Clinical Characterization of Oral and Maxillofacial Tumors and Tumor-Like Lesions in Children and Adolescents

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Purpose: To investigate the clinical characteristics of oral and maxillofacial tumors in children and adolescents.

Methods: This is a retrospective study of patients who had oral and maxillofacial tumors under the age of 18 years and were treated at the Department of Oral and Maxillofacial Surgery, Peking University School and Hospital of Stomatology from January 1990 to July 2021 (31 y). Their general conditions, pathological diagnosis, gender, age, and anatomical location were counted to analyze their morbidity and composition characteristics.

Results: This study contained 5405 cases, including 2903 male patients and 2502 female patients, with a median age of 9 years. Peak incidence was observed in the 14 to 18 years age group. The mandible (22.15%), maxilla (11.75%), and tongue (9.25%) were the most common sites of incidence. Malignant and intermediate type tumors accounted for 13.04%, benign tumors and tumor-like lesions for 55.67%, most often occurs in the maxillofacial bone, of which fibro-osseous lesions constitute an important part. Cysts accounted for 31.29%. Among the tumors occurring in the jaws, the most common malignant type was sarcoma, and ameloblastoma was the most common benign tumor. Malignant jaw tumors were mostly treated by resection, 10.64% by fibular flap reconstruction. While benign jaw tumors and tumor-like lesions were mostly treated by resection or curettage.

Conclusions: The distribution of anatomical location and pathological types of oral and maxillofacial tumors in children has certain characteristics, so that the selection of their treatment options is different from that of adults due to the consideration of the growth and developmental characteristics of children.

Key Words: Adolescents, children, oral and maxillofacial, tumor, tumor-like lesions

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The incidence of oral and maxillofacial tumors in children ranges from 0.25% to 15%.[1–3] In recent years, the incidence of head and neck tumors in children has been on the rise. Schwartz[2] et al found that the incidence of head and neck tumors in children increased by 45% (from 1.1 to 1.6 per 100,000) since 1973 to 2010.

Children's oral and maxillofacial tumors have both the characteristics of maxillofacial tumors and the particularity of children. The etiology and histopathologic types of children's tumors occurring in the oral and maxillofacial region are complicated. Not only the composition and occurrence of tumors are different from those of adults, but even the clinical manifestations and biological behaviors of the same tumors occurring in children may also be quite different from those of adults.[3] Therefore, summarizing the cases of oral and maxillofacial tumors in children and understanding their morbidity characteristics and regularity, especially the differences with adults, can lead to early detection, diagnosis, and treatment. In this way, we can achieve secondary prevention strategies and provide a basis for etiological prevention (primary prevention). Therefore, it is of great significance to establish a mature diagnosis and treatment system for oral and maxillofacial tumors in children.

In 2022, the World Health Organization (WHO) updated the classification system for head and neck tumors, providing several additions, deletions and modifications compared to the previous 2017 version.[4–9] For example, the surgical ciliated cyst was a new entry to the cyst classification of the jaws. Adenoid ameloblastoma was added to benign epithelial odontogenic tumors. Segmental odontomaxillary dysplasia was introduced in the group of fibro-osseous tumors and dysplasia. In the 2017 classification, "cemento-ossifying fibroma" was classified as benign mesenchymal odontogenic tumor, but it was discussed together with juvenile trabecular ossifying fibroma (JTOF) and juvenile psammomatoid ossifying fibroma (JPOF) under the heading of ossifying fibroma in fibro-osseous and osteochondromatous lesions. In the 2022 classification, "juvenile trabecular ossifying fibroma (JTOF)" and "psammomatoid ossifying fibroma (PsOF)" were discussed respectively, instead of being combined under the heading of ossifying fibroma. Rhabdomyosarcoma with TFCP2 rearrangement, was introduced into the group of malignant jawbone tumors, which

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was used to differentiate it from other types of rhabdomyosarcomas. Melanotic neuroectodermal tumor of infancy and osteoid osteoma were deleted from the benign bone and cartilage tumors, as well as the hematolymphoid tumor of solitary plasmacytoma of bone. There were several new entities among salivary gland tumors such as sclerosing polycystic adenoma, keratocystoma, intercalated duct adenoma, and striated duct adenoma among the benign neoplasms. Cribriform adenocarcinoma of salivary gland origin (CASG) now represented a distinctive subtype of polymorphous adenocarcinoma (PAC). Myofibroma and myopericytoma were classified together. Lymphoepithelial cysts and branchioma were now included in the chapter of the Neck and Lymph Nodes, while hematolymphoid tumors and Merkel cell carcinoma were excluded from this chapter and instead discussed in other sections, etc.

