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Investigation of prevalence of dental anomalies by using digital panoramic radiographs

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Background: *This study was performed to evaluate the prevalence of all types and subtypes of dental anomalies among 6- to 40-year-old patients by using panoramic radiographs.*

Materials and methods: *This cross-sectional study was conducted by analysing digital panoramic radiographs of 1200 patients admitted to our clinic in 2014. Dental anomalies were examined under 5 types and 16 subtypes. Dental anomalies were divided into 5 types: (a) number (including hypodontia, oligodontia and hyperdontia); (b) size (including microdontia and macrodontia); (c) structure (including amelogenesis imperfecta, dentinogenesis imperfecta and dentin dysplasia); (d) position (including transposition, ectopia, displacement, impaction and inversion); (e) shape (including fusion-gemination, dilaceration and taurodontism).*

Results: *The prevalence of dental anomalies diagnosed by panoramic radiographs was 39.2% (46% in men and 54% in women). Anomalies of position (60.8%) and shape (27.8%) were the most common types of abnormalities and anomalies of size (8.2%), structure (0.2%) and number (17%) were the least in both genders. Anomalies of impaction (45.5%), dilacerations (16.3%), hypodontia (13.8%) and taurodontism (11.2%) were the most common subtypes of dental anomalies. Taurodontism was more common in the age groups of 13–19 years. The age range of the most frequent of all other anomalies was 20–29.*

Conclusions: *Anomalies of tooth position were the most common type of dental anomalies and structure anomalies were the least common in this Turkish population. The frequency and type of dental anomalies vary within and between populations, confirming the role of racial factors in the prevalence of dental anomalies. Digital panoramic radiography is a very useful method for the detection of dental anomalies.* (Folia Morphol 2018; 77, 2: 323–328)

Key words: digital panoramic radiographs, dental anomalies, anomalies of position

INTRODUCTION

Dental anomalies are changes in the dental structure that arise from deformities during tooth formation; they can be congenital, developmental, or acquired [21]. The congenital types are inherited and have a genetic basis, the developmental types arise during tooth improvement, and the acquired anomalies arise after tooth improvement [25]. Dental anomalies may occur due to various factors, including environmental and genetic influences [20]. Developmental anomalies are events that happen during the tooth developmental processes and can range from simple isolated defects to symptoms of specific syndromes [13, 18].

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Dental anomalies encompass a wide spectrum of features, including the number, morphology, size, and changes in eruption [22]. These anomalies can complicate dental treatments, such as root canal therapy or tooth extraction, and can induce malocclusion, increases in sensitivity, and aesthetic problems [21, 25].

The prevalence of dental anomalies has been investigated in different communities and ethnic groups in several studies; however, variations in several factors, such as race, sampling methods, and different diagnostic criteria, have led to inconsistent results between and within populations [21, 25]. A few types or subtypes of dental anomalies within a limited and particular population have been evaluated in previously published studies. The purpose of the present study was to evaluate the incidence of dental anomalies of all types (position, number, shape, and structure) and the subtypes of dental anomalies in a dental patient population.

MATERIALS AND METHODS

This cross-sectional study was conducted by analysing digital panoramic radiographs of 1200 patients admitted to our clinic in 2014. Exclusion criteria were low-quality radiographs, patients under fixed orthodontic treatment, cleft palate, any type of disease, traumatic injuries, or jaw fractures that affected the natural eruption of permanent teeth, crown restorations, and caries or root canal treatment that would interfere with the detection of some anomalies, such as taurodontism.

Dental anomalies were divided into the following 5 types and 16 subtypes: (a) number (including hypodontia, oligodontia, and hyperdontia); (b) size (including microdontia and macrodontia); (c) structure (including amelogenesis imperfecta, dentinogenesis imperfecta, and dentin dysplasia); (d) position (including transposition, ectopia, displacement, impaction, and inversion); and (e) shape (including fusion-gemination, dilaceration, and taurodontism) (Figs. 1–10).

