ORIGINAL ARTICLE

Determination of the prevalence of dental anomalies by digital panoramic radiography analysis

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Abstract

To determine the prevalence of dental abnormalities and which dental anomalies are more common in Turkish society by evaluating panoramic radiographs. This study is based on a retrospective examination of randomly selected panoramic radiographs of 2500 patients who applied to Karabük Oral and Dental Health Hospital during 2016-2020 years. Dental anomalies were evaluated by dividing them into 5 types and 16 subtypes. Also, data such as age and gender of the patients were found from the patient records and noted. The average age of the patients was 34.5 (range 6-45) years; 1167 (46.68 %) patients were male and 1333 (53.32 %) were female. Of the 2500 patients, 817 had at the lowest one type of dental anomaly; so the prevalence of dental anomaly in the research community was calculated at 32.68% (43% of these were men, 57% were women). Amongst them of 750 (91.79%) patients had one type of anomaly, 61 (7.46%) had two types of anomalies, and 6 (0.75%) had three types of anomalies. Dental anomalies are quite common disorders of teeth. Although even not to show any symptom, they can induce very kind of practical complication. The high rate of dental anomalies shows the importance of detecting dental anomalies.

Keywords: Dental anomaly, panoramic radiography, tooth malformation

Introduction

Dental anomalies are congenital, developmental, or acquired changes that occur in the formation stage of teeth and cause impairment in dental structures [1]. Dental anomalies occur by the influence of various environmental and genetic factors [2]. Congenital anomalies are inherited and have a hereditary elementary, while developmental anomalies occur in the development stage of the teeth, acquired dental anomalies occur as a result of factors that occur after the maturation stage of the teeth [1,3,4].

Dental anomalies have a comprehensive variation that comprises the number, size, shape, and eruption disorders of teeth [5] and it can cause difficulties in dental treatments and aesthetic problems [1,3]. A developmental defect or dental anomaly occurred in the enamel can lead to problems such as tooth sensitivity or aesthetic problems [6]. Besides, dental anomalies can result in malocclusion and impairment in tooth eruption and dental arch development. Therefore, early diagnosis is important in preventing occlusal and maxillofacial deformities [7,8]. Early diagnosis also enables the right patient accomplishment and treatment planning and can decrease problems and the cost and difficulty of therapy [9].

Dental imaging methods have an important place in the detection of dental problems and maintenance of oral and dental health. Panoramic radiographs are a routine imaging method used in clinics because they are non-invasive and give data that we cannot obtain with clinical examination [10]. For this purpose, panoramic radiographs are effectively used in the imaging of oral and maxillofacial pathologies, treatment planning, evaluation of dental development, as well as detecting clinically asymptomatic anomalies [8]. The early detection of these asymptomatic situations with panoramic radiographs is especially important in children because delayed treatments in long-term lesions and maxillofacial deformities can bring some psychological problems [11]. Also, early detection of dental anomalies is very fundamental in terms of preventing some deviations that may occur in permanent teeth [4,12,13].

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Various studies have been achieved to determine the prevalence of dental abnormalities in certain populations. When we look at the results of these studies, it is seen that the frequency of dental anomalies varies among societies [2,14-18]. It is thought that this diversity may arise from ethnic, genetic, and environmental factors as well as the determination of the study group and differences in diagnostic criteria [7,18,19].

The purpose of this study is to report the prevalence of dental anomalies and which dental anomalies are more common in a dental patient population who applied to Karabük Oral and Dental Health Hospital, by examining panoramic radiographs. For this purpose, the panoramic radiography records of the patients were examined in detail and the anomalies detected according to the tooth shape, number, location, and structure were classified.

Materials and Methods

This study is built on retrospective evaluation of randomly selected panoramic radiographs of 2500 patients who applied to Karabük Oral and Dental Health Hospital during 2016-2020 years. The study protocol was approved by the Ethics Committee of Non- Interventional Clinical Research of Karabük University, Turkey (2020/282). Exclusion criteria for the study are; unclear radiographs of low quality, radiographs of patients with cleft lip-

palate, patients with dental trauma detected in treatment records or x-ray, patients with fixed or mobile prosthetic restorations that may prevent the identification of so many abnormalities, for instance, taurodontism, microdontia, and radiographs of patients with root canal treatment or filling.