Since the changes made in the 5th edition of the WHO Classification of the head and neck tumors, no large sample study has been conducted to systematically summarize the clinical characteristics of oral and maxillofacial tumors in children and adolescents. This study amied to investigate the clinical characteristics of oral and maxillofacial tumors in children and adolescents in a retrospective study of cases under the age of 18 years in a tertiary hospital in northern China over a 31-year period according to the WHO (2022) head and neck tumor classification system.

MATERIALS AND METHODS

Research Subjects

This retrospective study was performed of all patients under 18 years of age with oral and maxillofacial tumors treated at the Department of Oral and Maxillofacial Surgery, Peking University School and Hospital of Stomatology from January 1990 to July 2021, with data obtained from the Medical Records Department and Information Center of Peking University Hospital of Stomatology.

Inclusion criteria: 1. Patients could be diagnosed as tumor or tumor-like lesions with availability of complete medical records including medical history, physical signs, general and auxiliary examination findings, and treatment; 2. Patients under the age of 18 years.

Exclusion criteria was incomplete clinical information.

Research Methods

The study protocol was approved by the Ethics Committee of Peking University Hospital of Stomatology (approval no. PKUSSIRB-202279121). This study has been registered with the China Clinical Trials Registry (ChiCTR) with registration number ChiCTR2200065129.

Variables

The data was collected including gender, age, date of admission, date of discharge, anatomical location, histopathological diagnosis, surgical procedures, and times to be hospitalized. The age of onset was recorded according to the medical record, i.e., "age of onset" = age at presentation-length of illness.

According to WHO (2022) classification of head and neck tumors, the morphology codes are from the International Classification of Diseases for Oncology (ICD-O). Behavior is coded /0 for benign tumors; /1 for unspecified, borderline, or uncertain behavior; /2 for carcinoma in situ and grade III intraepithelial neoplasia; and /3 for malignant tumors. In this study, all pathological diagnoses were divided into 3 categories: malignant and intermediate tumors (/1-3), benign tumors and tumor-like lesions, and cysts.

According to the stages of children's growth and development, we divided the patients' ages into the following 6 age groups referring to the 9th edition of *Pediatrics*:[10] infant period (0 to 1 y old), toddler period (1 to 3 y old), preschool period (3 to 6 y old), school-age period (6 to 10 y old), early adolescence period (10 to 14 y old) and late adolescence period (14 to 18 y old).

Statistical Analysis

The age distribution, disease composition ratio, anatomical site distribution, benign-to-malignant ratio, treatment method, and prognosis were analyzed using SPSS26.0 software package (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp). $P < 0.05$ was considered statistically significant.

RESULTS

The initial sample included 5813 patients. Among them, 408 met the exclusion criteria and were excluded. The patients who were treated many times in our hospital for the same disease were recorded according to their first onset age, and their follow-up treatment was recorded in detail. The final sample included 5405 patients.

General Distribution

A total of 5405 patients under 18 years of age with oral and maxillofacial tumors treated at the Department of Oral and Maxillofacial Surgery, Peking University School and Hospital of Stomatology from January 1990 to July 2021 met the inclusion criteria. There were 2903 male patients (53.71%) and 2502 female patients (46.29%), with a male-to-female ratio of 1.16:1.

The number of patients increased gradually with age, and the highest number of cases occurred between the ages of 14 and 18 years (late adolescence period) ($P < 0.001$) (Fig. 1). The number of males was consistently higher than females at different ages from 0 to 18 years (Fig. 2).

