Evaluation of the frequency of dental anomalies in children: A cross-sectional retrospective study

Büşra Karaağaç Eskibağlar,[1] Yelda Polat,[2] Şemsettin Yıldız,[3] Gizem Karagöz Doğan[4]

[1]Department of Pediatric Dentistry, Fırat University, Elazığ, Türkiye
[2]Department of Pediatric Dentistry, Dicle University, Diyarbakır, Türkiye
[3]Department of Pediatric Dentistry, Gaziantep University, Gaziantep, Türkiye
[4]Department of Pediatric Dentistry, Iğdır University, Iğdır, Türkiye

Purpose: This study aimed to determine the prevalence of common dental anomalies in children.

Methods: In this study, 5280 digital orthopantomographic images of patients aged 5-16 years were retrospectively analyzed. A total of 3619 digital orthopantomographic images that met the study criteria were evaluated. Descriptive statistics of the categorical data obtained were analyzed using percentage and frequency analyses, followed by Pearson Chi-Square or Fisher's Exact test for binary group comparisons. The significance level for statistical analyses was set at ($p < 0.05$).

Results: In the individuals included in the study, at least one dental anomaly was detected in 13.78%. Numerical anomalies were the most commonly observed type of anomaly, with hypodontia being the anomaly with the highest prevalence in this group. A statistically significant difference was observed between genders in the frequency of supernumerary teeth, ectopy, and mesiodens ($p > 0.05$).

Conclusion: Dental anomalies can occur in different types in humans. Clinicians can prevent future dental problems that may occur in later ages with the early diagnosis and treatment of dental anomalies.

Keywords: Dental anomalies; hypodontia; mesiodens; numerical anomalies; supernumerary teeth.

Introduction

Dental anomalies can be congenital, developmental, or acquired (1). While congenital anomalies have a genetic transmission, developmental anomalies occur during the formation of a tooth or teeth. It is known that acquired anomalies occur after the normal formation of teeth (2). The etiology of dental anomalies is not completely understood. Developmental tooth anomalies arise due to the influence of genetic and environmental factors, particularly during the morpho-differentiation or histo-differentiation stages of tooth development (3). Depending on the effects occurring at different stages of development, various anomalies such as number, structure, size, and shape can be observed (4). Dental anomalies are usually asymptomatic. Common oral diseases, such as tooth decay, can overshadow dental anomalies and may not be detected during clinical practice (5). These anomalies can affect a single tooth or the entire dentition and can appear as part of any systemic disease or syndrome (6). Early diagnosis of

dental anomalies is of great importance in the diagnosis and prognosis of genetic anomalies involving the craniofacial region (5). Teeth with anomalies can cause eruption disorders, malocclusion, an increase in caries incidence, and aesthetic problems. Additionally, patients may experience speech and chewing problems, temporomandibular joint pain, and periodontal issues due to increased occlusal force (7,8). Identifying these teeth with an appropriate diagnostic protocol can help in creating an ideal treatment plan that results in less invasive interventions and a more favorable prognosis (9). Dentists can contribute to the diagnosis of such syndromes by detecting these anomalies through clinical and radiographic examination. The aim of this study is to determine the prevalence of the most common dental anomalies that can occur in childhood, thereby providing guidance to clinicians on this subject.

Materials and Methods

This study was conducted in accordance with the guidelines of the Helsinki Declaration on Human Rights and received ethical approval from the Non-Interventional Research Ethics Committee of Fırat University (2024/02-07). In this cross-sectional study, digital orthopantomographic imaging (Planmeca ProMax 3D Mid, Helsinki, Finland) of 5280 patients aged 5-16 who visited the Pediatric Dentistry Department of Firat University Faculty of Dentistry for various reasons between April 2021 and August 2022 was retrospectively evaluated by a single researcher. Of the 5280 digital orthopantomographic images, patients who had undergone dental extraction, had cleft lip and palate, had any syndrome, and had digital orthopantomographic

images with poor image quality for evaluation were excluded from the study, and 3619 digital orthopantomographic images were included. Open-source software (Jamovi®) version 1.8 was used for the evaluation of statistical data. After performing percentage and frequency analyses for the descriptive statistics of categorical data, Pearson Chi-Square or Fisher's Exact test was used for the comparison of two groups. A significance level ($p < 0.05$) was accepted for statistical analyses.

