International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 13-11-2018; Accepted: 16-12-2018
www.medicalsciencejournal.com
Volume 5; Issue 1; January 2019; Page No. 142-146

Prevalence of dental anomalies in Golestan province in panoramic radiographies in 2014-2018

Dr. Sajad Yusefi[1], Dr. Hoora Sadat Alimohammadi[2], Dr. Jamshid Yazdani[3], Hamid Shirzad[4]
[1-2] Assistant Professor, Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Mazandaran University of Medical Sciences, Sari, Iran
[3] Associated Professor, Department of Environmental Science, Plant Protection and Animal Health, PhD Biostatistics, Mazandaran University of Medical Science, Sari, Iran
[4] PhD Student in Dental, Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Mazandaran University of Medical Sciences, Sari, Iran

Abstract
Background and Purpose: Dental anomalies are one of the human problems caused by disruption of dental structure formation. These defects are evolutionary or acquired. Many epidemiological studies have been conducted to determine the prevalence of various types of the dental anomalies. The aim of the present study was to study the prevalence of dental anomalies on panoramic radiographs in Golestan province, Iran in 2014-2018.
Materials and Methods: In this retrospective descriptive study, 4500 panoramic radiographs belonging to 2897(64%) females and 1603(36%) males were assessed for evaluation of dental anomalies including: Impaction, hypertonia, microdontia, endosmosis, taurodontism, dilacerations and transposition. The One-Sample Poisson Rate, Two-Sample Poisson Rate, Fisher-Exact test were used for statistical analysis of data.
Results: The total prevalence of dental anomalies was 9.6%, most commonly in men. Dilacerations (4.8%) had the highest prevalence, followed by endosmosis (1.9%) and impaction (1.4%). Gender only affected the prevalence of dilacerations. The prevalence of impacted teeth and microdontia was higher in maxilla while endosmosis was more prevalent in mandible.
Conclusion: The dental anomalies occur with different frequencies in various populations. Since, these anomalies may be the cause of various dental problems, it seems that the precise diagnosis of these anomalies is essential in the prevention of the associated problems.

Keywords: panoramic radiography, dental anomaly, prevalence

Introduction
Evolutionary dental anomalies form a significant part of dental morphology [1], with manifestations as dental color, teeth size (microdontia and macrodontia), the number of teeth (Hyperdontia, hypodontia, oligodontia), tooth shapes (Dens evaginatus, dens oaginatus, talon cusp, gemination, fusion, dilaceration, taurodontism and concrescence), positional displacement in the jaw, developmental pattern and normal morphology (amelogenesis imperfecta, dentinogenesis imperfecta and dentin dysplasia) [2].
The shape, number and structure of evolutionary disorder anomalies are in morphological differentiation stages, whereas situational disorders (dysplasia, dental rotation, and impaction) are due to disorders in the dental vegetative stage [3]. Anomalies in the number, shape, and position cause disturbances in the maxillary mandibular arc and cause malaise. Dental anomalies are less prevalent compared to oral diseases, such as caries and periodontal problems, but their control is more complicated because it causes malocclusion and disturbance in beauty [4, 5].
The incidence and degree of manifestation of these anomalies in different populations can provide valuable information for phylogenic and genetic studies and assist understand their differences [4]. For instance, Guttal and Azodini studies have shown high premolar and premolar prevalence in Iranian and Indian patients [6, 7].
Furthermore, early detection of these dental procedures can be effective in controlling their complications. For example, in Dens evaginatus, where teeth lack any decay, delayed diagnosis can cause pulpal and periapical lesions. Thus, a conservative repair can prevent this problem [4]. Besides these cases, these extra teeth cause a rupture of natural teeth that may cause root damage or prevent normal growth, even an untreated extra dental follicle sometimes becomes a dentigerous cyst [2].
Several studies have been conducted to examine the prevalence of these dental defects in different parts of the world [2, 5]. These studies have diverse and various results indicating that the prevalence of anomalies is affected by genetic, racial and environmental factors. Considering the lack of comprehensive study on the prevalence of dental anomalies based on radiographic images in the northern strip of the country and the importance of the subject, the purpose of the study was to specify the prevalence of dental anomalies in Golestan.