The oral and maxillofacial anatomical sites involved in this study include: maxilla, mandible, zygoma, tongue, lip, buccal area, palate, oropharynx, gingiva, sublingual region, posterior molar region, parotid gland, sublingual gland, submaxillary gland, submental region, submandibular region, neck, facial skin, temporal region, infratemporal fossa, skull base, parapharyngeal. The top 10 most common anatomical sites of incidence were: mandible (22.15%), maxilla (11.75%), tongue (9.25%), parotid gland (8.99%), sublingual gland (6.88%), neck (6.01%), facial skin (5.88%), buccal area (4.51%), lip (4.05%), and palate (2.33%), as shown in Figure 3.

There were 705 cases (13.04%) of malignant and intermediate tumors, 3009 cases (55.67%) of benign tumors and tumor-like lesions, and 1691 cases (31.29%) of cysts, whose gender and age distribution were shown in Supplemental Table 1, Supplemental Digital Content 1, http://links.lww.com/SCS/E952.

Figure 4 showed the change in the total number of oral and maxillofacial tumor cases aged 0 to 18 years from 1990 to 2020. The number of cases in 2021 was not included in this figure because the data in this study were counted until July, which is less than 1 year.

From 1990 to 2020, the proportion of malignant and intermediate types of tumors and cysts among children and adolescents with oral and maxillofacial tumors showed an increasing trend, while the proportion of benign tumors and tumor-like lesions showed a decreasing trend (Fig. 5).

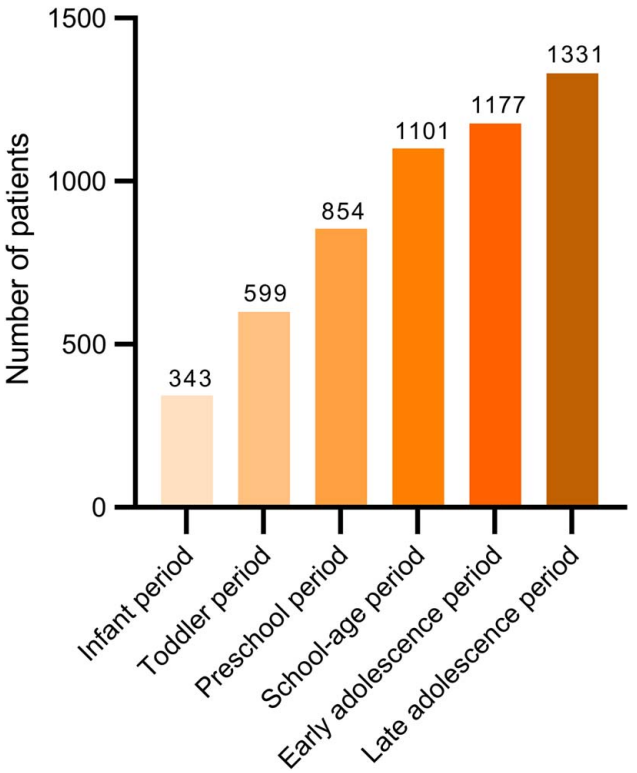

FIGURE 1. Age distribution of oral and maxillofacial tumors in children and adolescents.

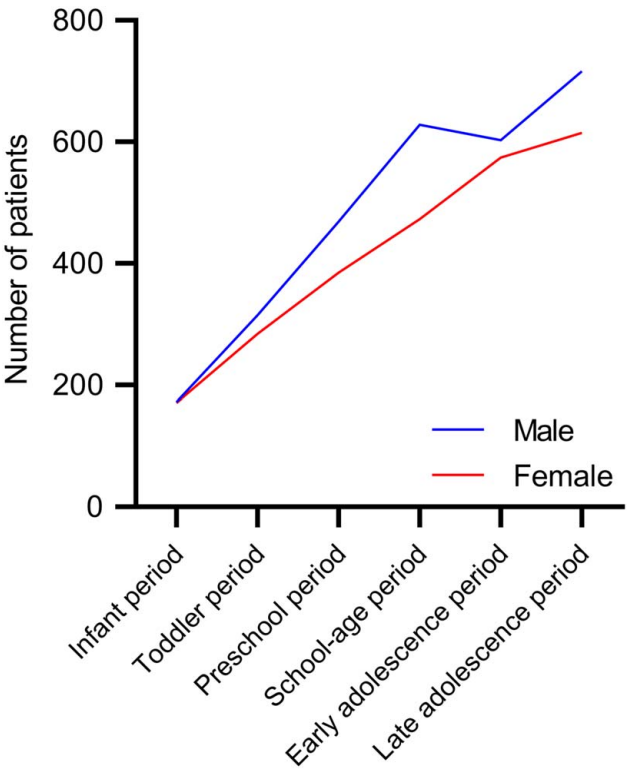

FIGURE 2. Distribution of male and female patients of different age groups.