Results

In this study, panoramic radiographs of 3619 children aged between 5-16 were evaluated for the presence of dental anomalies. Of the evaluated panoramic radiographs, 42.4% belonged to female patients and 57.6% to male patients. The average age of the individuals in the study group was determined to be 10.8 ± 2.95. The average age for males was 10.5 ± 2.97, while for females, it was 10.9 ± 2.93. Upon examining the individuals in the study group, it was found that 3120 out of 3619 individuals did not have any dental anomalies, while 476 out of 499 individuals had one dental anomaly. Furthermore, 23 individuals had two or more dental anomalies.

According to the data presented in Table 1, the types of dental anomalies detected in the studied population, the number of individuals with these anomalies, and the prevalence of each dental anomaly are shown. According to this data, numerical anomalies constitute the most commonly encountered group of anomalies. Hypodontia, a subcategory of this group, was observed in 46.9% of individuals

Table 1. Detected dental anomaly type, number of individuals with dental anomalies, and prevalence of dental anomalies

Dental Anomaly Type	Number of Individuals with Dental Anomalies	Prevalence of Dental Anomalies (%)
Number of Anomalies	288	57.7
Tooth Deficiency	235	47.1
Hypodontia	234	46.9
Oligodontia	1	0.2
Hyperdontia	53	10.6
Meziodens	34	6.8
Supernumerary	19	3.8
Positional Anomalies	59	11.8
Ectopia	54	10.8
Impacted Tooth	4	0.8
Transposition	1	0.2
Shape Anomalies	175	34.6
Dilaceration	50	10.0
Taurodontism	101	20.2
Peg Lateral	3	0.6
Fusion	2	0.4
Talon Cusp	19	3.8

Table 2.   Frequency and percentage distribution of dental anomalies by gender [n(%)]

Dental Anomaly Type	Male	Female	Total	P-Value
Dilaceration	25(5)	25(5)	50	0.177
Taurodontism	44(8.8)	57(11.4)	101	0.570
Peg Lateral	1(0.2)	2(0.4)	3	1.000
Supernumerary	13(2.6)	6(1.2)	19	0.014*
Hypodontia	86(17.2)	148(29.7)	234	0.065
Ectopia	15(3)	39(7.8)	54	0.035*
Mesiodens	20(4)	14(2.8)	34	0.029*
Fusion	1(0.2)	1(0.2)	2	1.000
Impacted Tooth	2(0.4)	2(0.4)	4	1.000
Talon Cusp	8(1.6)	11(2.2)	19	0.926
Oligodontia	1(0.2)	0(0)	1	0.411
Transposition	0(0)	1(0.2)	1	1.000

*Statistically significant p values.

Table 3.   Frequency and percentage distribution of the number of dental anomalies by gender [n(%)]

	Male	Female	p-value
Individuals with 1 dental anomaly	196(39.3)	283(56.7)	0.716
Individuals with 2 or more dental anomalies	9(1.8)	11(2.2)	0.818
Total	205(41.1)	294(58.9)	

(n = 234), making it the anomaly type with the highest prevalence among numerical anomalies. The second most prevalent group of anomalies following numerical anomalies is shape anomalies, with taurodontism being the most frequently observed anomaly type in this group with a prevalence of 20.2% (n = 101). The group with the least frequency in the study is positional anomalies, with ectopia being the most commonly encountered anomaly type in this group with a prevalence of 10.8% (n = 54) (Table 1).

Table 2 compares the frequency and percentage distributions of dental anomalies according to gender. Significant differences have been observed in the frequency of certain dental anomalies between genders. Supernumerary teeth are observed twice as frequently in males at a frequency of 2.6% compared to females, and this difference has been found to be statistically significant (p = 0.014). Additionally, ectopia and mesiodens anomalies have higher frequencies in females at rates of 7.8% and 2.8% respectively, and these differences are statistically significant (For ectopia p = 0.035, for mesiodens p = 0.029).

Table 3 presents the distribution of the number of dental anomalies according to gender. Looking at the conditions of individuals having dental anomalies, 39.3% of individuals with a single dental anomaly are male, and 56.7% are female. The rates of individuals with two or more dental anomalies are 1.8% in males and 2.2% in females. The obtained p-values indicate that there is no significant differ-

ence between genders in the number of dental anomalies (p = 0.716 for a single dental anomaly, p = 0.818 for two or more dental anomalies).