For evaluation size anomalies only gross deviations in sizes easily discernible by clinical judgement were accepted. When assessing number anomalies, age and extraction history were considered. Structure anomalies was evaluated without dividing into subgroups and confirmed by clinical examination. The impaction is, impossibility of reaching or growing a functional positon of tooth or the blockage of the eruptional pathway by the adjacent teeth, bone or soft tissue. Impaction from position anomalies were assessed according to developmental age of the person.

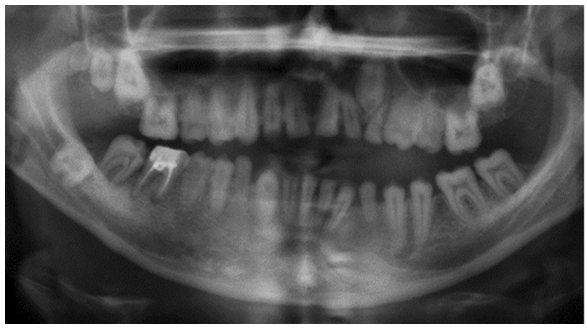

Figure 1. Amelogenesis imperfecta.

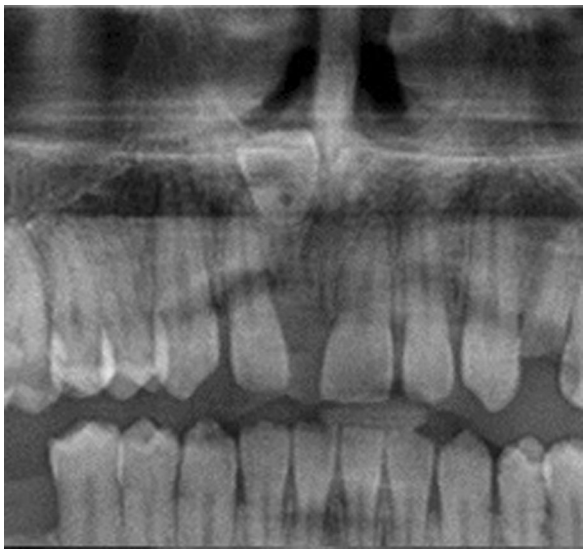

Figure 2. Inversion.

Figure 3. Transposition.

Figure 4. Ectopia, hypodontia, impaction.

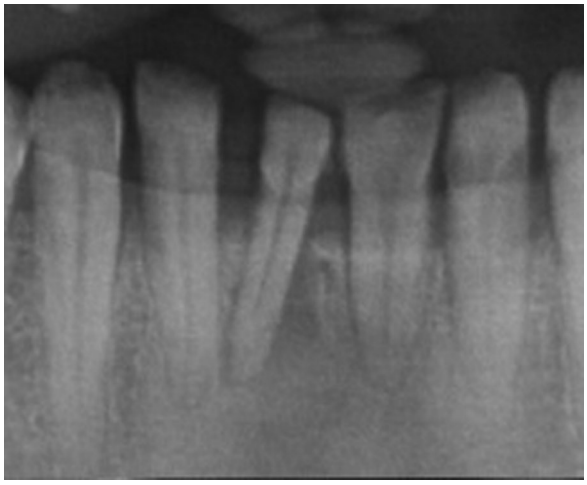

Figure 5. Fusion and gemination.

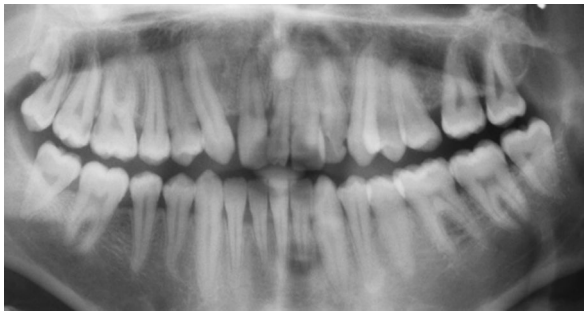

Figure 6. Hyperdontia.

