17. Minimally invasive techniques or early interventions can be planned, especially for frequently seen odontogenic cysts. The study has provided awareness of the distribution and localization of lesions in the jaw. Targeted screening methods can be applied especially for lesions seen in the lower jaw and posterior region.

Giant cell lesions are most commonly observed in young adult females [12]. Clinical presentation, treatment options and outcomes distinguish between nonaggressive and aggressive subtypes. Clinical and radiographic examinations are very important for determining the natural structure of a lesion and for determining treatment methods. While the main criteria for determining aggressive lesions are lesions that are 5 cm or larger in size and recurrence after treatment, additional criteria include patients aged 10 years and younger, root resorption, tooth migration, cortical bone resorption or perforation, rapid growth and clinical findings that cause symptoms such as pain/paresthesia [36, 37]. Several studies on fibroosseous lesions have reported that it is the 3rd most common jaw lesion and is more common in females in the maxillary and posterior regions [38]. Additionally, it has been reported that reactive lesions in the mandible and posterior region are more common in female patients [39, 40]. In this study, contrary to the literature, fibroosseous lesions were observed more frequently in male patients and in the anterior region. However, in accordance with the literature, these lesions are more commonly observed in the upper jaw. Giant cell lesions of the jaws typically encompass cherubism, giant cell granulomas of the jaws, aneurysmal bone cysts, traumatic bone cysts and jaw tumors of hyperparathyroidism [41]. Central giant cell granuloma, classified as a giant cell lesion, is an uncommon condition that is typically asymptomatic and represents less than 7% of all benign jaw lesions. It primarily affects children and young adults, with more than 60% of cases occurring before the age of 30. Lesions in the anterior region of the jaw are more frequently observed in the mandible than in the maxilla [42]. In this study, giant cell lesions constituted 7% of all lesions. Although few differences in age, gender or jaw location were detected, these differences were predominantly

observed in the lower jaw. In this study, cherubism was not encountered at all. The reason for this is that the diagnosis can be made clinically and radiologically and that only lesions from which a biopsy was taken were evaluated in this study.

Melo *et al.* [4] reported that in their study evaluating fibroosseous lesions as nonodontogenic lesions, significantly more lesions were observed in patients aged 0–9 years than in those aged 10–19 years. With respect to reactive connective tissue lesions, they reported that lesions were more common in adolescents aged 10–19 years, but the difference was not statistically significant. In the present study, fibroosseous and soft tissue lesions were found to be significantly more common in the 10–17 year age group than in the other age groups, which is consistent with the literature. In addition, significantly more cases were found in the maxillary and anterior regions than in other studies. These differences may be due to the small number of lesions or the small size of the study population. In this study, inflammatory collateral cysts and pyogenic granulomas were not detected in female patients, possibly because of the limited sample size. The rarity of such lesions may suggest that the distribution is not equal between genders; however, it should be noted that this situation is not statistically significant and should be confirmed with larger sample groups. The higher prevalence of fibroosseous lesions in males may be related to hormonal influences, genetic factors or environmental influences such as trauma. In addition, the tendency of males to be exposed to more mechanical trauma (*e.g.*, sports injuries or physical activities) may explain this difference. The higher prevalence of lesions in the 10–17 age group may be related to the rapid growth and development processes during this period, hormonal changes, and the effects of the eruption period of the teeth. The eruption of the third molars in particular may contribute to the higher prevalence in this age group, together with increased inflammatory responses. In addition, inadequate oral hygiene habits of individuals in this age group or delayed diagnosis may also affect this situation.

The findings of this study are consistent with some previous studies, but also reveal notable deviations. For example, the finding of dentigerous cysts as the most common lesion is in contrast to studies that primarily identified radicular cysts. This difference may be due to the age distribution of the study populations, local health practices, or environmental factors that influence disease etiology. Furthermore, although the gender distribution of the lesions is consistent with most of the existing literature, the higher frequency of fibroosseous lesions in female and in the anterior region is different from previous reports. These deviations emphasize the importance of contextual factors such as genetic predisposition and local health practices in shaping disease prevalence. Further investigation of these factors in various populations will increase the comparability and applicability of such studies.

The findings presented in this study are subject to some limitations that should be considered with caution. The evaluation of only lesions that underwent biopsy in this study may reduce the rate of evaluation of lesions that do not require biopsy, such as radicular cysts or focal inflammatory fibrous hyperplasia. This may underestimate the true prevalence of such lesions and limit the generalizability of the data. This approach may also create a bias towards more severe or atypical cases. This limitation should be considered when evaluating the findings of the study, and it should be noted that a separate analysis could be performed for such clinical diagnoses. In this study, the absence of inflammatory collateral cysts and pyogenic granulomas in female patients may be due to the limited sample size. The rarity of such lesions may suggest that the distribution is not equal between genders; however, it should be noted that this situation does not carry statistical significance and should be confirmed with larger sample groups.

The retrospective nature of this study and the fact that the data only cover lesions in the Eskişehir region are among the limitations of the study. Furthermore, the inclusion of biopsied lesions may not fully represent all pediatric oral and maxillofacial pathologies in the general population. The inclusion of additional variables such as socioeconomic status, environmental exposures, and genetic predisposition may contribute to a better understanding of the factors that influence the distribution and characteristics of lesions. For future studies, the collection of data from wider geographical areas and multicenter institutions is recommended. A prospective design may reduce biases with new data collection methods and provide more comprehensive results.

## 5. Conclusions

This study revealed that the distribution and characteristics of benign lesions in the oral cavity and jaws in Turkish society, especially in the Eskişehir region, showed similarities as well as differences when compared to studies conducted in different societies. No significant difference was found when lesion groups were compared between genders. Lesions were more frequent in the posterior region of the mandibular quadrant. Other external factors such as socioeconomic status, regional differences and access to health services, which may affect the distribution of lesions, may also cause differences. Awareness of oral and maxillofacial lesions in pediatric patients, especially during critical developmental periods between the ages of 10 and 17, should be increased. The fact that lesions are more common in the 10–17 age group creates a preference for avoiding invasive treatments in the treatment of pediatric patients; this is thought to be due to biopsy in later periods when patient compliance increases. In order to improve clinical outcomes, early diagnosis and targeted interventions for common lesions such as dentigerous cysts and odontogenic tumors can be prioritized and more effective implementation of health services can be achieved.

### AVAILABILITY OF DATA AND MATERIALS

The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author upon reasonable request.

### AUTHOR CONTRIBUTIONS

GT, NSK and OD—conceptualization. GT, MFA and YCK—methodology. GT—formal analysis. GT, OB and YCK—investigation. GT, OD, OB and SC—writing–original draft

preparation. OD, MFA and NSK—writing–review and editing. OD and NSK—supervision. All authors have read and agreed to the published version of the manuscript.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All procedures performed in studies involving human participants were following the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (ethics committee approval protocol number: 2024-101). Participant consent for participation in the study was obtained from the children and written informed consent from their parents/guardians. All were assured that the information collected would be treated confidentially.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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