

Evaluation of developmental dental anomalies in digital panoramic radiographs in Southeast Iranian Population

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Abstract

Objectives: The objective of this study was to evaluate the prevalence of dental developmental anomalies in digital panoramic radiographs of the patients referred to the Zahedan medical imaging center and to evaluate the frequency of anomalies regarding the disorders in shape, position and number in the Southeast of Iran. **Materials and Methods:** A total of 1172 panoramic radiographs from 581 males and 586 females aged over 16 years were obtained from the files of the Zahedan medical imaging center between the years of 2014 and 2015. The selected radiographs were evaluated in terms of the anomalies such as dilacerations, taurodontism, supernumerary teeth, congenitally missing teeth, fusion, gemination, tooth impaction, tooth transposition, dens invagination, and peg lateral. Then, the anomalies were compared to each other regarding the frequency of the anomaly type (morphological, positional and numerical). Data were evaluated using descriptive statistics such as frequency and percent, and statistical tests such as X^2 at 0.05 significant level using the Statistical Package for the Social Sciences version 16.5. **Results:** The prevalence of dental anomaly was 213 (18.17%), which was higher in females (9.90) than male, (8.28), however, this difference was not statistically significant ($P > 0.05$). The prevalence of dilacerated teeth was 62 (5.29%), taurodontism 63 (5.38%), supernumerary teeth 6 (0.51%), congenitally missing teeth 13 (1.11%), fusion 1 (0.09%), gemination 1 (0.09%), impaction 40 (3.41%), transposition 2 (0.18%), dens invagination 16 (1.37) and peg lateral was 9 (0.77%). The prevalence of morphological anomaly was 152 (71.36%), malposition 42 (19.72%) and numerous anomaly was 19 (8.92%). **Conclusions:** Dental anomalies are relatively common; although their occurrence is not symptomatic, they can lead to several clinical problems in patients. Detailed clinical and radiographic assessment and counseling during patient visits is a critical factor in assessing the patient's degree of difficulty to help the dentist for better preparedness for the treatment.

Key words: Dental anomaly, panoramic, prevalence, Zahedan

INTRODUCTION

Dental anomalies are a series of the human dental structure changes that result from disturbances during tooth formation which can be congenital,

developmental, or acquired. They consist of changes in the tooth number, size, shape, and position in the jaws.^[1]

Congenital anomalies are inherited through genetics whereas acquired anomalies are caused by the changes

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occurring during tooth formation. Developmental anomalies are cases that occur during tooth developmental stages. This anomaly can be simply an isolated defect or can be associated with various syndromes.^[2,3] Compared to other common diseases and disorders of the oral cavity, such as dental caries and periodontal diseases, dental anomalies are less common; however, their treatment and control is often associated with difficulty and complexity.^[4,5] These disorders can cause malocclusion, beauty challenges, and can make root canal therapy or tooth extraction difficult. Morphological anomalies such as dilacerations, taurodontism, fusion, gemination, and dens invagination, in addition to the impact on the person's appearance, could influence the root canal system. Hence, successful endodontic treatment requires careful and special attention to their unusual anatomy. Anomalies in the number and position of teeth in the jaws are associated with beauty and occlusion-related challenges.

The prevalence of dental anomalies has been investigated in different communities and ethnic groups via several studies. Prevalence of dental anomalies in panoramic radiographs was reported to be 31.55% by Yamunadevi *et al.*^[6] The most common findings were anomalies in shape (22.1%), followed by size (8.6%) and number (3.2%). In western Saudi Arabia, the prevalence of dental anomalies was reported to be 45.1%. The most common anomalies were congenitally missing teeth and impaction.^[7]

Ardakani *et al.* stated that the prevalence of dental anomalies in Yazd was 40.8% and the most common findings were dilaceration, impaction, taurodontism, and supernumerary tooth.^[8] Thongudomporn and Freer showed that 74.77% of patients had at least one anomaly. The most common anomaly was dens invagination whereas dilaceration and supernumerary teeth had the lowest prevalence.^[9]

Epidemiological studies have shown that missing teeth is more in Caucasians than the Blacks and in Asians than Caucasians,^[10] and can be seen more in women than men.^[10] Because no information is available regarding the prevalence of dental anomalies in the Southeast of Iran, the aim of this study was to investigate the prevalence of dental developmental anomalies in panoramic radiographs of the patients referred to the Zahedan Medical Imaging Center during 2014–2015.

MATERIALS AND METHODS

A total of 1172 archival records of the patients referred to the Zahedan Frontier Medical Imaging Center

during the years 2014–2015 that met the inclusion criteria were selected and were examined using the census method. This study was reviewed and approved by the ethics committee of the Zahedan University of medical sciences. Inclusion criteria were patient's age above 16 years and without the history of permanent tooth extraction. Exclusion criteria were low quality radiographs, Patients under fixed orthodontic treatment, cleft palate and any type of disease, traumatic injuries or jaw fractures that affect the natural eruption of permanent teeth, crown restorations, and caries or root canal treatment that interfere with the detection of some anomalies such as taurodontism. To reduce the error of radiographic interpretation, maxillary molars in terms of dilacerations and third molars in terms of impaction and dilaceration were excluded.