Distribution of Malignant and Intermediate Tumors

Among the malignant and intermediate tumors (705 cases), there were 397 males and 308 females, with a male-to-female ratio of 1.29:1. The median age was 9 years, 9 years for males, and 10 years for females. Late adolescence period (14 to 18 y) was the peak incidence period ($P < 0.001$). 36.60% were sarcomas, 26.96% were adenocarcinomas, 20.00% were haematolymphoid tumors (10.21% Langerhans cell histiocytosis, 9.50% malignant lymphomas). Supplemental Table 2, Supplemental Digital Content 1, http://links.lww.com/SCS/E952 showed the gender and age distribution of the most common types of oral and maxillofacial malignant and intermediate tumors in children and adolescents. The most common sites of malignant tumors were parotid (24.11%), mandible (20.28%), maxilla (8.79%), buccal area (5.39%), and palate (4.68%).

There were 119 cases of mucoepidermoid carcinoma, 60 males and 59 females, with a male-to-female ratio of 1:1. The median age was 13 years, with a peak incidence at 14 to 18 years (late adolescence period) ($P < 0.001$). 63.87% of the cases occurred in the parotid gland, followed by the palate (19.33%) and submandibular gland (6.72%). Of these cases, 39.50% were performed resection with I-125 radioactive particle implantation, 35.29% were performed resection, 5.04% underwent lesion excision with neck dissection. 6.72% underwent tissue flap repair (2 iliac crest flaps, 2 fibular osseous flaps, 2 forearm free flaps, 1 submental island flap, and 1 anterolateral thigh flap) during the initial surgery. The recurrence rate was 17.65%.

Distribution of Benign Tumors and Tumor-like Lesions

Among benign tumors and tumor-like lesions (3009 cases), 1586 cases were male and 1423 cases were female, with a male-to-female ratio of 1.11:1. The median age was 8 years for both males and females. Late adolescence period (14 to 18 y) was the peak incidence ($P < 0.01$). Hemangioma and vascular malformation (48.16%) were the most common types. Supplemental Table 3, Supplemental Digital Content 1, http://links.lww.com/SCS/E952 showed the gender and age distribution of the most common types of benign tumors and tumor-like lesions in children and adolescents. The most common sites of benign tumors and tumor-like lesions were the mandible (20.37%), tongue (14.56%), parotid gland (8.77%), maxilla (8.14%), facial skin (8.11%), and buccal area (6.55%). We found that the most benign tumors and tumor-like lesions in children and adolescents located in maxillofacial bones (including maxilla, mandible, zygomatic bone, frontal bone, temporal bone and infratemporal fossa), accounted for 30.18%.

There were 1451 cases of hemangioma and vascular malformation, 755 cases (52.03%) in males and 696 cases (47.97%) in females, with a male-to-female ratio of 1.08:1. The median age was 4 years, and the peak incidence was between preschool period (3 and 6 y) ($P < 0.001$). The most common site was the tongue (26.39%), followed by the lip (11.85%), buccal area (10.13%), facial skin (9.58%), and parotid gland (5.51%).

According to the 2022 classification, epithelial odontogenic tumors (24.78%) were the most benign maxillofacial bone lesions in this study, and many scholars have done a lot of research on them. Fibro-osseous lesions (22.80%) took the second place, including 108 fibrous dysplasia, 90 ossifying fibroma, 5 cemento-ossifying dysplasia, and 4 familial gigantiform cementoma.

