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Evaluation of dental anomalies in a group of Turkish children: A retrospective cross-sectional study

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Abstract

Developmental dental anomalies occur as a result of changes in tooth shape, size, number, and position due to genetic, epigenetic, or environmental factors during tooth development. This study aims to evaluate the presence and distribution of dental anomalies in a group of Turkish children in the Central Black Sea Region of Turkey. In this retrospective study, children aged between 6-15 years who applied to Tokat Gaziosmanpaşa University Faculty of Dentistry, Pediatric Dentistry Clinic for various dental problems between 2015 and 2024 were included. The data of 2034 children, whose panoramic radiographs were taken after clinical examination and dental anomalies were detected were analyzed retrospectively. Dental anomalies were categorized under headings such as number, position, size, shape, and structure anomalies. Differences between categorical variables were analyzed using the chi-square test. Dental anomalies were detected in 4216 teeth of 1982 children (53.7% girls, 46.3% boys) with a mean age of 9.3 ± 2.5 years. The most common type of anomaly was number anomalies (61.1%), followed by structure anomalies (19.2%). When the distribution of dental anomalies between genders was analyzed, the frequency of dental anomalies in girls (55.7%) was found to be statistically significantly higher ($p<0.05$). When the distribution between maxilla and mandible was examined, it was found that the incidence in the maxilla (52.8%) was statistically significantly higher than in the mandible ($p<0.001$). Hypodontia was the most frequently observed anomaly in a group of Turkish children living in the central black sea region and 14 different types of anomalies were found. Early detection of dental anomalies by dentists during diagnosis and treatment planning is crucial for preventing potential dental problems in later years and reducing the need for comprehensive treatments.

Keywords: tooth abnormalities, pediatric dentistry, hypodontia, child

1. Introduction

Dental anomalies are congenital, developmental or acquired changes that occur in teeth due to genetic, epigenetic and environmental factors during tooth development. Dental anomalies have a wide variety affecting the number, position, size, shape and structure of the teeth (1).

These anomalies are asymptomatic in most cases and present accidentally as clinical or radiographic findings (2). Children with dental anomalies may have occlusal interference, mastication and speech difficulty and temporomandibular joint pain and periodontal problems. In addition, teeth with dental anomaly can prevent the eruption of normal teeth and cause serious complications such as root resorption of adjacent teeth. These complications can prevent treatment procedures (extractions, root canal treatments, etc.) or cause pathological changes such as cysts (3,4). In addition, the presence of more than one dental anomaly in children may suggest some syndromes (5). In consequence, early diagnosis by routine radiographic examinations is important for the evaluation and treatment planning of these cases.

Studies on the prevalence of dental anomalies can provide valuable information for phylogenetic and genetic studies. They can also contribute to the understanding of genetic and environmental influences within and between populations (6,7). There are many studies in the world and in Turkey investigating the prevalence of dental anomalies, but discrepancies are observed for different populations (5, 8-16). Therefore, population-specific prevalence studies are needed to provide more reliable information to physicians about this condition, which can affect oral and dental health and quality of life.

This study aims to evaluate the presence and distribution of dental anomalies in a group of Turkish children in the central black sea region of Turkey.

2. Materials and methods

The protocol of this cross-sectional retrospective study was approved by the Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University Faculty of Medicine (Approval No: 24-KAEK-136, Date: 18 April 2024). This study was conducted in accordance with the principles outlined in the Declaration of Helsinki and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

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In this study, patients between the ages of 6-15 years who applied to Tokat Gaziosmanpaşa University Faculty of Dentistry, Department of Pedodontics between June 2015 and June 2024 were examined. Panoramic radiographs taken from the patients during the examination for diagnosis and treatment planning and clinical records were retrospectively evaluated for dental anomalies.

Regarding panoramic radiographs, only good quality radiographs were accessed according to the European Guideline on Radiation Protection in Dental Radiology (17). Patients with any syndrome or cleft lip/palate, patients with extracted tooth loss due to caries, periodontal disease, trauma or orthodontic reason, patients with insufficient clinical record information and patients with insufficient quality radiographs for interpretation were excluded. In addition, data on third molars were not included in the study.

The dental anomalies evaluated in this study were categorised according to number, position, size, shape and structure anomalies and related subheadings. All panoramic radiographs were taken with a single device (J. Morita Mfg. Corp. Kyoto, Japan). The data obtained from the evaluated radiographs were recorded in a manner to indicate the patient's gender, age, anomaly type, tooth numbers and jaw information.