Discussion

Developmental anomalies are disorders that occur during the processes of tooth development and can range from simple isolated defects to symptoms of specific syndromes (10,11). These anomalies can complicate dental treatments such as root canal treatment or tooth extraction and can lead to malocclusion, increased sensitivity, and aesthetic problems (1,12). Teeth with anomalies are typically asymptomatic, and their identification by clinicians is often done through clinical or radiographic examination (7). Panoramic radiography is an initial radiographic examination method that provides a comprehensive view of the teeth, jaws, maxillary sinuses, nasal fossa, and temporomandibular joints (13). Therefore, in this study, dental anomalies were determined by evaluating orthopantomographic images. The frequency and types of dental anomalies vary within and between populations. Studies in the literature have reported that the prevalence of dental anomalies ranges between 1.73% and 74% (14-16). The prevalence of dental anomalies in the population studied in this research was found to be 13.78%. The variability in prevalence can be explained by the variability of geographical and genetic factors, as well as the use of differ-

ent sampling and diagnostic methods (8,12,14). The age range of the examined population is also important both in terms of prevalence and distribution of anomalies (16). This study included individuals aged 5-16 years, and we consider that the type and prevalence of anomalies might be lower in this age group since the eruption time for some teeth has not yet arrived.

In this study, numerical anomalies were found to be the most frequently encountered type of anomaly, with hypodontia being the most common anomaly in this group with a prevalence of 46.9%. The prevalence of congenital tooth absence, excluding third molars, has been reported to range between 0.15% and 16.2% (17). This datas does not support the results of this study which may be due to the genetic characteristics of the examined population and the diagnostic methods used. A cross-sectional study conducted in the Turkish population reported a 1.8% rate of dental anomalies, with numerical anomalies being the most frequently observed anomaly (18). Another study in the Turkish population reported hypodontia (4.4%) as the most common dental anomaly (19). These studies show similarities. Furthermore, consistent with similar studies, no statistically significant difference was found in the prevalence of hypodontia between genders in study (20,21). Based on the findings of study, we believe that gender is not a determining factor in the frequency of hypodontia; it can vary depending on genetic factors and characteristics of the selected population, and understanding these factors can make significant contributions to clinical practices.

In this study, the diagnosis of taurodontism was made according to the taurodontism index developed by Shifman and Channel, and taurodontism was found to be the most common shape anomaly with a prevalence of 20.2%. In the literature, the prevalence of taurodontism has been reported to range between 0.02% and 60% (3,18), and study's data is consistent with the literature. Many studies evaluating taurodontism in early ages do not mention the method used for diagnosis (14,16,18,21,22), and it has been reported that the prevalence of taurodontism in individuals under 20 years of age is lower due to the difficulty in diagnosing taurodontism in permanent teeth with incomplete root development (3,22). We believe that when evaluating the diagnosis and prevalence of taurodontism, genetic differences, the age range of the population, and the diagnostic criteria used have a significant impact.

Ectopic eruption is a permanent tooth malposition affecting the primary tooth and leading to its early loss due to insufficient growth in the jaw or jaw segment (23). The prevalence of ectopic eruption has been reported to range between 0.01% and 8.9% in the literature (3,18). In our study, the prevalence of ectopia was determined to be 10.8%, and its frequency was found to be higher in females compared to males. A study evaluating the prevalence of ectopic eruption using different diagnostic methods showed that out of 47 patients with ectopic eruption, 23 were female, indicating no significant difference between genders (24). Barberia-Leache et al. (25) did not find a statistically significant difference between genders in ectopic eruption. In their study, Cheyne et al. (26) reported that one in every 50 children had a tooth with ectopic eruption, which was more common in the maxilla and among males. Differences among studies could be attributed to genetic factors, age range, and the size of the sample selected.