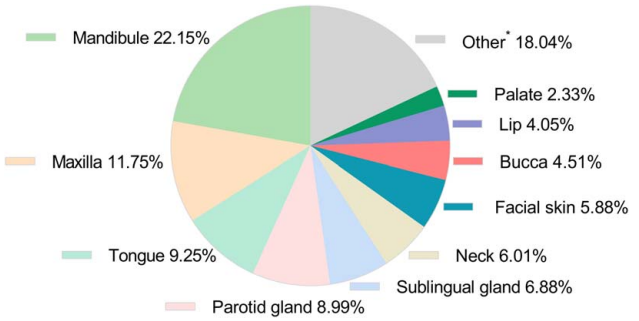

FIGURE 3. Distribution of anatomical sites oral and maxillofacial tumor in children (*others: including zygomatic bone, oropharynx, gingiva, sublingual region, posterior molar region, submandibular gland, submental region, submandibular region, temporal region, infratemporal fossa, skull base, parapharyngeal, etc.).

Distribution of Cysts

A total of 1691 cysts were involved, including 920 males and 771 females, with a male-to-female ratio of 1.19:1. The median age was 9 years for males and 10 years for females. School-age period (6 to 10 y) had the largest number of cases. Non-specific cysts were found in 490 cases (28.98%). Among odontogenic cysts, dentigerous cyst was the most common developmental cyst. Among non-odontogenic cysts, branchial cleft cyst was the most common developmental cyst, and ranula was the most common non-developmental cyst. The gender and age distribution of main cysts were shown in Supplemental Table 4, Supplemental Digital Content 1, http://links.lww.com/SCS/E952. The most common sites of cysts were mandible (26.08%), sublingual gland (21.47%), maxilla (19.40%), neck (12.66%), and floor of the mouth (3.49%).

Characteristics of Jaw Lesions

Characteristics of Malignant and Intermediate Type Tumors of the Jaws

Among the tumors of the jaws, there were 220 cases of malignant and intermediate tumors, including 134 cases (60.9%) in males and 86 cases (39.1%) in females, with a median age of 8 years. The most common anatomical site was mandible

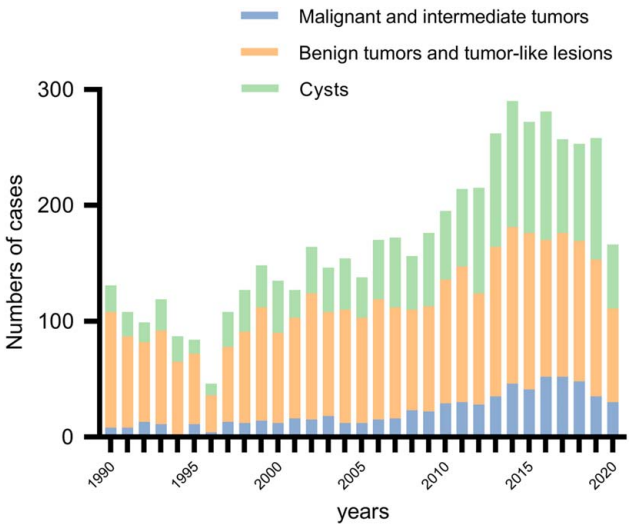

FIGURE 4. Number of cases of oral and maxillofacial tumors in 0 to 18 years old from 1990 to 2020.

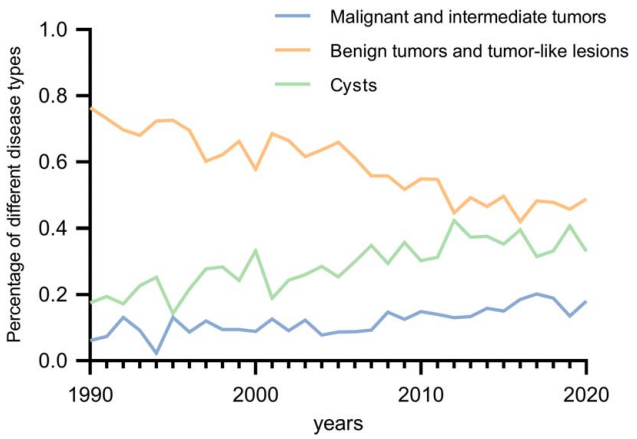

FIGURE 5. Proportion of different disease types from 1990 to 2020.