The data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS for Windows, version 26.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics including number and percentage for categorical data were calculated. Pearson's chi-square test was used to evaluate the relationship of dental anomalies with gender and jaw localisation. Statistical significance level was accepted as $p<0.05$.

3. Results

Dental anomalies were diagnosed in 2034 patients out of 95543 patients admitted to department of pediatric dentistry. The prevalence of dental anomaly in the studied population was found to be 2.1%. In the study, clinical data and panoramic radiographs of 2034 patients were examined and 1982 patients who met the evaluation criteria were included in the study.

Among the patients with dental anomalies, 53.7% were girls and 46.3% were boys. The mean age of the patients in the study group was 9.3 ± 2.5 years (Table 1).

The types of dental anomalies detected, the number of patients with dental anomalies and the number of teeth affected by dental anomalies were presented in Table 2. There were 14 dental anomaly types under the headings of number, position, size, shape and structure. There were 1982 patients and 4216 teeth affected by dental anomalies. The most common dental anomaly were number anomalies (61.1%), followed by structure anomalies with 19.2%. The least common dental anomaly was size anomaly (0.7%). Among the number anomalies, hypodontia was the most common (75.9%) and the most common tooth agenesis were the mandibular 2nd premolar, maxillary 2nd premolar and maxillary lateral incisors, respectively. Peg-shaped lateral was the most common form anomaly (38.4%) and molar incisor hypomineralisation was the most common structure anomaly (97.8%). The least common size anomaly was microdontia (0.7%).

When the relationship between dental anomalies and gender was evaluated, dental anomalies were observed in 55.7% of girls and 48.8% of boys and there was a statistically significant difference between them ($p=0.021$). Size anomaly was more common in boys, whereas other types of dental anomalies were more common in girls (Tablo 3).

When the relationship between the teeth affected by dental anomalies and the region where they were located was evaluated, it was found that the teeth in the maxilla (52.8%) were more affected than the teeth in the mandible (47.2%) and the difference was statistically significant ($p<0.001$). Number anomaly was more common in the mandible (52.3%), whereas other types of dental anomalies were more common in the maxilla (Table 4).

Table 1. Distribution of children according to gender and age

Gender	N (%)	Age
		Mean ± sd
Girl	1065 (53,7)	9.3 ± 2.5
Boy	917 (46,3)	9.2 ± 2.4
Total	1982 (100)	9.3 ± 2.5

Table 2. Distribution of dental anomalies observed in children according to number of patients and number of teeth affected

Types and subtypes of dental anomalies	Number of patients N (%)	Number of affected tooth N (%)
Number	1211 (61.1)	2247 (53.3)
Hypodontia	919 (75.9)	1661 (73.9)
Oligodontia	38 (3.1)	273 (12.1)
Hyperdontia	254 (21.0)	313 (13.9)
Position (259)		
Ectopia	259 (13.10)	395 (9.4)
Size (13)		
Microdontia	13 (0.7)	25 (0.6)
Shape (119)	119 (6.0)	198 (4.7)
Fusion	30 (25.2)	31 (15.7)
Gemination	12 (10.1)	12 (6.1)
Odontoma	9 (7.6)	9 (4.5)
Dens İnvaginatus	5 (4.2)	8 (4.0)
Peg-shaped lateral	55 (46.2)	76 (38.4)
Taurodontism	8 (6.7)	62 (31.3)

Structure (380)	380 (19.2)	1351 (32.0)
Amelogenesis imperfecta	11 (2.9)	11 (0.8)
Molar incisor hypomineralisation	364 (95.8)	1321 (97.8)
Primary molar hypomineralisation	5 (1.3)	19 (1.4)
Total	1982 (100)	4216 (100)

Table 3. Evaluation of the distribution of dental anomalies according to gender

Types of dental anomalies	Girl	Boy	p
	N (%)	N (%)	
Number	620 (51.2)	591 (48.8)	**0.021**
Position	144 (55.6)	115 (44.4)	
Size	6 (46.2)	7 (53.8)	
Shape	77 (64.7)	42 (35.3)	
Structure	218 (57.4)	162 (42.6)	
Total	1065 (55.7)	917 (46.3)	

