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ORIGINAL ARTICLE

Evaluation of the prevalence, clinical and radiographic characteristics of odontomas in children and adolescents in Afyonkarahisar Province

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Abstract

Odontomas represent benign odontogenic tumors arising from proliferations of epithelial and mesenchymal tissues involved in tooth development. They are typically asymptomatic, slowgrowing lesions detected radiographically. This study aimed to determine the prevalence of odontomas in children and adolescent patients in Afyonkarahisar province and to analyze their clinical and radiographic features. In this retrospective study, panoramic radiographs of 19,212 patients aged 6–18 years who presented to the Afyonkarahisar Health Sciences University Faculty of Dentistry between January 2023 and January 2025 were reviewed. Patients diagnosed with odontoma were evaluated for age, sex, lesion type, anatomical location, and clinical symptoms. Statistical analyses were performed using IBM SPSS Statistics Version 26. The prevalence of odontomas among patients aged 6–18 years in Afyonkarahisar was 0.1%. It was found that 33.3% of odontoma cases were compound type and 66.7% were complex type. In 76% of cases, odontomas were observed to prevent the eruption of adjacent permanent teeth. This study, which evaluated children and adolescents, found that the prevalence of odontoma was lower than reported in the literature. As the most common odontogenic tumors, odontomas are frequently identified during routine radiographic examinations, enabling early diagnosis and prevention of potential complications. Early detection in growing patients is especially critical for preventing disturbances in tooth eruption.

Keywords: Odontoma, prevalence, children and adolescents, odontogenic tumor, radiographic characteristics, eruption disturbances

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Introduction

Odontomas are defined as benign odontogenic tumors that involve odontogenic epithelium and ectomesenchyme and are capable of forming dental hard tissues such as enamel, dentin, cementum, and pulp [1]. These lesions represent a significant percentage (23-77%) of all odontogenic tumors [2-4]. Many studies have examined extensive case series of these tumors and identified odontomas as the most common odontogenic tumors [2,3]. Odontomas most often occur in children and adolescents, particularly during the second and third decades of life, without a significant gender predilection [5-7].

The diagnosis of odontomas is typically made during routine radiographic examinations. Radiographically, odontoma appears as well-defined radiopaque lesion surrounded by a thin radiolucent area with a soft tissue capsule. The classification of odontomas is determined by their radiographic appearance and histologic features. The World Health Organization (WHO) divides odontomas into two groups histopathologically as complex odontomas and compound odontomas [5-7]. Complex odontomas appear as radiopaque irregular and amorphous masses, and the radiopaque lesion does not resemble tooth structures. A typical feature is the identification of an X-ray image like a sun ray [5,6]. Compound odontomas appear on radiographic examinations as well-demarcated lesions containing radiopaque regions in a surrounding radiolucent halo. More than one follicular formation is seen in compound odontomas, and these follicular formations are separated by fibrous septa. Compound odontomas are lesions exhibiting multiple small tooth-like structures called denticles [5-7].

The pathogenesis of odontomas, which are commonly seen in the jaws, has not been fully explained. However, heredity, genetic mutations and local trauma are accepted as possible etiologic factors [8]. Odontomas may also present as a part of some syndromes such as Gardner syndrome, Hermann syndrome, familial colonic adenomatosis and basal cell nevus syndrome [8,9].

Odontomas are usually benign and asymptomatic lesions. The most common clinical symptom encountered in odontoma cases is delayed eruption of permanent teeth because odontoma prevents tooth eruption [6,7]. Since odontomas commonly involve the anterior region of the maxilla, incisors and canines are the most commonly affected teeth [7,10,11]. Other findings that can be encountered very rarely in odontoma cases include symptoms such as agenesis of the permanent tooth, pain, inflammation or infection [7,8,10-12].

A review of the current literature reveals that several retrospective studies have evaluated the prevalence of odontomas across different age groups. Although the findings of these studies are generally similar, some variations are observed [2,3,13]. In Türkiye, the number of studies that comprehensively investigate odontomas remains limited [14,15]. Therefore, the aim of the present study was to determine the prevalence of odontomas among children and adolescents in Afyonkarahisar province, to evaluate their various clinical and radiological characteristics, and to interpret the findings in the context of the existing literature.

Materials and Methods

This retrospective study was conducted by reviewing the panoramic radiographs of patients aged 6-18 who applied to the Afyonkarahisar Health Sciences University Faculty of Dentistry between January 2023 and January 2025. Ethical approval was obtained from the Non-Interventional Research Ethics Committee of Afyonkarahisar Health Sciences University (Approval no: 2025/6/322).