(65.00%), followed by maxilla (28.18%) and multiple sites of the jaws (6.81%). Sarcoma (42.27%) was the most common type, followed by Langerhans cell histiocytosis (25.45%), malignant lymphoma (6.82%), and aggressive fibromatosis (4.55%). The recurrence rate was 14.55%, in which 62.50% of the pathological types were sarcomas. Of the cases where the disease outcome was not recurrence, 32.98% were not treated surgically (including biopsy, radioactive particle implantation, radiotherapy, and abandonment of treatment), and were mostly hematopoietic and lymphoid tissue tumors. Of the initial surgical approaches, the most common was simple local expanded resection of the mass (45.21%). Soft tissue flap repair was performed in 10 cases (including 7 cases of anterolateral thigh flap, 2 cases of rectus abdominis flap, and 1 case of submental island flap). Bone tissue (flap) reconstruction was performed in 24 cases (including 20 cases of fibular flap, 2 cases of iliac flap, and 2 cases of free iliac). The lesion sites and ages of patients with different repair and reconstruction modalities were shown in Supplemental Table 5, Supplemental Digital Content 1, http://links.lww.com/SCS/E952. The results showed that for malignant and intermediate tumors of the jaws, the choice of repair and reconstruction modality was site-related, with soft tissue flaps commonly used for the maxilla and bone tissue (flap) commonly used for mandibular defects ($P < 0.001$). There was no significant correlation between surgical options and the age of the patient.

Characteristics of Benign Tumors and Tumor-like Lesions of the Jaws

There were 898 cases of benign tumors and tumor-like lesions of the jaws, including 499 cases (55.57%) in males and 399 cases (44.43%) in females, with a median age of 12 years. The mandible (68.26%) remained the most common site of morbidity, followed by the maxilla (26.50%) and multiple sites of the jaws (4.45%). The highest incidence was in the order of ameloblastoma (26.50%), odontoma (16.15%), fibrous dysplasia (11.80%), ossifying fibroma (9.91%), hemangioma and vascular malformation (6.24%). Local resection or curettage of the swelling was most often performed (77.03%). 4.27% were not treated surgically, mostly for fibrous dysplasia, and were recommended to be treated surgically in adulthood. Soft tissue flap was performed in 8 cases (including 8 cases of anterolateral thigh flap) and bone tissue (flap) repair in 132 cases (including 92 cases of fibular flap, 23 cases of iliac flap, 10 cases of free iliac, 6 cases of rib, and 1 case of scapula flap). The lesion sites

and ages of patients with different repair and reconstruction methods were shown in Supplemental Table 6, Supplemental Digital Content 1, http://links.lww.com/SCS/E952. For benign tumors and tumor-like lesions of the jaws, defects of the mandible and multiple sites of the jaws were mainly reconstructed with bone tissue (flaps), and soft tissue flaps were mainly used for maxillary masses ($P < 0.001$). Patients with bone tissue (flaps) were generally older than those with soft tissue flaps ($P = 0.003$).

Characteristics of Jaw Bone Cysts

There were 801 cases of maxillary cysts, including 486 cases (60.67%) in males and 315 cases (39.33%) in females, with a median age of 11 years. The mandible (55.06%) was the most common site of incidence, followed by the maxilla (40.95%) and multiple sites of the jaws (3.99%). The highest incidence was in order of non-specific cysts (53.30%), odontogenic keratocyst (26.33%), dentigerous cyst (15.48%), radicular cyst (2.25%), calcifying odontogenic cyst (2.00%), and nasopalatine duct cysts (0.37%). For treatment, local resection or curettage of the mass was used the most (99.00%). Furthermore, 3 cases were reconstructed with fibular flap. 4 with free iliac, among them a 9-year-old patient recurred after 9 years and used fibular flap instead; one case was reconstructed with iliac bone with vascular crisis, so it was changed to free iliac bone. One with distraction osteogenesis after resection of the mass.

DISCUSSION

This is a retrospective study that analyzed a large sample of cases from a tertiary care hospital in northern China over a 31-year period. The results of this study to some extent reflect the clinical characteristics of oral and maxillofacial tumors in children and adolescents in northern China.