Materials and methods
Type and the population studied
The study was descriptive retrospective. The sample size was calculated using similar studies [8, 10] as follows:

$$n = \frac{Z_{1-\alpha/2} * p_* * (1 - p_*)}{d^2} = 4500$$

Is found to be 0.05 α and p = 0.16 and d = 0.01 respectively. In this study, archives of panoramic radiographs of patients admitted to jaw and radiology centers of public and private

centers of cities of Golestan (Gorgan, Gonbad, Kalaleh) were used. These cities were divided into three parts - west, center and east of the province. The cities with randomly selected jaw and radiology centers were selected randomly. This means that for the east of the province, the dome was examined for the central region and Gorgan for the west of the province during the years 2014-2018. The allocation of the sample size to these cities was based on the population density of these cities. In order to avoid interpretation problems due to delayed growth and non-growth of permanent teeth, the patient's pictures of the patients who had passed the dentition period were examined. The images were then examined by a high-precision maxillofacial radiologist in a monitor with a high-intensity adjustment of the magnification and light of the screen.

Each of the panoramic clichés was examined according to the gender of the patient and the location of the anomalies. After observing and examining the panoramic images of patients in the radiology unit in the presence of radiologists and completing the samples, the data were analyzed to determine the prevalence of anomalies by jaw and material.

Anomalies examined in the study:

1. Impacted tooth
2. Hyperdontia
3. Taurodontism
4. Microdontia
5. Transposition
6. Enostosis
7. Dilaceration

Data analysis

Data were described using descriptive statistics methods including frequency tables for qualitative variables such as anomaly type and anomaly position and material. Chi-square test, ratio tests, and t-test were used for variance analysis at the significance level 0.05 for examining relationships. Descriptive statistics were used for distribution tables and percentages. Inferential analysis and hypothesis tests were performed using chi-square test and Fisher's exact test at a significance level of 0.05 and 95% confidence. One-way Poisson Sample Poisson and Two Sample Poisson Rate tests were used to study the relationship between variables in relation to gender and jaw. Ultimately, statistical analysis was performed in SPSS25.

Exclusion criteria

Orofacial cleft, unclear radiographic images, patients with orthodontic brackets [4] and third molar teeth due to the shape and position of the jaw [3] were the criteria.

Research variables, type and scale of their measurement:

Table 1: Table of variables

Row	Variable name	Variable role				Scale		Unit	Measurement tool	Behavior with interventional variable			
		Independent	Dependent	Demographi	Interfering	Quantitative	Qualitative			Ignoring	Recording	Elimination	Assimilating
1	Impacted tooth			*			*	Percent	Observation OPG				
2	Hyperdontia			*			*	Percent	Observation OPG				
3	Taurodontism			*			*	Percent	Observation OPG				
4	Microdontia			*			*	Percent	Observation OPG				
5	Transposition			*			*	Percent	Observation OPG				
6	Enostosis			*			*	Percent	Observation OPG				
7	Dilaceration			*			*	Percent	Observation OPG				
8	Material			*			*	Female-male	Observation				
9	Jaw type			*			*	Upper-lower	Observation OPG				

Results

In this study, 4500 panoramic radiography clichés of patients admitted to jaw and facial radiology units of governmental and private centers of Golestan (Gorgan, Gonbad, Kalaleh) were investigated during 2014-2018. The prevalence of dental anomalies in these patients was 9.6% (430) persons, according to Figure 1-3, in terms of gender distribution, 36% were males (1603) and 64% were females (2897).