All radiographs were taken by one device (sordex, kvp 70, ma 12, time 12s, finland) and were processed by one digitizer and were evaluated by one Endodontist under proper light with Mac Book Air monitor [Apple Inc., Cupertino, CA (US)]. Panoramic radiographs were evaluated in terms of having anomalies of dilacerations, taurodontism, supernumerary teeth, congenitally missing teeth, fusion, gemination, impaction, transposition, dens invagination, and peg lateral. Data were analyzed using descriptive statistics including frequency and percent. X^2 test was used to compare differences between groups at 0.05 significance level using Statistical Package for the Social Sciences version 16.5 software.

RESULTS

From a total of 1172 selected records, 213 (18.17%) had at least one dental anomaly. Of these, 97 were males (8.28%) and 116 were females (9.90%). Table 1 shows the summary of the prevalence of dental anomalies. The prevalence of anomalies in females was higher, although the difference was not significant ($P > 0.05$).

Taurodontism was the most prevalent dental anomaly (5.38%), followed by dilacerations (5.29) and tooth impaction (3.41%). Gemination and fusion each with a prevalence of 0.09% and transposition with 0.18% prevalence were the least common.

According to Table 2, the most common type of dental anomalies was morphological (dilaceration, taurodontism, fusion, gemination, peg lateral and dens invagination), followed by positional (tooth impaction and transposition) and numerical (supernumerary and

Table 1: Prevalence of different types of anomalies

Anomalies	Male (581) (%)	Female (586) (%)	Total (1172) (%)	P
Supernumerary tooth	4 (0.34)	2 (0.17)	6 (0.51)	<0.01
Dilaceration	28 (2.39)	34 (2.90)	62 (5.29)	
Taurodontism	27 (2.30)	36 (3.07)	63 (5.38)	
Transposition	1 (0.09)	1 (0.09)	2 (0.18)	
Impaction	15 (1.28)	25 (2.13)	40 (3.41)	
Missed tooth	7 (0.60)	6 (0.51)	13 (1.11)	
Fusion	0 (0.00)	1 (0.09)	1 (0.09)	
Gemination	1 (0.09)	0 (0.00)	1 (0.09)	
Peg lateral	4 (0.34)	5 (0.43)	9 (0.77)	
Dens invagination	10 (0.85)	6 (0.51)	16 (1.37)	
Total	97 (8.28)	116 (9.90)	213 (18.17)	

There is no significant difference between males and females in different types of anomalies

Table 2: Comparison of anomalies by the frequency of anomaly type

Anomaly type	Male (%)	Female (%)	Total (%)
Morphological anomaly	70 (72.16)	82 (71.30)	152 (71.70)
Numerous anomaly	11 (11.34)	7 (6.09)	18 (8.49)
Positional anomaly	16 (16.49)	2 (22.61)	42 (19.81)

All anomalies are divides into three groups

congenitally missing teeth) anomalies. Figures 1-3 are examples of anomalies identified in this study.

DISCUSSION

This study investigated the prevalence of dental anomalies in the Southeast of Iran and deals with the associated problems. All patients admitted to the Zahedan Dental School and the private sector as well as the surrounding cities and areas that required panoramic radiographs are referred to the “Frontier Zahedan medical imaging center” as a paraclinical referral site, thus, it is representative of the Southeast population of Iran. Digital panoramic radiographs are developed with low-dose radiation, showing more detail, low cost, and extent of the reviews of the jaws and teeth are the technique of choice in most dental procedures including orthodontics, prosthetics, and surgery. They can be used for studying normal and abnormal findings, including dental anomalies that sometimes need to be reviewed and followed-up; additional treatment may also be required.^[11] Based on our data, the prevalence of dental anomalies was 18.17% and was higher in females (9.90%) rather than males (8.28%), however, the difference was not significant ($P > 0.05$).

The most commonly type of dental anomaly was morphological (71.70%) followed by positional (19.81%) and numerical (8.49%) anomalies. Taurodontism was the most common recorded anomaly (5.38%). Taurodontism is the change in tooth shape.



Figure 1: Impacted right mandibular second premolar



Figure 2: Compound odontom of the maxilla (supernumerary tooth)

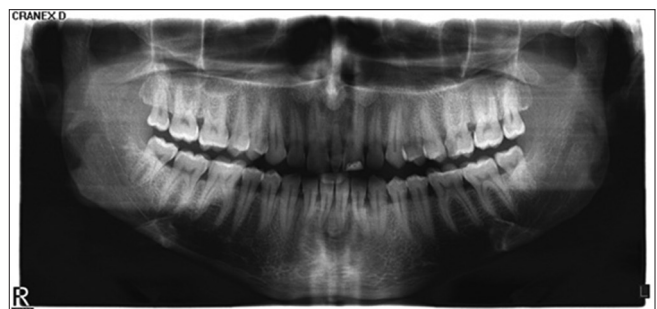


Figure 3: Radiographic image of mesiodense

The characteristic features are vertically elongated pulp chamber, apical displacement of the pulpal floor and lack of the constriction at cemento-enamel junction level.^[12]