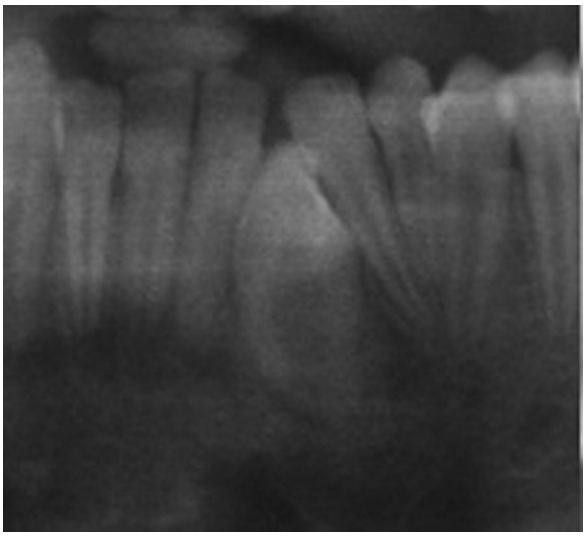

Figure 7. Displacement.

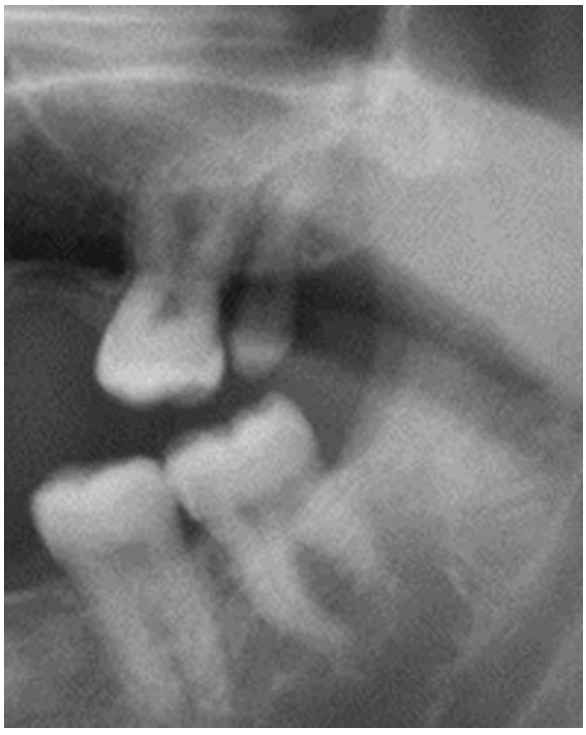

Figure 8. Microdontia.

Eruption of any tooth in an abnormal position was considered to represent ectopic eruption.

Patient data were obtained from their medical records. All radiographs were taken with two devices (Gendex Orthoralix 9200, kvp 70, ma 4, time 12 s, USA; Planmeca Promax, kvp 70, ma 10, time 16 s, Finland), processed with one digitiser, and evaluated by one radiologist under proper lighting. Data were analysed using descriptive statistics, including frequency and per cent.

RESULTS

Panoramic radiographs of 1200 eligible patients were studied. The mean age of the subjects was 22.2

Figure 9. Dilaceration.

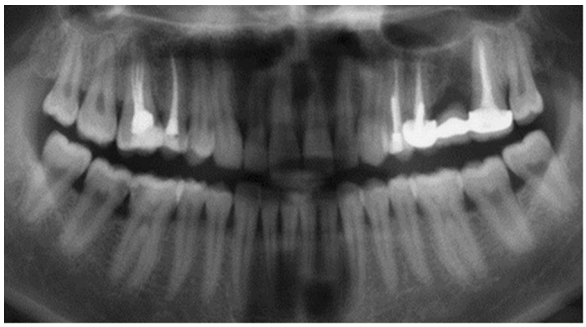

Figure 10. Taurodontism.