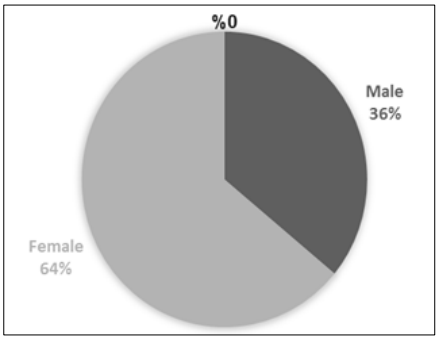

Fig 1: Gender Distribution

According to Table 2 the highest anomalies observed in this study were dilacerations in 219 (4.8%) patients then enostosis in 88 patients (1.9%), impacted tooth in 63 (1.4%), taurodontism in 26 (0.58%), hyperdontia in 19 (0.42%), Microdontia in 14 (0.31), and the lowest was transposition in 1 (0.02%) person.

Table 2: Prevalence of anomalies

Variable	Frequency	Cl (95%)	(%) Prevalence
Impacted tooth	63	1_1.7	1.4%
Hyperdontia	19th	0.25_0.65	0.42%
Taurodontism	26	0.43_0.95	0.58%
Microdontia	14	0.17_0.52	0.31%
Transposition	1	0.0006_0.12	0.02%
Enostosis	88	1.5_2.4	1.9%
Dilaceration	219	4.2_5.5	4.8%
Total	430	8.8_10.5	9.6%

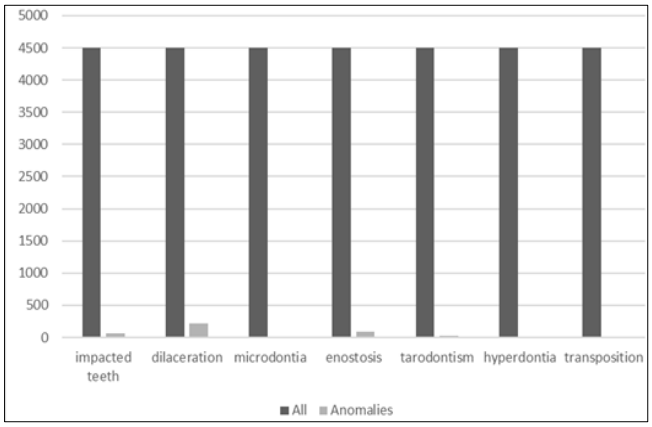

Fig 2: Prevalence of anomalies

To determine the relationship between the prevalence of dental anomalies and demographic (gender) and clinical (jaw) indices, Fisher's exact test was used. The results of these tests are shown in the following tables.

According to the results obtained (Table 3), one can conclude a statistically significant relationship between the prevalence of dilaceration and gender (P.Value<0.001) and the prevalence of other anomalies in men and women was not significantly different. Moreover, among the people with anomalies, 205 (12.6%) were males and 225 (8%) were females. There was a statistically significant difference between the prevalence of anomalies and gender, so that the total prevalence of anomalies in men was higher than in women (P.Value <0.001).

Table 3: Comparison of anomalies by gender

Variable	Total (4500) Number of people (% prevalence)		P Value
	Females	Males	Fisher exact
Gender	2897 (51%)	1603 (49%)	-
Impacted tooth	29 (1.1%)	34 (1.8%)	0.102
Hyperdontia	12 (0.41%)	7 (0.43%)	1.00
Taurodontism	18 (0.62%)	8 (0.49%)	0.439
Microdontia	8 (0.25%)	6 (0.37%)	0.588
Transposition	1 (0.3%)	0 (0.0%)	1.00
Enostosis	46 (1.5%)	42 (2.1%)	0.018
Dilaceration	111 (3.8%)	108 (6.7%)	0.000
Total	225 (8%)	205 (12.6%)	0.000

