Original Article

Radiographic Evaluation of Dental Anomaly Prevalence in a Selected Iranian Population

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ABSTRACT

Statement of the Problem: Many studies have explored the prevalence of dental anomalies, with conflicting results, possibly attributed to differences in the ethnicities of the populations evaluated.

Purpose: The aim of this study was to investigate the prevalence of dental anomalies, using panoramic images, in an Iranian population.

Materials and Method: In this cross-sectional study, panoramic radiographs of patients aged 18 years or more, between 2015 and 2017 from three private clinics in Babol and Sari, were evaluated for presence or absence of anomalies (tooth shape, number, structure, and position). Data were analyzed using the chi square test, Student's t-test, and analyses of variance. In this study, $p \leq 0.05$ was considered significant.

Results: Of 8018 cases examined, anomalies were found in 2250 cases (28.06%), with 95% confidence intervals of 27.08 - 29.0; one, two, and more than two types of anomalies were observed in 1968 (24.5%), 267 (3.3%), and 15 (0.2%) cases, respectively. Root dilaceration was the most prevalent anomaly (7.7%), followed by dens invaginatus (3.8%). Impaction was observed with a prevalence of 15.2%. Impaction, dens invaginatus, and missing teeth were significantly more prevalent in women than in men, whilst supernumerary teeth and hypercementosis were more common in men than in women ($p < 0.05$).

Conclusion: Regarding the relatively high prevalence of dental anomalies such as root dilacerations and dens invaginatus, it is essential to consider these anomalies carefully in treatment decision-making.

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Introduction

Dental anomalies are influenced by various environmental and genetic factors [1]. Developmental anomalies occur during tooth development, whereas acquired anomalies occur after tooth maturation [2-3]. Some dental anomalies and developmental defects of the enamel cause difficulties, such as tooth sensitivity and esthetic issues [4]. Other anomalies, such as impaction, can lead to malocclusion [2]. Anomalies affect occlusion and arch length, particularly in the anterior region of younger patients; thus, they are a substantial concern in dental esthetics and orthodontics [5-6].

Many studies have explored the prevalence of anomalies and reported variable results, probably because these studies were performed on populations of different ethnicities and possibly, different sampling and diagnostic methods were employed [2, 7-9]. The congenital absence of teeth, or missing teeth, is one of the most prevalent anomalies of tooth number, and can affect dental esthetics and function [10-11]. Various studies have reported the prevalence of missing teeth as occurring in 3.49% - 25.7% of individuals [2, 7, 9, 12]. Dilaceration, an anomaly of tooth shape, has also been widely studied, occurring at a reported prevalence of

0.5% - 21.11% [2, 7, 9, 13-14]. Tooth impaction is also a common finding in patients; numerous studies have reported the prevalence of impacted teeth as 8.3%- 44.76% [2, 7, 9, 14-16]. Another developmental anomaly of tooth shape is dens invaginatus, occurring at a prevalence of 0.4%-10.9% [2, 7-8, 14, 17-19]. Tooth transposition is an anomaly of tooth position, defined as a tooth switching positions with an adjacent tooth; canines are most commonly involved, usually in the maxilla [20-23]. Various studies have estimated the prevalence of transposition as 0.1% - 0.38% [7, 23- 24].

The aim of this study was to investigate the prevalence of dental anomalies in an Iranian population using radiographic records. A range of anomalies were studied and categorized according to tooth shape, number, position, and structure.

Materials and Method

In this cross-sectional study, panoramic radiographs from patients aged 18 years and over, taken between 2015 and 2017 at three private oral and maxillofacial radiology clinics in Mazandaran province (in Babol and Sari), were examined by three experienced oral and maxillofacial radiologists. Inclusion criteria were considered as minimum age of 26 years for 3rd molar impaction and 18 years for other anomalies, and acceptable quality of radiographic images. The exclusion criterion was any systemic condition that could affect the dental structures. The anomalies investigated in this research related to tooth were (1) shape (i.e. fusion, taurodontism, dens invaginatus, gemination, and root dilacerations with curves of at least 45 degrees), (2) number (i.e. missing and supernumerary) ,though missing third molars were not considered, (3) structure (i.e. amelogenesis imperfecta, dentinogenesis imperfecta, and dentin dysplasia), (4) position (i.e. transposition), and (5) the impaction. A checklist was composed to record patients' demographic information and the presence or absence of anomalies.

The data were analyzed using SPSS software (v.22); chi-square tests, Student's t-tests, and analyses of variance were conducted. Probability values of (p) ≤ 0.05 were considered statistically significant. Descriptive data were reported as frequencies, and relative frequency prevalence rates were estimated using confidence intervals.

Results

The panoramic radiographs of 8018 patients, with a mean± standard deviation age of 35.45±10.94 years, were examined. The cases comprised 3470 men (43.4%; aged 36.13±11.25 years) and 4525 women (56.6%; aged 34.92±10.66 years).