Dental anomalies were evaluated by dividing them g into 5 types and 16 subtypes. It is accepted as a number anomaly when there isn't evidence of tooth development radiographically or there are more teeth than they should be, considering the age and extraction history of the patients.

The presence of the tooth or its bud between the two central incisors was also accepted as mesiodens. Dentin dysplasia, dentinogenesis imperfecta, and amelogenesis imperfecta have been specified only under the name of 'structural anomalies' without dividing them into subgroups. Impaction has been used for situations where the eruption path of the tooth is blocked by bone or adjacent teeth. In addition, data such as age and gender of the patients were found from the patient records and noted. All collected data was analyzed in terms of gender and the frequency of anomalies. Statistical analysis of the results were done with MiniTab 17 Statistical Software (Statistical Software Version, Version 17.3.1. Minitab Inc. USA). Descriptive statistics were obtained in terms of frequency and percentage.
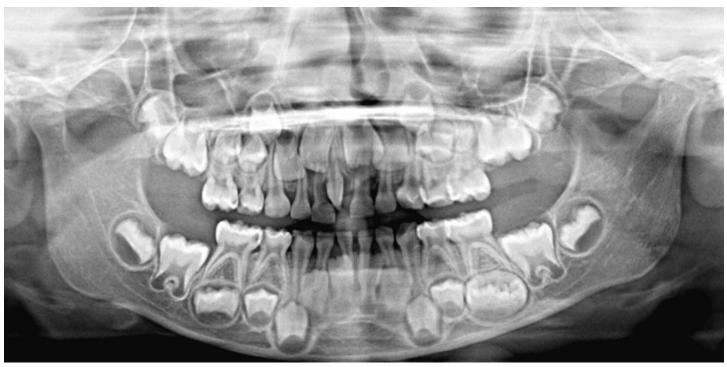

Figure 1. Mesiodens

Results

2500 appropriate patients were examined by their panoramic radiographs. The average age of the patients was 34.5 (range 6-45) years; 1167 (46.68 %) patients were male and 1333 (53.32 %) were female. Among the 2500 patients, 817 had a minimum of one kind of dental anomaly; so, the prevalence of dental anomaly in the research community was calculated at 32.68% (43% of these were men, 57% were women). Of the people who had dental anomalies,

750 (91.79%) patients had one kind of anomaly, 61 (7.46%) had kinds of anomalies, and 6 (0.75%) had three kinds of anomalies.

The most common types of abnormalities were position anomalies (61.07%) and shape anomalies (19.33%). Anomalies of size (5.63%), structure (1.22%), and number (13.83%) were the lowest widespread in both genders. The most common shape anomaly was dilaceration. The most common position anomaly was impaction. Anomalies of impaction (46.51%), dilaceration

(11.87%), hypodontia (11.01%), and displacement (9.17%) were the most widespread subtypes of dental abnormalities. Only one patient (1.22%), presented amelogenesis imperfecta; only one patient (1.22%) presented oligodontia; only one patient (0.12%) presented fusion and gemination; only two patients (0.24%) presented inversion. The certain and approximate frequencies of the different types and subtypes of anomalies in the research community are defined in Table 1. Also the distribution of the most common types of anomalies in the research community in terms of gender is shown in Table 2. Displacement and taurodontism were more widespread in patients aged 13–19 years. The age range for the most often appearing of all other abnormalities was 19–28 years.