Table 4. Evaluation of the distribution of teeth affected by dental anomalies according to region

Types of dental anomalies	Maxilla	Mandible	p
	N (%)	N (%)	
Number	1071 (47.7)	1176 (52,3)	**<0,001**
Position	255 (64.6)	140 (35,4)	
Size	19 (76)	6 (24)	
Shape	135 (67.8)	63 (32,2)	
Structure	747 (55.3)	604 (44,7)	
Total	2227 (52.8)	1989 (47.2)	

4. Discussion

Early diagnosis of dental anomalies is of great importance to prevent possible complications and provide prompt treatment. In the literature, there are studies on the incidence, etiological factors, genetic basis and associated syndromes of dental anomalies. This study evaluates the distribution of dental anomalies in a group of Turkish children in the central black sea region, allowing comparison with data from studies with other populations.

The prevalence of dental anomalies in the general population in the literature has been reported to vary widely between 5.6% and 74.7% (7,14-16,18-20). In Turkey, dental anomalies have been reported to be seen at rates ranging from 1.8-26.7% in prevalence studies conducted in paediatric patients aged 0-18 years (5,8,9,12,14,21). In this study, the presence of dental anomalies and the localisation of these anomalies in gender and jaws were investigated and the prevalence of dental anomalies was found to be 2.1%. Different results of studies examining anomalies may be related to genetic disorders, environmental and ethnic factors. In addition, the design of the studies, the method applied, the criteria for determining the population also affect the results of the studies.

Considering the types of dental anomalies frequently observed in populations, the most frequently reported anomaly in most studies was tooth agenesis, which is among the number anomalies (2,5,8,9,11,12,22). In most of the studies in which the structure anomaly was reported most frequently, the age range of the patient group examined was significantly higher than the age range of the population included in the study. The researchers attributed this difference to the increased frequency of structure anomalies with increasing age (16,23). Our study is similar to other studies with similar ethnicity and age groups, and the frequency of number anomaly is remarkable. In studies evaluating dental anomalies, the prevalence of congenital tooth agenesis in permanent dentition, excluding third molars, was found to be between 0.15-16.3%. (24,25,26). In this study, the most common anomaly found both among the number anomalies and in the overall study was tooth agenesis. The groups of teeth reported to be congenitally agenesis may vary according to ethnic groups. The most common agenesis teeth are maxillary lateral incisors in American children and mandibular 2nd premolars in European children (27). As supported by many studies, mandibular 2nd premolars, maxillary laterals and maxillary 2nd premolars are the most commonly agenesis teeth. In this study, the most common agenesis was observed in mandibular 2nd premolars, followed by maxillary 2nd premolar agenesis and maxillary lateral agenesis, and the incidence rates were close to each other (12,16,28). Premolar hypodontia was the most common congenitally agenesis tooth, similar to findings in Caucasian and European populations (29,30). In addition, mandibular 2nd premolars have been reported as the tooth group with the highest congenital tooth deficiency in studies conducted in the Turkish population. (12,26,31-33). It is thought that a decrease in the number of teeth and a smaller jaw are part of human evolution and will continue to become more frequent in the coming years.

The least common anomaly in our study was microdontia, which is included in the size anomaly with a rate of 0.7%. In recent studies in the literature, it is observed at rates ranging from 0.3 to 5.2% (13,15,21). Again, these variations may be due to the diagnostic criteria used to classify and define dental anomalies and ethnic and genetic factors. In fact, studies showing a higher prevalence rate for microdontia compared to our study also included 3rd molars in the study (14,15).

Many studies have shown that dental anomalies are independent of gender (16,34,35). In contrast, the present study found that girls exhibited statistically significantly more dental anomalies, as in a study by Pallikaraki et al. (2). Similarly,

reports show that girls have a higher rate of tooth agenesis (36). These contradictory results may be explained by dietary differences and local environmental influences.

In this study, the incidence of dental anomalies in the maxilla was higher. Kær (1997) explains the different rates of dental anomalies in the maxilla and mandible with neural development. The nerve transmission of the mandible is provided by the inferior alveolar nerve, while the maxilla has palatinal, nasopalatine and infraorbital nerve branches. While the inferior alveolar nerve is more protected thanks to the compact structure of the mandible, the nerve branches in the maxilla are more superficial and wider, which causes nerve damage in this region. Damage to these nerves, which provide innervation of the jaws, is associated with the formation of dental anomalies (37).