Sarr *et al.* reported the prevalence of taurodontism using panoramic radiographs of the first and second molars of 150 cases aged between 15 and 19 years. Taurodontism was seen in 48% of their cases.^[13] The prevalence was much higher than the present study. Taurodontism in examined panoramic radiographies of oligodontia patients in the study by Schalk *et al.* was 28.9%,^[14] whereas the prevalence of taurodontism in normal subjects was 9.9%. Findings supported the hypothesis that taurodontism could be the result of an ectodermal defect in oligodontia patients. The different results in different studies may be due to racial differences or differences in the type, method, and place of study.

The second anomaly in terms of prevalence in this study is dilaceration (5.3%) which is more common in females (3%) than in males (2.4%). This developmental anomaly is an abrupt change in the axial inclination between the crown and the root of a tooth. The diagnosis is possible only through X-ray, and it is very important to identify before initiation of root canal treatment. Only a few publications have reported the prevalence of dilacerations, with the frequency ranging from 0.32% to 98% of teeth.^[15] Although Chohayeb has reported that the frequency of dilaceration in upper lateral incisors is 98%,^[16] it is highly questionable whether 98% of teeth can be classified as having a large enough deviation to be classified as a dilaceration. Though diagnostic criteria of dilaceration is variously noted in different papers, the two possible reasons are traumatic injuries and developmental disorders of the tooth bud.^[15] The prevalence of fusion and gemination in the present study was 0.09% which is similar to those reported in other studies. Reported prevalence of these anomalies in different studies varied from 0 to 0.8% and did not differ in the two genders.^[17-19] Because of the low incidence of these anomalies, their importance is often overlooked. Occurrence of these anomalies in the oral anterior region created esthetic problems because of unpleasant shape and these teeth are highly susceptible to decay and periodontal disease. Root canal therapy in some cases is associated with complexities.^[20]

The prevalence of peg lateral in the present study was 0.8%; it has been reported to be 0.3% in American population, 0.6% in Swedish schoolchildren, and 0.4% in children of Saudi Arabia.^[21-23] The prevalence of hypodontia or congenitally missing teeth in the present study was 1.11%. The most commonly involved tooth was the maxillary lateral incisor followed by mandibular second premolar and mandibular lateral incisor. A meta-analysis conducted by Polder *et al.* showed that the prevalence of tooth agenesis for both

the sexes was higher in Europe and Australia than for North-American Caucasians; thus, the agenesis differs by continent.^[10]

The prevalence of dens invagination was 1.4% in our study and was found in the maxillary lateral incisors. 75% of the cases were involved bilaterally. This anomaly is in the range of 0.3–10% reported by other studies,^[24] and the differences is contributed to the geographical differences, the diagnostic criteria, and research method. Endodontic treatment of the teeth is difficult because of the irregularities of the root canal system and the fact that the burs hardly penetrate into the root canal system through invagination. If pulpal necrosis occurs before the apical closure, apexification becomes necessary.

The prevalence of tooth impaction in the present study was 3.41%. The present study was performed on permanent teeth, and the maxillary canine was the most impacted tooth. The incidence of canine impaction was found to be 3.58% in a study by Aydin.^[25] The prevalence of supernumerary teeth in permanent dentition ranges from 0–3.8%.^[26] Similarly, our data showed the prevalence of 0.51% for supernumerary teeth which was the same as these rate.

In the present study, the prevalence of tooth transposition was 0.18%, and both were observed in the lower jaw. Men and women are equally involved. The prevalence of tooth transposition was 0.38% in a recent investigation and maxillary canine-lateral incisor transposition was found to have a higher frequency than the maxillary canine-first premolar transposition.^[27] Thoma reported that the mandibular canines are rarely involved^[28] and the study was indicative of mandibular canine transposition, most are limited to the case reports.^[29] Abnormal displacement of dental lamina, presence of obstacles though small in the eruptive route, mandibular fracture adjacent to the canine, and mandibular anterior teeth proclination have been reported as the possible causes of canine displacement in the lower jaw.^[29,30]

Future studies should be designed using periapical instead of panoramic radiographs that show more details regarding dental anomalies, especially along with clinical examination that reveals the cases that are not detectable in X-ray radiographs.

CONCLUSION

Dental anomalies are fairly common events. Although not symptomatic, they can lead to several clinical

problems. Early recognition is very important, because many preventive and therapeutic treatments if done at appropriate time and position, lead to the best results. Detailed clinical and radiographic assessment during visits and consultation are critical factors in assessing the degree of difficulty of the cases. Assessment of treatment difficulty and comparing natural conditions and condition of the tooth that should be treated helps dentist to be more prepared to doing an ideal treatment.

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Conflicts of interest

There are no conflicts of interest.

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