There is a large literature on oral and maxillofacial tumors in adults, which have a high incidence and mortality. For adult tumors, the findings of risk factors are clearer, such as smoking, alcohol consumption, HPV infection.[3] In contrast, for oral and maxillofacial tumors in children and adolescents, they have special characteristics of children in terms of pathogenesis. Understanding the clinicopathological features is crucial for the diagnosis, treatment, and prevention of tumors in children and adolescents.

Previous reports on oral and maxillofacial tumors in children have shown wide variation due to geography, ethnicity, and inclusion and exclusion criteria, making it difficult to compare them and thus draw reliable conclusions. Among the available studies, the classification methods regarding histopathology vary and have been updated over time. Gosepath[11] used the International Classification of Childhood Cancer (ICCC) and the International Classification of Diseases for Oncology (ICD-O-2). Arboleda[3] et al used the International Classification of Diseases for Oncology (ICD-O-3) for histopathological classification. Most studies since 2017 have used the World Health Organization WHO (2017) head and neck tumor classification.[12,13] This study, as the first study on oral and maxillofacial tumors in children and adolescents since the WHO Head and Neck Tumor Classification in 2022, may provide clinicians with the most up-to-date reference information. On this basis, this study includes most types of oral and maxillofacial tumors in children and adolescents, among which malignant and intermediate tumors, benign tumors and tumor-like lesions, and cysts are analyzed. And tumors occurring in the jaw bone and diseases with high incidence are analyzed in depth. Therefore, we analyzed the clinical characteristics of oral and maxillofacial tumors in children and adolescents from a more comprehensive perspective, which is important for the early diagnosis, differential diagnosis, and clinical decision making of the diseases in children and adolescents.

In previous studies, the inclusion of the age range and age division of children and adolescents has varied. For example, Arboleda,[1] Arruda[12] included patients aged 0 to 19 years, da Silva Barros[14] included patients aged 10 to 19 years. Arruda[12] divided the age into 0 and 9 years (children) and 10 to 19 years (adolescents), without detailed analysis of the age distribution. In this study, the age was divided into 6 groups according to the growth and development characteristics of children, showing that the incidence increases with age, with a peak incidence at late adolescence period, which further verifies that the incidence of oral and maxillofacial tumors is higher in adults than in children and adolescents, with a gradual increase in incidence during growth.

The increasing trend in the proportion of malignant and intermediate tumors over the 30-year period from 1990 to 2020 is consistent with Schwartz,[2] who showed that the incidence of head and neck malignancies increased between 1973 and 2010 in patients under 14 years of age, but the proportion of head and neck malignancies among systemic malignancies remained essentially unchanged. Therefore, they concluded that head and neck malignancies in children have a faster growth rate compared to systemic malignancies. Therefore, an understanding of the incidence and epidemiological trends of the disease, as well as a full understanding of the distribution of disease pathological types is necessary for clinicians to make reasonable diagnosis and treatment at an early stage.

The incidence of malignant oral and maxillofacial tumors in children and adolescents is lower than that of benign lesions, accounting for approximately 0.61% to 25%,[3,12,14–17] but they are highly aggressive and require clinical attention. In this study, malignant and intermediate tumors accounted for 13.04%. Arruda[12] shows that there were more females than males. In addition, most of the studies showed more males than females, which is consistent with the results of this study. Furthermore, this study showed a higher number of male patients than females at different ages. In some studies, the prevalence of the disease changed with age in different genders, such as more males at the age of 0 to 9 years, while the prevalence in females gradually increased with age, surpassing the number of males by the age of 10 to 14 years.[1,11] Arboleda[3] et al indicated that lymphomas were the most, followed by sarcomas and carcinomas. In their review, non-Hodgkin's lymphoma, fibrosarcoma, and thyroid carcinoma had the highest incidence in Asia.[1] Arruda[12] showed that with the highest incidence, mucoepidermoid carcinoma, sarcoma, squamous cell carcinoma, and Burkitt's lymphoma were followed. In this study, the incidence of sarcoma is the highest, followed by adenocarcinoma, and malignant lymphoma is the fourth. This may be because lymphoma is not a head and neck specific disease, and patients may present with systemic manifestations and thus are treated in other non-specialist hospitals.