Dental anomalies that cause malocclusions are among the reasons for orthodontic treatment, and therefore the incidence of dental anomalies may be higher in studies evaluating orthodontic patients than in studies evaluating patients in the general population. Our study provides more reliable results in terms of reflecting the general population since it consists of randomly selected child patients who applied to the faculty of dentistry for examination. In this retrospective study, archived records and X-ray records of these patients were evaluated. Higher detection rates would have been possible with a prospective study.

The prevalence of dental anomalies varies from population to population, but the results of this study are largely consistent with the results of studies in the literature. Genetics, age and evaluation criteria may be effective in the formation of differences. Hypodontia was the most frequently observed anomaly in a group of Turkish children living in the central black sea region, which is the subject of this study. Early diagnosis of hypodontia, which is common in the region, during the examination will make it easier to inform and guide families about multidisciplinary treatment options for the future.

Ethics Committee Approval

The protocol of this cross-sectional retrospective study was approved by the Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University Faculty of Medicine (Approval No: 24-KAEK-136, Date: 18 April 2024).

Conflict of interest

The authors declared no conflict of interest.

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None to declare.

Authors' contributions

Concept: C.B.N., Design: C.B.N., Data Collection or Processing: A.B.K., E.N.D., Analysis or Interpretation: C.B.N., Literature Search: C.B.N., A.B.K., Writing: C.B.N., A.B.K.

References

1. Soxman JA, Wunsch PB, Haberland CM. Anomalies of the Developing Dentition. 1st ed. Switzerland: Springer Cham; 2019.
2. Pallikaraki G, Sifakakis I, Gizani S, Makou M, Mitsea A. Developmental dental anomalies assessed by panoramic radiographs in a Greek orthodontic population sample. Eur Arch Paediatr Dent. 2020;21:223-228.
3. Temilola DO, Folayan MO, Fatusi O, Chukwumah NM, Onyejaka N, et al. The prevalence, pattern and clinical presentation of developmental dental hard-tissue anomalies in children with primary and mix dentition from Ile-Ife, Nigeria. BMC oral health. 2014;16(14):125.
4. Wright JT. Challenges managing individuals with hereditary defects of the teeth. Semin Orthod. 2016;22:211–222.
5. Bodrumlu EH, Tazegül FS. Prevalence of selected dental anomalies in children and adolescents in Turkey. Tanta Dent. J. 2022;19(3):153-156.
6. Yaacob H, Nambiar P, Naidu MDK. Racial characteristics of human teeth with special emphasis on the Mongoloid dentition. Malays J Pathol. 1996;18:1–7.
7. Vani NV, Saleh SM, Tubaigy FM, Idris AM. Prevalence of developmental dental anomalies among adult population of Jazan, Saudi Arabia. Saudi J Dent Res. 2016;7:29–33.
8. Bag İ. Kütahya İli Popülasyonundaki Çocuklarda Görülen Dental Anomalilerin İncelenmesi: Bir Retrospektif Kesitsel Çalışma. Turkiye Klinikleri J Dental Sci. 2022;28(4):832-838.
9. Özveren N, Atay MT. Trakya Bölgesi'ndeki Çocuk Hastalarda Görülen Dental Anomali Tipleri ve Prevalansları. Turkiye Klinikleri J Dental Sci. 2020;26(3):262-270.
10. Gokcek M, Cirakoglu NY. Determination of the prevalence of dental anomalies by digital panoramic radiography analysis. Med Sci. 2021;10(4):1128-1132.
11. Küchler EC, Risso PA, de Castro Costa M, Modesto A, Vieira AR. Studies of dental anomalies in a large group of school children. Arch Oral Biol. 2008;53(10):941-946.
12. Almaz ME, Sönmez IS, Oba AA. Prevalence and distribution of developmental dental anomalies in pediatric patients. Meandros Med. Dental J. 2017;18(2):130.
13. Hoyte T, Coppin E, Kowlessar E, Mahabir A, Ali A, Henry K. Prevalence of dental anomalies in Trinidad and Tobago. A retrospective study. Clin Invest Orthodon. 2022;81(2):117-125.
14. Altug-Atac AT, Erdem D. Prevalence and distribution of dental anomalies in orthodontic patients. Am J Orthod Dentofacial Orthop. 2007;131(4):510-514.
15. Patil S, Doni B, Kaswan S, Rahman F. Prevalence of dental anomalies in Indian population. J Clin Exp Dent. 2013;5(4):e183-186.
16. Gupta SK, Saxena P, Jain S, Jain D. Prevalence and distribution of selected developmental dental anomalies in an Indian population. J Oral Sci. 2011;53(2):231-238.
17. European Commission. Radiation Protection 136. European Guidelines on Radiation Protection in Dental Radiology. Luxembourg: Office for Official Publications of the European Communities [Internet]. 2004. Available from: http://ec.europa.eu/energ y/nucle ar/radio prote ction /publicatio n/doc/136_en.pdf. Accessed 22 Nov 2024.