The radiographic evaluations were conducted by two pediatric dentists. Patients diagnosed with odontoma on panoramic radiographs were identified, and their clinical records were retrieved from the archives. Patients with complete clinical documentation, standard-quality radiographs, and histopathologically confirmed odontoma diagnoses were included in the study. Patients with syndrome were excluded based on a thorough review of their medical histories and clinical records. Any patients with documented genetic syndromes or clinical findings suggestive of syndromic conditions were not included in the study. The selected cases were evaluated and documented in terms of age, gender, type and localization of the odontoma, as well as the presence of any accompanying dental anomalies.

- **Age:** Patient ages were recorded to evaluate the correlation between different odontoma types and patient age at diagnosis. In cases where a patient had multiple panoramic radiographs, only the first radiograph indicating the presence of odontoma was included, and the age at the time of that radiograph was recorded.
- **Gender:** Gender of the patients was recorded to determine whether different types of lesions were predisposed according to gender.
- **Odontoma type:** Odontoma types were recorded to assess the frequency of different types of odontoma (complex or compound odontoma). The 2017 WHO classification was used for diagnosis [16].
- **Localization:** To determine the localization of odontomas, the upper and lower jaws were divided into anatomical regions: anterior, premolar and molar
- **Clinical Symptoms:** Clinical findings in odontoma were evaluated and recorded in terms of the presence of persistent deciduous teeth, agenesis of permanent teeth, impacted permanent teeth, pain, and malposition of teeth.

The diameter of the odontomas was measured on panoramic radiographs using digital measuring tools available in the radiographic imaging software. The measurements were performed by two independent pediatric dentists, and any discrepancies were resolved through collaborative evaluation and consensus.

Statistical analysis

All analyses were conducted in SPSS statistical software package program (version 26, Chicago, USA). Categorical data were presented as counts (n) and percentages (%). Chi-square tests were used to assess distributions across parameters. The results that were found to be statistically significant in the dependency test were further analyzed through post-hoc evaluations using the z-test and Bonferroni correction. For statistical tests, $p<0.05$ was considered statistically significant.

Results

A total of 19,658 panoramic radiographs of patients aged 6-18 years were reviewed. After applying the inclusion and exclusion criteria, 446 panoramic radiographs were excluded. Therefore, 19,212 radiographs were included in the final analysis. Panoramic radiographs of patients aged 6-18 were included, with an average age of 12 ± 2.9 years. The prevalence of odontomas was found to be 0.1% among 19212 patients. This rate was 0.11% in female patients and 0.09% in male patients. Of the odontomas included in the study, 61.9% were seen in females and 38.1% in males. Parameters such as odontoma type, localization, related teeth, odontoma size, accompanying anomaly, relationship with anatomical structures, treatment or prevention of eruption of adjacent teeth were not found to be associated with gender ($p>0.05$). The location of 61.9% of odontomas was in the maxilla, 38.1% in the mandible; 66.7% in the anterior region and 33.3% in the posterior region.

Enucleation was performed in 42.9% of the odontomas, enucleation + extraction in 19%, and follow-up was recommended in 38.1%. It was found that 28.6% of odontomas were accompanied by other dental anomalies such as hypodontia, dilaceration, rotation, diastema, enlargement of the dental follicle or dentigerous cyst. In 76% of cases, odontoma impeded the eruption of adjacent permanent teeth. It was observed that 61.9% of odontoma lesions were referred to orthodontics. It was determined that 23.8% of the odontomas were closely adjacent to anatomical regions such as maxillary sinus or mandibular canal. When odontomas were analyzed according to size, 19% were smaller than 5mm, 52.4% were between 5 and 10 mm, and 28.6% were larger than 10 mm. The relationships between odontoma size and age, gender, and localization of the odontoma were examined, and no relationship was found between odontoma size and age, gender, and localization (maxilla-mandible). Only 9.5% of odontomas were symptomatic, primarily presenting with pain

Table 1. The relationship between odontoma types and different parameters.