Table 1. Absolute and relative frequency distribution in the study population and the prevalence of anomalies in the main and subtypes

Types and subtypes of anomalies	Frequency (%)	Prevalence %
Number	80 (17.02%)	6.66
Hypodontia	66 (14.04%)	5.50
Oligodontia	0 (0.00%)	0.00
Hyperdontia	14 (2.97%)	1.16
Size	39 (8.29%)	3.25
Macrodontia	2 (0.42%)	0.16
Microdontia	37 (7.87%)	3.08
Sutructure	1 (0.21%)	0.08
Amelogenesis imperfecta	1 (0.21%)	0.08
Dentinogenesis imperecta	0 (0.00%)	0.00
Dentin dysplasia	0 (0.00%)	0.00
Position	286 (60.85%)	23.88
Transposition	5 (1.06%)	0.41
Ectopia	21 (4.46%)	1.75
Displacement	43 (9.14%)	3.58
Inversion	3 (0.63%)	0.25
Impaction	214 (45.53%)	17.83
Shape	131 (27.87%)	10.91
Fusion and gemination	1 (0.21%)	0.08
Dilaceration	77 (16.38%)	6.41
Taurodontism	53 (11.27%)	4.41
Total	470 (100%)	39.1

Prevalence — number of anomalies/total population (1200)

(range: 6–40) years; 538 (44.8%) subjects were male and 662 (55.2%) were female. Of the 1200 patients, 470 had at least one type of dental anomaly; therefore, the prevalence of dental anomaly in the study population was estimated at 39.2% (46% of these were men, 54% were women).

Among the people who had dental abnormalities, 423 (90%) subjects had one type of anomaly, 45 (9.6%) had two types of anomalies, and 2 (0.4%) had three types of anomalies. Anomalies of position (60.8%) and shape (27.8%) were the most common types of abnormalities, whereas anomalies of size (8.2%), structure (0.2%), and number (17%) were the least common in both genders. Anomalies of impaction (45.5%), dilaceration (16.3%), hypodontia (13.8%), and taurodontism (11.2%) were the most common subtypes of dental anomalies. The absolute and relative frequencies of the different types and subtypes of anomalies in the study population are shown in Table 1.

Taurodontism was more common in the patients aged 13–19 years. The age range for the most frequently occurring of all other anomalies was 20–29 years.

DISCUSSION

We used digital panoramic radiographs to evaluate the prevalence of dental anomalies in patients ranging in age from 6 to 40 years. Digital panoramic radiographs are advantageous because they

allow examination of the jaws and teeth at the same time, with low dose radiation and at low cost. Thus, this type of radiograph is preferred in most dental procedures, including orthodontics, prosthetics, and surgery. It can be used to study normal and abnormal findings, including dental anomalies that sometimes need to be reviewed and followed up [1].

Our data indicated a prevalence of dental anomalies diagnosed by digital panoramic radiographs of 39.2%, which was higher in females (54%) than in males (46%). Saberi et al. [21] reported a prevalence of dental anomalies of 18.17%, which was also higher in females (9.90%) than in males (8.28%). A prevalence of 28.34% was reported by Gupta et al. [10] in 2011, 73.1% by Guttal et al. [11] in 2010, and 29% by Shokri et al. [25] in 2014. The inconsistency in these percentages might be explained by the diagnostic criteria used to identify and classify the dental anomalies, as well as genetic and racial factors. The fact that only a few types of anomalies have been evaluated in previous studies may be another reason for the observed inconsistency.