Anomalies were found in 2250 cases (28.06%), with a 95% confidence interval of 27.08-29.0. One type of anomaly was found in 1968 cases (24.5%), two types of anomalies were found in 267 cases (3.3%), and more than two types of anomalies were found in 15 cases (0.2%). Table 1 shows the prevalence percentages of the investigated anomalies according to gender, with 95% confidence intervals.

Talon cusps were observed most frequently in maxillary lateral incisors (n = 88, 1.1%), followed by maxillary canines (n= 79, 1.0%). Dens invaginatus were

Table 1: Radiographic distribution and prevalence of developmental dental anomalies by gender

Dental Anomalies		Total (n=8018) N (%)	Male (n=3478) N (%)	Female (n=4540) N(%)	*p* Value	OR(CI=95%)
Shape	Talon cusp	161(%2.0)	76(%2.2)	85(%1.9)	0.322	0.85(0.62-1.16)
	Dens invaginatus	301(%3.8)	112(%3.2)	189(%4.2)	0.028	1.3(1.03-1.66)
	Dilaceration	620(%7.7)	264(%7.6)	356(%7.8)	0.677	1.04(0.88-1.22)
	Fusion	0	0	0	1.000	
	Taurodontism	11(%0.2)	4(%0.1)	7(%0.2)	0.639	1.34(0.39-4.58)
Number	Missing	134(%1.7)	43(%1.2)	91(%2)	0.008	1.63(1.13-2.35)
	Supernumerary	69 (%0.8)	36(%1)	33(%0.7)	0.151	0.69(0.42-1.15)
Structure	Dentinogenesis imperfecta	1(%0.01)	0	1(%0.02)	1.000	
	Amelogenesis imperfecta	0	0	0	1.000	
	Dentin dysplasia	0	0	0	1.000	0.53(0.20-1.40)
	Hypercementosis	17(%0.2)	10(%0.3)	7(%0.02)	0.198	
	Odontodysplasia	1(%0.01)	1(%0.03)	0	0.434	
Position	Transposition	5(%0.06)	4(%0.1)	1(%0.02)	0.174	
Impaction	Third molar*	745(%11.4)**	300(%10.5)***	445(%12.2)****	0.032	1.19(1.02-1.39)
	Other teeth	146(%1,8)	59(%1.7)	87(%1.9)	0.465	1.13(0.81-1.58)

*Minimum age: 26   **Total number: 6517***Number: 2864   ****Number: 3653

detected in 477 teeth of 301 patients, and were most prevalent in maxillary lateral incisors (n = 166, 2.1%) and in women as opposed to men (*p*= 0.028).

Root dilacerations, with a curve of at least 45 degrees, were observed in 749 teeth of 617 patients (7.7%), at a prevalence of 9.3%, most frequently in mandibular third molars (2.3%) followed by maxillary second molars. Three cases of crown dilacerations were also found, two in lateral incisors and one in a third molar. Missing teeth were found in 134 (1.7%) patients, most frequently maxillary lateral incisors (n=91, 1.1%), followed by maxillary premolars (n= 18, 0.2%). Missing teeth were significantly more prevalent in women than men were (*p*= 0.013).

Sixty-nine cases (0.86%) of supernumerary teeth were found in 54 patients (0.7%). The most common supernumerary teeth were distomolars (n = 33, 0.41%) in 26 patients, followed by premolar region supernumerary teeth (n = 31, 0.39%) in 23 patients. Four cases (0.05%) of mesiodense and only one case (0.01%) of paramolars were found. Distomolars were detected most frequently on the left side of the maxilla.

Table 2: Distribution of impacted teeth in the maxilla and mandible by gender

	Maxilla				
Gender	Central incisor	Canine	Premolar	First molar	Third molar∗
Male	0	38(1.1%)	8	1	150(5.2%)
Female	1	63(1.4%)	5	0	276(7.5%)
Total	1	101(1.2%)	13(0.1%)	1	426(6.5%)
	Mandible				
Gender	Central incisor	Canine	Premolar	First molar	Third molar
Male	0	17(0.5%)	11	0	212(7.4%)
Female	0	12(0.2%)	5	0	244(7.7%)
Total	0	29(0.4%)	25(0.3%)	0	456(7%)

∗ Minimum age 26 (n=6517)

Table 3: Distribution and prevalence of impaction plurality by gender

	Impaction number∗				
	One tooth	Two teeth	Three teeth	Four teeth	Five teeth
Male	212	86	26	13	1
Female	329	125	31	24	1
Total	541 (8.3%)	211 (3.2%)	57 (0.9%)	37 (0.6%)	2 (0.03%)

∗ Minimum age 26
n=6517 (male=2864, female=3653)

Impacted teeth were observed in 1222 and 848 patients with the minimum age of 18 and 26 respectively, and were significantly more prevalent in women (Table

1). The mandibular third molar was most commonly impacted (7%), followed by the maxillary third molar (6.5%); no impaction was observed in lateral incisor regions or second molars. The prevalence of impacted teeth according to gender is given in Table 2. The number of impacted teeth in each patient according to gender is given in Table 3.