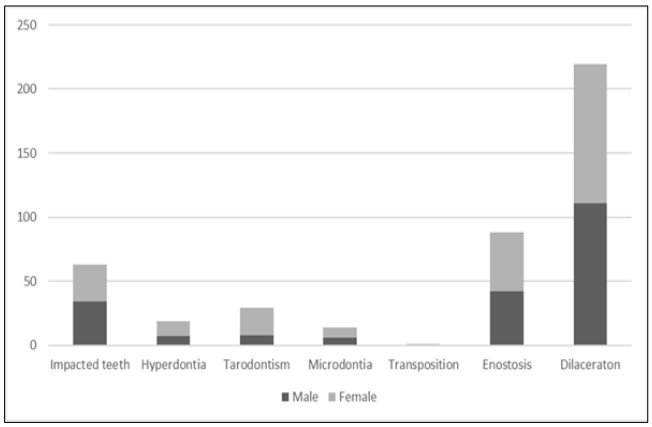

Fig 3: Prevalence of anomalies by gender

According to Table 4, the prevalence of impacted tooth was higher in the maxilla than the lower (P Value <0.001). Additionally, Microdontia was predominantly observed in maxilla (P Value <0.001). Enostosis was seen only in mandibles (P Value <0.001). There was no significant difference in the distribution between two jaws among other anomalies.

Table 4: Prevalence of anomalies by jaws

Variable	Total (4500)		P Value
	Mandibular	Maxilla	Fisher exact
Impacted tooth	21 (4.7%)	42 (0.9%)	0.000
Hyperdontia	6 (0.13%)	13 (0.28%)	
Taurodontism	10 (0.2%)	16 (0.4%)	
Microdontia	1 (0.3%)	13 (28%)	0.000
Transposition	1 (0.02%)	0 (0.0%)	
Enostosis	88 (1.96%)	0 (0.0%)	0.000
Dilaceration	98 (2.17%)	121 (2.68%)	

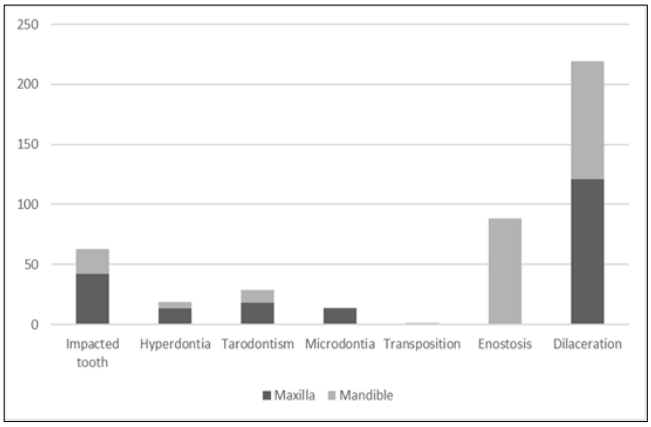

Fig 4: Prevalence of anomalies by jaws

Discussion

The study used panoramic radiographic images to estimate the prevalence of dental anomalies in 4500 patients over the age of dentistry mix. Panoramic radiography has many advantages as it provides the observer with the opportunity to simultaneously examine the teeth and jaw with the lowest dose and minimum cost. Thus, it is commonly used to observe normal and abnormal results, including dental anomalies [12]. In this study, the prevalence of 7 dental anomalies with higher sample sizes than previous studies was evaluated in Golestan based on panoramic radiography. In this study, the results showed an outbreak of 9.6% of the anomalies among the population, which was (12.6 %) more in men than women (8%). However, Saberi reported an outbreak of 18.17%, which was higher in women (9.90%) than in men (8.28%) [13]. Guttal showed a 73% outbreak in 2011 [7]. The reason for the difference in these statistics is the variety of the instruments tools used to identify and classify dental anomalies, as well as racial diversity. The cause of anomalies has been genetically evaluated. Many epidemiological studies on dental anomalies in different parts of the world have shown the effects of geography and race on prevalence rates [11, 14]. Thus, different results have been reported among many studies evaluating the prevalence of dental anomalies. Nutrition and environmental factors can be the other causes of these disparities. Another major reason is the difference in the number of anomalies examined in each study and the age range selected to the patients participating in the study. 4.8% dilatation anomalies, 1.9% enostosis, 1.4% lesion were more common than the rest of the anomalies, while in the Saberi study, the most common anomalies were 5.38% tarodentism, 5.29% dislocation and 3.41%