The anomalies of position (60.8%) and shape (27.8%) were the most common types of abnormalities, whereas the anomalies of size (8.2%), structure (0.2%), and number (17%) were the least common in both genders. Anomalies of impaction (45.5%), dilaceration (16.3%), hypodontia (13.8%), and taurodontism (11.2%) were the most common subtypes of dental anomalies. Saberi et al. [21] reported that the most common type of dental anomalies were morphological (71.70%), positional (19.81%), and numerical (8.49%). They found that the most prevalent dental anomalies were taurodontism (5.38%), dilacerations (5.29%), and tooth impaction (3.41%).

The most common abnormality found in our study was impaction (45.5%), which was consistent with the findings of Shokri et al. [25]. By contrast, Saberi et al. [21] reported a prevalence of tooth impaction of 3.41%. A prevalence of impaction of 16.6% was reported by Dalili et al. [4], 8.3% by Ezoddini et al. [7], and 2.95% by Ghabanchi et al. [8] in different regions of Iran [21]; these values are much lower than those in our study. This inconsistency may have arisen because third molars were not counted as impacted teeth in the previous studies, but they were counted in our study.

The second most common anomaly in this study was dilaceration (16.3%). Only a few publications have reported the prevalence of dilacerations, with frequencies ranging from 0.32% to 98% of teeth [15]. The prevalence of dilaceration was reported as 7.58% by Shokri et al. [25], 15% by Ezoddini et al. [7], and 5.6% by Dalili et al. [4]. This developmental anomaly represents a sudden change in the axial inclination between the crown and the root of a tooth. Two possible causes of dilaceration are traumatic injuries and developmental disturbances of the tooth bud [15]. The diagnosis of dilacerations is possible only by X-ray, but a small buccal and lingual curvature may not be observed on radiographs.

In the present study, the prevalence of hypodontia was 13.8%. In previous studies, this prevalence ranged from 0.15% to 26.1% [11, 16]. The prevalence of hypodontia was estimated at 16.7% by Shokri et al. [25]. The absence of tooth buds is usually controlled by genetic factors; however, in some studies, environmental factors were noted as the only etiological factors [19].

The prevalence of taurodontism was 11.2% in our study. Taurodontism, which is a change in tooth shape, has characteristic features of a vertically elongated pulp chamber, apical displacement of the pulpal floor, and lack of the narrowing at the cementoenamel junction level [14]. Sarr et al. [23], who reported the prevalence of taurodontism using panoramic radiographs of the first and second molar teeth of 150 patients aged 15–19 years, found a prevalence of taurodontism of 48%. A prevalence of 8.61% was reported by Ghaznawi et al. [9], 8.0% by Darwazeh et al. [5] in Jordanian dental patients, 5.6% by Shifman and Chanannel [24] in Israeli patients, and 46.4% by MacDonald-Jankowski and Li [17] in an adult Chinese population. The main cause of this inconsistency in prevalence may be differences in the criteria used to define taurodontism.

The prevalence of fusion and gemination in the present study was 0.08%, which is similar to that reported in other studies, where the prevalence of these anomalies ranged from 0% to 0.8% and showed no differences between the two genders [2, 12, 22]. The low frequency of these anomalies means that their significance is often overlooked. The formation of these anomalies in the anterior regions creates aesthetic problems due to their shape and these teeth are also very sensitive to decay and periodontal diseases. Root canal treatment may be complicated in some cases [6].

In this study, the prevalence of transposition was 0.41%. This result was in agreement with the findings of previous studies [16, 25, 26].

In our study, the prevalence of amelogenesis imperfecta was 0.08%. The prevalence of amelogenesis imperfecta has been reported in many studies, but the results vary widely [3].

CONCLUSIONS

Dental anomalies are quite common events. Although not always symptomatic, they can cause a variety of clinical problems. The frequency and type of dental anomalies apparently vary within and between populations, confirming the role of racial factors in the prevalence of dental anomalies. Because the prevalence and types of anomalies change within populations and between populations, knowledge of the types of anomalies, as well as their age, gender, and jaw prevalence, may help clinicians perform a better diagnosis of dental anomalies at early stages.

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