Parameters		Compound (n=7)	Complex (n=14)	*p* value
Gender	Female	46.2% (n=6)	53.8% (n=7)	>0.05
	Male	12.5% (n=1)	87.5% (n=7)	
Jaw	Maxilla	53.8% (n=7)	46.2% (n=6)	**0.003**
	Mandible	0% (n=0)	100% (n=8)	
Region	Anterior	57.1% (n=4)	42.9% (n=3)	>0.05
	Posterior	71.4% (n=10)	28.6% (n=4)	
Associated teeth	Central Incisor	75% (n=3)^{a}	25% (n=1)^{b}	**0.022**
	Lateral Incisor	0% (n=0)^{a}	100% (n=2)^{a}	
	Canine	11.1% (n=1)^{a}	88.9% (n=8)^{a}	
	Premolar	0% (n=0)^{a}	100% (n=2)^{a}	
	Molar	75% (n=3)^{a}	25% (n=1)^{b}	
Treatment	Enucleation	55.6% (n=5)	44.4% (n=4)	>0.05
	Extraction + Enucleation	0% (n=0)	100% (n=4)	
	Follow-up	25% (n=2)	75% (n=6)	
Presence of concomitant anomaly	Absent	26.7% (n=4)	73.3% (n=11)	>0.05
	Present	50% (n=3)	50% (n=3)	
Relationship with anatomical regions	Absent	25% (n=2)	75% (n=12)	>0.05
	Present	60% (n=3)	40% (n=2)	
Affecting the eruption of adjacent teeth	Absent	20% (n=1)	80% (n=4)	>0.05
	Present	37.5% (n=6)	71.4% (n=10)	
Size	<5 mm	75% (n=3)	25% (n=1)	>0.05
	5-10 mm	18.2% (n=2)	81.8% (n=9)	
	>10mm	33.3% (n=2)	66.7% (n=4)	

**a, b Different superscript letters within rows indicate statistically significant differences (z-test, Bonferroni correction, $p<0.05$).*

and localized swelling, and the remaining cases were detected through routine examination.

When odontomas were analyzed according to type, 33.3% were compound type and 66.7% were complex type. The mean age at presentation of the compound type was 13±2.3, while the mean age at presentation of the complex type was 11.5±3.2. No significant correlation was found between odontoma types and gender, anterior/posterior location, treatment, accompanying anomaly, interference with tooth eruption, relationship with anatomical region and lesion size ($p>0.05$). When analyzed according to the jaws, only complex odontoma was found in the mandible ($p<0.05$). Compound type was more common in central incisors and molars. The relationship between odontoma types and different variables is shown in Table 1.

Discussion

Although odontomas are classified as benign odontogenic tumors according to the WHO classification, odontomas are generally regarded as hamartomatous malformations rather than benign neoplasms [17]. However, many studies examining series of these tumors have reported that odontomas are the most common odontogenic tumors [18,19]. A comprehensive review of the available literature indicates that prior studies investigating the prevalence of odontomas have reported varying results, with reported frequencies ranging from 0.24% to 1.21% across different populations [13]. When the studies conducted in Türkiye were examined, the prevalence of odontoma was found to be 0.39% in the study by Soluk Tekkesin et al. and 0.1% in the study by Bodrumlu et al. which examined children and adolescents between the ages of 6-18 [14,15]. Consistent with prior research by Bodrumlu et al., this study observed an odontoma prevalence rate of 0.1% in the pediatric and adolescent population. Since this study consisted of data obtained from randomly selected patients who applied for examination, it is thought to reflect the general population reliably.

In this study, complex odontomas accounted for 66.7% of the total cases, while compound odontomas accounted for 33.3%. This ratio between odontoma types is similar to the study of Soluk Tekkesin et al. who examined the same population [15]. However, many studies have also been reported in literature in which compound odontoma was reported at a higher rate than complex odontoma [8,20,21]. It is thought that differences in study populations may be effective in the differences between the results.

When the prevalence of odontoma was analyzed in terms of patient gender, a rate of 61.9% in females and 38.1% in males was found in this study. There is no consensus on gender tendency among odontoma studies in the literature. The literature presents conflicting findings regarding the gender predilection for odontoma-associated eruption disturbances, with some studies reporting a higher prevalence in female patients [7,20,22], while others indicate a male predominance [23,24].

There are also studies reporting that there is no gender difference in odontomas [6,15]. In multiple case series studies in which odontoma cases were analyzed, the relationship between odontoma type and patient gender was examined, but no significant finding was found [11,20,23]. In this study, the relationship between odontoma type and patient gender was examined and no gender difference was observed in terms of complex and compound odontoma type. There was also no relationship between the tendency of odontoma type in females and males.

In the literature, the most common age range in which odontoma is seen is reported to be the second decade [22,24]. In this study, the mean age at diagnosis of odontoma was found to be 12±2.9. In a study examining the relationship between odontoma type and mean age at diagnosis, it was reported that compound odontomas were diagnosed at a younger age than complex odontomas [15]. The findings of this study revealed no association between odontoma type and the mean age at presentation. This difference between the studies may be since this study only examined patients in the pediatric and adolescent age group.