inclusiveness. The highest prevalence among the anomalies was related to dilaceration 4.8%. This evolutionary anomaly is characterized by a sudden change in the axial angle between the crown and the root of the tooth. Two possible causes of dislocation of traumatic injuries and evolutionary disorders are in the process of formation of dental sprout. In the study conducted by Ardakani *et al*., the prevalence of dilaceration was 15% [15]. And in the study of Afifi *et al*. in Saudi Arabia, the prevalence of d dilaceration was 1.1% [11]. The difference in the prevalence of different studies can be due to the difference in race. Additionally, there was no relationship between the prevalence of dilaceration and dilacerations of the jaw. Dilacerations detection is possible only by radiography, but a slight buccal or lingual curvature may not be detected in the image [16]. Enostosis was the second most common anomaly with 1.9% prevalence in this study, while in the study by Miloglu *et al*., the prevalence of enostosis was 5% [9], and in the study of Sisman *et al*., the incidence of anesthesia was 6.1% [17]. In this study, there was a significant difference between the incidence of anesthesia and jaw, which was seen only in the mandibular. Similar results were also found in Miloglu *et al*. [9] and Zakir Syed *et al*. [18] The prevalence of impacted teeth in this study was 1.4%. While the study showed 8.3% (15%) and Patil (16.8%), the results showed a significant difference in the prevalence of impacted teeth in both genders (P.Value<0.001). Men were reported more than women, while in Singh *et al*. (47% males and 53% females) [20] and Bokhari Syed (0.7 = P.Value) [21], no significant difference was observed in the two genders. In this study, the impacted teeth were found to be greater in the upper than the mandibular. Unlike the Bokhari study, the prevalence of impacted teeth was higher in the upper than the mandibular. In this study, third molar teeth was not included, so the percentage of latency was less than previous studies. The prevalence of the taurodontism in this study was 0.58%. The taurodontism is a change in the shape of the tooth that is associated with unique features, including chopper pulp lengthening, apical displacement of the pulp floor and reducing CEJ thickness [22]. In Ghaznawi *et al*., the prevalence of taurodontism was 8.6% [23], in Darwazeh *et al*. in Jordan 8% (24%) and in Afifi 0.1% [11]. In this study, the prevalence of hyperdontia was 0.42%. In the study of Amini *et al*., the prevalence of hyperdontia was 0.72% [25]. In another study by Vankata Vani in Saudi Arabia, its prevalence was 1% [3]. The incidence of Microdontia in this study was 0.31%. In the study done by Vine *et al* in Saudi Arabia, the prevalence of Microdontia was 0.9% [3] and in the Gupta *et al*. in India, the Microdontia was 2.58% [5]. The difference in the prevalence of different studies can be due to the difference in race. In this study, similar to Dalili *et al*. [4] there was a statistically significant difference between the Microdontia and jaw incidence, so that it was more common in maxilla. It can be concluded that due to the high prevalence of lateral cuffs in the maxilla, the incidence of Microdontia anomaly in maxilla is higher. According to the statistical analysis, the prevalence of transposition was 0.02%. Dental transposition can be either unilateral or bilateral in maxilla or mandibular teeth, although most canine teeth are involved. In other studies, the prevalence of transpositions varies in different societies, and in most studies it remains below 1% [26 -27]. Various theories have been presented about the causes of dental transposition, but the dominant etiology of dental transposition is considered as a heritable multifactorial model.

Conclusion

The prevalence of dental anomalies was 9.6% in men (12.6%) more than in women (8%). The most commonly observed anomalies in this study were dilaceration (4.8%), then enostosis (1.9%) and impacted tooth (1.4%). There was a statistically significant relationship only between the prevalence of dilaceration and gender. The prevalence of impacted tooth and Microdontia in maxilla was higher than mandibular and the incidence of enostosis in mandibular.

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