Supernumerary teeth, which occur in both deciduous and permanent dentition due to environmental and genetic factors, are extra teeth formed in addition to the normal number of teeth (27). Although it is thought that these teeth develop due to environmental or genetic factors, their etiology is not fully understood (28,29). In study, supernumerary teeth were found with a prevalence of 2.6% in males, twice as frequently as in females. A study found the prevalence of supernumerary teeth to be 0.98%, with a male-to-female ratio of 1.84:1 (30). Another study identified a prevalence of 1.6% for supernumerary teeth, with a higher rate in male patients (19). Yet another study reported that while there was no difference in the distribution of genders during deciduous dentition, supernumerary teeth were more common in males than in females during permanent dentition (31). This finding could be attributed to the non-homogeneity of our sample size and the influence of genetic factors. Mesiodens is the most common type of supernumerary tooth. In study, the prevalence of mesiodens was determined to be 6.8%, with statistically significant results found more frequently in males compared to females. The literature reports that the prevalence of supernumerary teeth does not differ by gender during the deciduous dentition period, but in the permanent dentition period, it is twice as common in males compared to females (31-33). A study investigating the frequency of mesiodens in the Turkish population found a statistically significant frequency of mesiodens in male patients with a ratio of 2.17:1 (34). The size of the study's sample, its demographic characteristics, and the criteria for selecting the sample can affect the generalizability of the results obtained.

Conclusion

Although the prevalence of dental anomalies varies among studies, we believe that the findings of this study will make significant contributions to the literature. Various factors

such as genetic and ethnic factors, age range, the size of the selected sample, and the criteria used in diagnosis can cause differences between studies. Among the limitations of our study, selecting a broader sample and to support clinical evaluation with radiographic assessment in future studies could enhance the reliability of the results obtained.

Authorship Contributions: Concept: B.K.E., Y.P.; Design: B.K.E., Y.P.; Supervision: S.Y.; Materials: B.K.E., G.K.D.; Data: B.K.E., S.Y., G.K.D.; Analysis: Y.P., S.Y.; Literature search: B.K.E., Y.P.; Writing: B.K.E., Y.P., S.Y., G.K.D.; Critical revision: S.Y., G.K.D.

Use of AI for Writing Assistance: Not declared

Source of Funding: None declared.

Conflict of Interest: The authors did not report a conflict of interest.

Ethical Approval: Ethics committee approval for this study was obtained from Fırat University Non-Interventional Ethics Committee (2024/02-07) .

References

1. Saberi EA, Ebrahimipour S. Evaluation of developmental dental anomalies in digital panoramic radiographs in Southeast Iranian Population. J Int Soc Prev Community Dent 2016; 6: 291–5. [CrossRef]

2. White SC, Pharoah MJ. Oral Radiology: Principles and Interpretation. 6th ed. St Louis, MO: Mosby Elsevier; 2009.

3. Laganà G, Venza N, Borzabadi-Farahani A, et al. Dental anomalies: Prevalence and associations between them in a large sample of non-orthodontic subjects, a cross-sectional study. BMC Oral Health 2017; 17: 62. [CrossRef]

4. Jahanimoghadam F. Dental anomalies: An update. Adv Hum Biol 2016; 6: 112–8. [CrossRef]

5. Goswami M, Bhardwaj S, Grewal N. Prevalence of shape-related developmental dental anomalies in India: A retrospective study. Int J Clin Pediatr Dent 2020; 13: 407–11. [CrossRef]

6. Afify AR, Zawawi KH. The prevalence of dental anomalies in the Western region of saudi arabia. ISRN Dent 2012; 2012: 837270. [CrossRef]

7. Mukhopadhyay S, Mitra S. Anomalies in primary dentition: Their distribution and correlation with permanent dentition. J Nat Sci Biol Med 2014; 5: 139–43. [CrossRef]

8. Özveren N, Atay MT. Types and prevalence of dental anomaly in Turkish pediatric patients of Trakya region. [Article in Turkish] Turkiye Klinikleri J Dent Sci 2020; 26: 362–70. [CrossRef]

9. Kapdan A, Kustarci A, Buldur B, et al. Dental anomalies in the primary dentition of Turkish children. Eur J Dent 2012; 6: 178–83. [CrossRef]

10. Hall C, Hallett K, Manton D. The association between Cri du chat syndrome and dental anomalies. J Dent Child (Chic) 2014; 81: 171–7.

11. Marques LS, Alcântara CE, Pereira LJ, et al. Down syndrome: A risk factor for malocclusion severity? Braz Oral Res 2015; 29: 44. [CrossRef]

12. Shokri A, Poorolajal J, Khajeh S, et al. Prevalence of dental anomalies among 7- to 35-year-old people in Hamadan, Iran in 2012-2013 as observed using panoramic radiographs. Imaging Sci Dent 2014; 44: 7–13. [CrossRef]

13. White SC, Pharoah MJ. Oral Radiology: Principles and Interpretation. Amsterdam: Elsevier; 2012.

14. Patil S, Doni B, Kaswan S, et al. Prevalence of dental anomalies in Indian population. J Clin Exp Dent 2013; 5: e183–6. [CrossRef]

15. Aren G, Guven Y, Guney Tolgay C, et al. The prevalence of dental anomalies in a Turkish population. J Istanb Univ Fac Dent 2015; 49: 23–8. [CrossRef]

16. Celebi F, Taşkan M, Turkal M, et al. Dental anomaly prevalence in middle Black Sea population. [Article in Turkish] Cumhuriyet Dent J 2015; 18: 343–50.