Figure 2. Inversion, hyperdontia (surnumerary tooth), displacement

Table 1. The certain and approximate frequencies of the different types and subtypes of anomalies in the research community

Types and subtypes of anomalies	Frequency (%)	Prevalence %
Number	113 (13.83%)	4.52
Hypodontia	90 (11.01%)	3.60
Oligodontia	1(1.22%)	0.4
Hyperdontia	32 (3.91%)	1.28
Size	46 (5.63%)	1.84
Macrodontia	12 (1.46%)	0.48
Microdontia	34 (4.16%)	1.36
Structure	1 (1.22%)	0.04
Amelogenesis imperfecta	1 (1.22%)	0.04
Dentinogenesis imperecta	0 (0.00%)	0.00
Dentin dysplasia	0 (0.00%)	0.00
Position	499 (61.07%)	19.96
Transposition	7 (0.85%)	0.28
Ectopia	35 (4.28%)	1.4
Displacement	75(9.17%)	3
Inversion	2 (0.24%)	0.08
Impaction	380 (46.51%)	15.2
Shape	158 (19.33%)	6.32
Fusion and gemination	1 (0.12%)	0.04
Dilaceration	97 (11.87%)	3.88
Taurodontism	60 (7.34%)	2.4
Total	817 (100%)	32.68

Table 2. The distribution of the most common types of anomalies in the research community in terms of gender

Type of anomaly	Male (n)	Female (n)
Hypodontia	42	48
Hyperdontia	12	20
Macrodontia	7	5
Microdontia	21	13
Ectopia	16	19
Displacement	46	29
Impaction	147	133
Dilaceration	38	59
Taurodontism	33	27

Figure 3. Hypodontia (persiste primary tooth)

Figure 4. Hypodontia, ectopia

Figure 5. Dilaceration, impaction

Discussion

The knowledge level of the common dental anomalies and alterations is essential for all dental clinicians. Many factors influence the dental development stage with genetic and environmental factors playing key roles.

Digital panoramic radiographs were used to determine the frequency of dental abnormalities in patients aged from 6 to 45 years. This type of radiographs is favorable because of permitting analysis of the teeth and jaws simultaneously, with fewer dosage radiation and at a fewer expense. In this way, this type of radiographs is get used in most dentistry fields, including surgery, prosthetics, and orthodontics. It is also advantageous in that it can show dental anomalies in all jaw (lower and upper jaw) in a just single radiograph. Our study expressed a frequency of dental abnorma¬lities detected with digital panoramic radiographs of 46.68%, which was higher in females (53.32%) than in males (46.68%). It is stated that the prevalence of dental anomalies of 18.17%, which was also higher in females (9.90%) than in males (8.28%) by Saberi et al. [1]. Gupta et al. [18] were reported a frequency of 28.34% in 2011, Guttal et al. [20] were reported 73.1% in 2010, Shokri et al. [3] was reported 29% in 2014, Bilge et al. [21] was reported 39.2% in 2017, Dang et al. [22] were reported 5.14% in 2017 and Haghanifar et al. [23]was reported 28.06% in 2019. The incongruity in these incidences could be defined with the indicative standards used to describe and categorize the dental abnormalities, further to hereditary and racial agents. Just several kinds of abnormalities that have been included in early studies could be other causes for the determined incongruity. These conflicting results also can be explained by nutritional differences and local environmental influences [14].

The most common types of anomalies were position (61.07%) and shape (19.33%) anomalies whereas size (5.63%), structure (1.22%), and number (13.83%) anomalies were seen lesser in both genders. Also; the most common subtypes of dental anomalies were impaction (46.51%), dilaceration (11.87%), hypodontia (11.01%), and displacement (9.17%) were. In study I,t was stated that structural (71.70%), positional (19.81%), and numerical (8.49%) anomalies were the most widespread kind of dental abnormalities. They reported that the most commonly seen dental abnormalities were taurodontism (5.38%), dilaceration (5.29%), and impaction (3.41%) [1]. Haghanifar et al. [23] reported that the impaction was the most prevalent anomaly (15.2%), followed by root dilaceration (7.7%).

In our study; it was reported that impaction (46.51%) was the most widespread anomaly. This result was compatible with the results of Kathariya MD et al. [24] and Bilge et al. [21]. In spite of this; Saberi et al. [1] stated that tooth impaction's prevalence was 39.2%. İncidence of impaction of 16.6% as stated by Dalili et al. [25] 8.3% by Ezoddini et al. [15] and 2.95% by Ghabanchi et al. [26]. These percentages are lesser than our study's results. This incongruity might occur due to third molars were not consider as impacted teeth in the menti ed researches, but they were considered in our research.