Among all malignant and intermediate types of tumors, mucoepidermoid carcinoma is the most. In previous studies, mucoepidermoid carcinoma was the most frequent malignancy of the salivary gland,[18] most commonly in the parotid gland, with a mean age of 12.9 to 13.4 years.[19,20] The results of this study showed no significant gender preference, which is consistent with the findings of Janz[19] and Rajasekaran,[21] although it is generally accepted that there are more female than male patients. In previous studies, most patients underwent surgical resection, and children had a better prognosis than adults, with

a 5-year survival rate of more than 93%.[19,21–23] In the research of Mao,[22] I-125 radiation therapy had been shown to be safe and effective in pediatric patients with no serious radiotherapy complications through 5 to 13.4 years of follow-up.

Consistent with previous studies, benign tumor remnant tumor-like lesions accounted for the majority of the patients.[14–17] Al Yamani[15] indicated that hemangiomas and vascular malformations were the most common and were more frequent in females. Rujkijyanont[24] concluded that the median age of onset of vascular disease was 11.3 years and that there was no difference in the gender distribution. da Silva Barros[14] showed inflammation was the most common among benign lesions. In their study, the age of the patients included in that study was 10 to 19 years and could not be directly compared with other studies.

Most of the oral and maxillofacial tumors in children and adolescents occur in the jaw. At present, there have been studies on the characteristics of jaw lesions in children and adolescents, most of which are malignant tumors and cystic masses.[25] However, benign lesions account for 90% of all jaw lesions.[26] Many benign lesions are asymptomatic and are only detected in imaging examination. Some locally invasive lesions can cause pain, facial swelling, and tooth loosening just like malignant tumors. Therefore, the early detection of benign lesions and the formulation of diagnosis and treatment plan should also attract the attention of clinicians. At present, most of the existing literatures only focus on one or one kind of lesions, and lack a systematic and comprehensive summary like malignant tumors. Chen[27] and Çubuk[13] et al conducted a retrospective study of benign jaw lesions in children and adolescents, but their sample size was small, which made the results have certain limitations.

In jaw tumors of this study, cysts accounted for 41.94%, which is not consistent with our impression that jaw cysts are in the majority. One of the reasons is that some jaw cyst patients in our hospital are treated in Department of Pediatric Dentistry or outpatient department, so the proportion is lower than the actual situation.

For children and adolescents with jaw lesions, it is more challenging to make treatment decisions because we need to consider the age, growth, and development of children and adolescents, donor site complications, etc. Diseases often destroy the oral and maxillofacial function and aesthetics, and have a certain impact on patients' growth and development, physical and mental health. For jaw tumors, the treatment is usually surgery, from simple curettage to segmental osteotomy and reconstruction. Malignant lesions usually need postoperative adjuvant radiotherapy and chemotherapy.[28] Surgeons must consider the growth potential of maxillofacial bones, the invasiveness of lesions, and the recurrence rate. Whether and how to perform simultaneous or second-stage repair and reconstruction in children and adolescents who need jaw tumor resection is a controversial topic. The formulation of repair and reconstruction plan usually needs to consider the extent and the location of the defect, the way of surgical resection, the possibility of recurrence, the patient's age, whether to carry out adjuvant treatment in the future, the wishes of the patient and parents, etc. From the results of this study, compared with benign tumors, patients with malignant tumors should take the control of primary and metastatic lesions as the most important task, so the choice of repair and reconstruction methods is more complicated and influenced by more factors, so it is difficult to determine the results affected by a single factor. In conclusion, based on this study, after a thorough analysis of the clinical characteristics of oral and maxillofacial tumors in children and adolescents, we will next conduct further studies on the clinical characteristics and regression of benign jaw lesions in children and adolescents, with the aim of providing a reference basis for clinical decision.

This study is a single-center retrospective study and therefore has its own limitations. Moreover, our hospital is a stomatological hospital, and some patients with multi-site manifestations may be seen in general hospitals, such as lymphoma. So, the data obtained are often lower than the actual ones. In future studies, we will strive to achieve a multicenter, prospective study to provide more robust research evidence on the clinical characteristics of oral and maxillofacial tumors in children and adolescents.

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