Discussion
In this study, the percentage of patients with at least one type of dental anomaly was 24.5%, similar to the results reported by Shokri *et al.* [2] a study performed on 1649 Iranian patients. The studies of Patil *et al.* [7] on 3143 Indian patients, Afify *et al.* [9] on 778 Arabian patients, Ezoddini *et al.* [14] on 480 Iranian patients, and Ghabanchi *et al.* [18] on 414 Iranian patients reported percentages of 40.8%, 33.8%, 36.7%, and 49.0%, respectively. [7, 9, 14, 18] The difference between this study and the mentioned previous studies is that the sample size has been considerably increased which would subsequently raise the accuracy of the results greatly. In addition, the differences in prevalence rates may be attributed to differences in the population ethnicities and anomalies investigated. This study has the largest sample size among these mentioned studies, with 8018 panoramic images evaluated.

In the present study, the prevalence of dens invaginatus was 3.8%, which is inconsistent with the findings of previous studies (Shokri *et al.* 0.24%, Ghaznawi 0.8%, Ghabanchi *et al.* 1.44%, Dalili 10.9%) [2,17-19]. The prevalence of Talon cusps was 2% in the present study, whilst Gupta *et al.* (0.97%) and Ezoddini *et al.* (0.6%) reported lower prevalence rates [8, 14]. Talon cusps were most frequently found in maxillary lateral incisors, similar to that observed in previous studies [19, 25-27].

The prevalence of root dilaceration was 7.7%, similar to the findings of Shokri *et al.* (7.5%) and Nabavizadeh *et al.* (7.2%) [2, 13], whilst other studies have reported contrary results [7, 9, 14, 18-19, 28]. These disparities may be attributed to differences in the type of radiographic images used, as well as to the fact that, in the current study, only roots curved more sharply than 45 degrees were considered dilacerated.

Taurodontism in the present population was estimated to occur at a prevalence of 0.2%, which is lower than the findings by Ghabanchi *et al.* (0.9%) and Dalili

et al. (0.5%) [18-19]. This difference is the result of an increase in the sample size of patients in comparison with the previous studies. The prevalence of supernumerary teeth was 0.7% in the present study, higher than the findings of Guttal *et al.* (0.43%) and Dang *et al.* (0.28%) [25, 29]. Two studies conducted in Iran reported the prevalence of supernumerary teeth to be 1.1% and 2.43% [2, 19]. In this study, distomolars and supernumerary teeth in the premolar region were the most common, respectively, whilst other studies found mesiodens to be the most common [8, 15].

The prevalence of missing teeth was found to be 1.7%, similar to Ghabanchi *et al.* (1.6%) [18], but lower than Patil *et al.* (16.7%) and Afify *et al.* (25.8%) [7, 9]. This disparity may be explained by the fact that these two studies did not exclude the third molar. Genetic and environmental factors can also affect the prevalence of this anomaly. The present study demonstrated that missing teeth are most common bilaterally in the maxillary lateral incisors, in line with studies by Shokri *et al.* and Gupta *et al.* [2, 8] The prevalence of hypercementosis was 0.2% in the current study.

The prevalence of transposition was 0.06%, which is substantially lower than previous studies. Shokri *et al.*, Patil *et al.*, Ghaznawi *et al.*, Dalili *et al.*, and Papadopoulos *et al.* found the prevalence of transposition to be 0.33%, 0.1%, 0.24%, 0.2%, and 0.1%, respectively [2, 7, 17, 19, 24]. The only notable difference between the current and previous studies is the large sample size.

In the current study, the prevalence of impaction was 15.2%, similar to studies by Shokri *et al.* [2] and Ghabanchi *et al.* [18] that reported rates of 16.07% and 16.6%, respectively. Afify *et al.* [9] reported the prevalence of impaction to be 21.2%. This difference may be explained by the selection criteria for impaction. In a study by Dalili *et al.* [19] in Rasht, Iran, the prevalence of impaction was 4.34%, which is inconsistent with our findings. This may be due to differences in the types of impaction studied, and the average of the examined population. In the present study, the most commonly impacted tooth was the third molar, similar to the findings of Shokri *et al.* [2] However, Fardi *et al.* found that the maxillary canine was the most frequently impacted tooth (8.8%).

Conclusion

Regarding the relatively high prevalence of dental ano-

malies such as root dilacerations and dens invaginatus, it is essential to consider these anomalies carefully in treatment decision-making.

Conflict of Interest

The authors report no conflicts of interest.

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