Dilaceration was the second most common anomaly in our study (11.87%). Just a few studies have stated the frequency of dilacerations, with frequencies ranging from 0.32% to 98% [27].

Incompatible with these results; Haghanifar et al. reported that the root dilaceration was the second most common anomaly (7.7%). The preva¬lence of dilaceration was stated that 15% by Ezoddini et al., 7.58% by Shokri et al. and 5.6% by Dalili et al. [3,15,25].

In our study, the prevalence of hypodontia was 11.01%. In early researches, this prevalence altered from 0.15% to 26.1% [20, 28]. The prevalence of hypodontia was reported as 7.1 % Laganà et al. [9] 7.4 % by Backman and Wahlin [29] 4.28% by Dang et al., [22] 1.7% by Haghanifar et al. [23]. The etiology of hypodontia (absence of tooth germs) is generally considered genetically; however, in a few studies, environmental factors have been reported as the sole etiological factor [30].

In our study, the prevalence of taurodontism was estimated as 7.34%. Taurodontism is an alteratiom of root shape that has indicative features of a vertically elongated pulp chamber, apical transposition of the pulpal floor, and lack of the shrinking at the cementoenamel junction grade [31]. Sarr et al. [32] found the frequency of taurodontism 48%. A frequency of 8.61% as stated by Ghaznawi et al. [33] 8.0% by Darwazeh et al. [34] in Jordanian patients, 11.2% by Bilge et al. [21]; 5.6% by Shifman and Chanannel [35] in Israeli patients, and 46.4% by MacDonald-Jankowski and Li [36] in an adult Chinese population. The reasons for this incongruity in prevalence can be alterations in the criteria used to identify taurodontism and racial differences.

In our study, fusion and gemination were seen in only one patient. So; the prevalence of fusion and gemination was 0.12%, which is identical to other researches, where the prevalence of these anomalies ranged from 0% to 0.8% and demonstrated no alterations between males and females [5,21]. Although the incidence of these anomalies is very low, it should not be overlooked. In addition to the aesthetic problems because of their shape in the anterior regions in patients, difficulties are encountered in root canal treatments due to differences in root canal morphology. Also, these teeth were vulnerable to periodontal problems and decay [37].

In this study, the prevalence of transposition was 0.85%. This finding was compatible with the results of early studies [3,9,21,28]. Lagana et al. [9] found tooth transposition prevalence 1.4 % ad they explained this higher prevalence of transpositions could be identified in the 8 and 9-year-old groups (~69%) and it was possible that some of the transpositions of teeth may be normalized later.

The prevalence of amelogenesis im¬perfecta was detected 1.22% in our study, Bilge et al. [21] -close to our result- found a prevalence of amelogenesis im¬perfecta 0.08% The frequency of amelogenesis imperfecta has been stated in few researches, but the findings vary variable [38].

Conclusion

If we state the contributions of our study to the literature; dental abnormalities are widespread irregularities of teeth. Although even not to show any symptoms, they can induce a variety of clinical problems. Early diagnosis of dental anomalies, can reveal potential orthodontic problems, ensures the correct treatment planning and reduces complication and complexity of treatment plan. The frequency and type of dental anomalies vary within and between populations, supporting the role of racial factors in the prevalence

of dental anomalies. Because of the prevalence and types of dental anomalies differs within and between populations, besides knowing the types of anomalies, also knowledge of patients age, gen¬der, and jaw prevalence, may provide practitioner better diagnosis of dental abnormalities at initial degrees.

This difference between populations, reveals the necessity of such studies in different populations. In our study it was determined which type dental anomalies are seen more frequently in our society. In the light of the data we have obtained, it is possible to carry out more detailed studies on more common dental anomalies seen in Turkish population. But, it is necessary that more studies with larger populations in different age groups must be done. Another limitation of our study is, enviromental and familial factors may lead to occurence of dental anomalies could not be evaluated in more detail in our study.

Conflict of interests
The authors declare that they have no competing interests.

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Ethical approval
This study protocol was approved by the Ethics Committee of Non- Interventional Clinical Research of Karabük University, Turkey (2020/282).

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