It has been reported in many studies that odontomas, which constitute a large proportion of odontogenic tumors in the jaws, are more common in the maxilla compared to the mandible [6,20,23]. Consistent with the literature, in this study, 61.9% of the total cases were located in the maxilla, while 38.1% were in the mandible. Studies have reported that the tendency to occur in the anterior region is higher than the posterior region in terms of the anatomical region of the jaws [6,20,22,24]. In this study, 66.7% of the total cases were located in the anterior region, while 38.1% were in the posterior region. When the localizations in which different types of odontomas are commonly encountered in the jaws are examined; it has been reported that complex odontomas are most found in the posterior mandibular region, while compound odontomas tend to be seen in the anterior region of the maxilla [20,25]. In this study, no correlation was found between odontoma type and its localization in the jaws. This difference between the studies may be associated with the small sample size of this study.

Odontomas are usually asymptomatic benign tumors. Since they rarely cause symptoms, they are usually diagnosed during routine radiographic examination [8]. The most common clinical symptom encountered in odontoma cases is delayed eruption of permanent teeth because odontoma prevents tooth eruption [6-8]. In this study, 76% of the total odontoma cases prevented eruption of permanent teeth. The assessment of eruption disturbances in permanent teeth adjacent to odontomas demonstrated no significant association between the incidence of such disturbances and the patient's gender, suggesting that gender is not a determining factor in the impaired eruption of permanent teeth near odontomas. When the available literature was reviewed, no study was found that evaluated the relationship between the eruption prevention of odontoma and patient gender. It has been reported that the teeth most frequently encountered with delayed eruption due to odontoma are maxillary incisors and canines [15,26,27]. In this study, it was concluded that the teeth most frequently affected by eruption delay were incisors and canines. Orthodontic treatment was required in 61.9% of the patients due to odontoma and the patients were referred to the orthodontic department. Another clinical symptom encountered in odontoma cases is the eruption of odontoma into the mouth. Cases of erupted complex and compound odontoma have been reported in the literature [28,29]. In this study, no case of odontoma erupting into the mouth was encountered. It is thought that the retrospective study was effective in this result. It has been reported in the literature that odontomas rarely cause pain, swelling and infection [30]. In this study, 2 of the 21 odontoma cases were symptomatic, whereas the others were asymptomatic and identified incidentally during routine examinations.

The size of the odontoma, the position of adjacent teeth, and its relationship with anatomical structures are clinically important for both diagnosis and treatment planning. Therefore, the relationship of these parameters with other variables should be examined in detail. The size of odontomas is usually not mentioned in the literature; it is only reported in some case reports with unusual dimensions [15,26,27]. The available evidence suggests that odontomas are usually small in size. Odontoma sizes are generally classified as <10 mm, 11-19 mm, and 20 mm or more in the literature [30]. In this study, odontoma size was evaluated as <5 mm, between 5 and 10 mm and >10 mm, and 71.4% of the total cases were found to be <10 mm. This result is consistent with the existing literature, which indicates that odontomas are generally small in size [8,22,30]. In a study evaluating the relationship between odontoma size and age and gender, a significant relationship was found between odontoma size and age, and it was reported that odontoma size increased with increasing age [30]. In this study, the size of the odontomas was evaluated in relation to different variables. No significant relationship was found between odontoma size and age, gender, or localization. The discrepancy with previous studies may be attributed to differences in the age ranges of the study populations.

The treatment of odontomas is performed by conservative surgical enucleation planned according to the location and size of the lesion [20]. In this study, enucleation or enucleation with extraction of the adjacent deciduous tooth was performed and follow-up was deemed appropriate in some cases. The recurrence rate after surgical enucleation treatment is quite low [31]. In this study, no recurrence was observed in one-year follow-up after surgical treatment.

A limitation of the current study is the possibility that odontomas may be missed during the initial examination. This may suggest that the actual prevalence may be higher than the reported value. Furthermore, the study was conducted on children and adolescents aged 6-18 years. Since it is reported in the literature that odontomas are most commonly seen in the second decade, the inclusion of a younger age group in this study may be considered as another limitation that may lead to underestimation of odontoma prevalence.

Conclusion

Odontomas are common benign odontogenic lesions, especially in childhood and adolescence. In this study, the prevalence was recorded as 0.1%, and the majority of cases were asymptomatic. Since odontomas are usually asymptomatic, early diagnosis of these lesions is of great clinical importance in terms of prevention of eruption disorders, appropriate treatment planning and prevention of possible complications. Through early diagnosis, timely surgical treatment of odontoma can help prevent tooth eruption disorders and reduce the need for orthodontic and/or surgical intervention.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement:

The dataset generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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