18. Thongudomporn U, Freer TJ. Prevalence of dental anomalies in orthodontic patients. Aust Dent J. 1998;43:395–398.

19. Afify AR, Zawawi KH. The prevalence of dental anomalies in the western region of Saudi Arabia. ISRN Dent. 2012;2012:837270.

20. Laganà G, Venza N, Borzabadi-Farahani A, Fabi F, Danesi C, Cozza P. 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.

21. Kapdan A, Kustarci A, Buldur B, Arslan D, Kapdan A. Dental anomalies in the primary dentition of Turkish children. Eur J Dent. 2012;6(02):178-183.

22. Dang HQ, Constantine S, Anderson PJ. The prevalence of dental anomalies in an Australian population. Aust Dent J. 2017;62(2):161-164.

23. Celebi F, Taşkan MM, Turkal M, Turkal H, Hologlu F. Dental anomaly prevalence in Middle Black Sea population. Cumhuriyet Dent J. 2015;18(4):343-350.

24. 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):1-13.

25. Kurt A, Kara P. Dental Number Anomalies in Children Applying to Recep Tayyip Erdoğan University Faculty of Dentistry: A Retrospective Cross-Sectional Study. Turkiye Klinikleri J Dental Sci. 2022;28(1):72-78.

26. Topal BG. Prevalence of dental number anomalies among A group of Turkish children. Balk. J. Dent. Med. 2021;25(3):153-158.

27. Nordgarden H, Jensen JL, Storhaug K. Reported prevalence of congenitally missing teeth in two Norwegian counties. Community Dent Health. 2002;19:258–261.

28. Shokri A, Poorolajal J, Khajeh S, Faramarzi F, Kahnamoui HM. 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(1):7-13.

29. Behr M, Proff P, Leitzmann M, et al. Survey of congenitally missing teeth in orthodontic patients in Eastern Bavaria. Eur J Orthod. 2011;33(1):32–36.

30. Tallón-Walton V, Nieminen P, Arte S, Carvalho Lobato P, Ustrell i Torrent JM, Manzanares Céspedes MC. An epidemiological study of dental agenesis in a primary health area in Spain: estimated prevalence and associated factors. Med Oral Patol Oral Cir Bucal. 2010;15(4):e569–574.

31. Sümer APAT, Köprülü H. Dental anomalies in children: panoramic radiographic evaluation. Ondokuz Mayıs Üniv Dis Hekim Fak Derg. 2004;5:81–84.

32. Uzamış MTT, Kansu Ö, Alpar R. Evaluation of dental anomalies in 6-13 year old Turkish children: a panoramic survey. J Marmara Univ Dent Fac. 2001; 4:254–259.

33. Demiriz L, Bodrumlu EH, Kokturk F. Patterns of incisor-premolar agenesis combinations: A retrospective study. J Indian Soc Pedod Prev Dent. 2017;35:51–55.

34. Baron C, Houchmand-Cuny M, Enkel B, Lopez-Cazaux S. Prevalence of dental anomalies in French orthodontic patients: A retrospective study. Arch Pediatr. 2018;25(7):426-430.

35. Uslu O, Akcam MO, Evirgen S, Cebeci I. Prevalence of dental anomalies in various malocclusions. Am J Orthod Dentofacial Orthop. 2009;135(3): 328-335.

36. Vastardis H. The genetics of human tooth agenesis: new discoveries for understanding dental anomalies. Am J Orthod Dentofacial Orthop. 2000;117(6);650-656.

37. Kær I. Can the location of tooth agenesis and the location of initial bone loss seen in juvenile periodontitis be explained by neural developmental fields in the jaws? Acta Odontologica Scandinavica. 1997;55(1):70-72.