17. Rakhshan V. Congenitally missing teeth (hypodontia): A review of the literature concerning the etiology, prevalence, risk factors, patterns and treatment. Dent Res J (Isfahan) 2015; 12: 1–13. [CrossRef]

18. Almaz ME, Sonmez IS, Oba AA. Prevalence and distribution of developmental dental anomalies in pediatric patients. Meandros Med Dental J 2017; 18: 130–3. [CrossRef]

19. Polat Y, Akleyin E. Evaluation of dental anomalies of pediatric patients during the COVID-19 pandemic process. Available at: https://www.turkiyeklinikleri.com/article/en-covid-19-pandemisi-surecinde-cocuk-hastalarin-dis-anomalilerinin-degerlendirilmesi-97785.html. Accessed Jul 19, 2024.

20. Yildiz S, Osman A, Tekin S, et al. Evaluation of the hypodontia prevalence among 8-15 years old children in Elaziğ province, from the eyes of parents: A qualitative research. [Article in Turkish] J Inonu Univ Health Serv Vocat Sch 2022; 10: 941–7. [CrossRef]

21. Ayrancı F. Evaluation of the prevalence of congenital teeth deficiencies in the middle Black Sea region children. [Article in Turkish] Suleyman Demirel Univ Inst Health Sci 2019; 10: 137–40.

22. Sumer A, Akça T, Köprülü H. Dental anomalies in children: Panoramic radiographic evaluation. [Article in Turkish] Ondokuz Mayıs Univ Fac Dent 2004; 5: 81–4.

23. Özdemir DS, Altan H. Ectopic eruption of permanent first molar teeth. [Article in Turkish] Yeditepe Üniv Diş Hekim Fak Derg 2021; 17: 68–74. [CrossRef]

24. Özdemir DS, Altan H. Use of two different classification

systems to determine the characteristics of ectopic eruption in the first permanent molars: A retrospective cross-sectional study. Turkiye Klinikleri J Dent Sci 2022; 28: 618–23. [CrossRef]

25. Barberia-Leache E, Suarez-Clúa MC, Saavedra-Ontiveros D. Ectopic eruption of the maxillary first permanent molar: Characteristics and occurrence in growing children. Angle Orthod 2005; 75: 610–5.

26. Cheyne VD, Wessels KE. Impaction of permanent first molar with resorption and space loss in region of deciduous second molar. J Am Dent Assoc 1947; 35: 774–87. [CrossRef]

27. Scarfe W, Farman A, White S, et al. Oral Radiology- Principles And Interpretation. Amsterdam: Elsevier; 2009.

28. Batra P, Duggal R, Parkash H. Non-syndromic multiple supernumerary teeth transmitted as an autosomal dominant trait. J Oral Pathol Med 2005; 34: 621–5. [CrossRef]

29. Erdem MA, Çankaya B, Güven G, et al. Supernumerary teeth. [Article in Turkish] J Istanbul Univ Fac Dent 2011; 45: 15–8.

30. Arikan V, Ozgul BM, Firdevs TO. Prevalence and characteristics of supernumerary teeth in a child population from Central Anatolia - Turkey. Oral Health Dent Manag 2013; 12: 269–72.

31. Rajab LD, Hamdan MA. Supernumerary teeth: Review of the literature and a survey of 152 cases. Int J Paediatr Dent 2002; 12: 244–54. [CrossRef]

32. Kim SG, Lee SH. Mesiodens: A clinical and radiographic study. J Dent Child (Chic) 2003; 70: 58–60.

33. Tyrologou S, Koch G, Kurol J. Location, complications and treatment of mesiodentes- A retrospective study in children. Swed Dent J 2005; 29: 1–9.

34. Ertaş ET, Sisman Y, Atıcı MY. The frequency, characteristics and complications of meziodens in Turkish population. Cumhuriyet Dent J 2013; 16: 267–72.