

Original Research Article

Radiographic Prevalence of Selected Developmental Dental Anomalies

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ABSTRACT

The Aim: The aim of this cross-sectional study was to investigate the radiographic prevalence of selected developmental dental anomalies in the western region of Saudi Arabia.

Materials and Methods: A retrospective cross-sectional study of randomly selected 1019 digital orthopantomograms (OPGs) taken of patients who presented for treatment at the Faculty of Dentistry, Umm Al-Qura University, Saudi Arabia between 2013 and 2014. The OPGs were examined to investigate three categories of dental anomalies; number, shape and eruption.

Results: The prevalence of patients that exhibited at least one developmental dental anomaly was 55.7%. The most prevalent dental anomaly observed was impaction (48.1%) followed by dilacerations (33.5%), hypodontia (6.8%), microdontia (4%), macrodontia (2.8%), supernumerary (2.3%), germination (0.6%), taurodontism (1.7%), fusion (0.1%) and dens in dent (0.1%). No transposition case was detected.

Conclusion: The results of this study showed that one in two patients from the study sample has at least one developmental dental anomaly. The most prevalent dental anomalies were wisdom tooth impactions followed by dilacerations. The least prevalent anomalies were germination, fusion, and dens in dent. No any cases for teeth transposition were recorded.

Keywords: Dental anomalies, Orthopantomograms (OPG), Hypodontia, Impaction.

INTRODUCTION

Developmental dental anomalies represent a category of dental morphological variations that can be due to genetic and environmental factors. Anomalies in tooth number, shape, position and structure can lead to problems in arch length and occlusion. This may complicate the treatment planning. It is important for dental practitioners to know the relative frequency of different dental anomalies in their local population as this will facilitate early detection and establishing the best alternative treatment plan. Several studies have investigated the prevalence of selected dental anomalies internationally. Their results showed that there are ethnic and regional variations. [1] For example,

congenitally missing teeth were widely reported in different parts of the world. The data of hypodontia varied from 1.9% in France to 11.3% in Ireland. [2] In Saudi Arabia the prevalence of hypodontia varied between different regions (2.2% in Gizan, [3] 4% in Riyadh [4] and 9.4% in Jeddah [1]).

Researchers have found that the most frequently occurring dental anomalies are; supernumerary teeth, impaction, peg lateral and fusion. [5]

It is not uncommon to observe more than one developmental dental anomaly in the same patient. 34% of conical-shaped lateral incisors (microdontia) are associated with palatally displaced canines. [6]

The aim of this study was to investigate the radiographic prevalence of

selected developmental dental anomalies in western region of Saudi Arabia.

MATERIALS AND METHODS

This retrospective cross-sectional study of randomly selected digital orthopantomograms (OPGs) taken for patients who presented to treatment at the Faculty of Dentistry, Umm Al-Qura University, between 2013 and 2014.

Two observers separately underwent visual radiographic interpretation to detect dental anomalies in permanent dentition in OPGs. Inter examiner Kappa reliability test scored almost perfect agreement (0.96) for inter examiner reliability.

The examined dental anomalies were categorised into three categories:

a. Numbering abnormality:

- Supernumerary: including mesiodens, paramolar and distomolar.
- Hypodontia: including lateral incisors, canines, premolars and excluding third molars.

b. Shape abnormality:

This category includes; microdontia, macrodontia, fusion, gemination, dilaceration, dens in dent and taurodontism. The presence of taurodontism was defined as an apical displacement of the pulp chamber. Dilaceration was defined as any kink or sharp bend on the crown or the root of the teeth.

c. Eruption abnormality:

- Impaction: including canine, premolar, third molar and others.
- Transposition

One thousand and nineteen patients who fulfilled the inclusion criteria formed the sample size of this study. The inclusion criteria included Saudi and non Saudi nationals patients of both sexes (males and females) who are 18 years old and more. Patients with blurred OPGs, under 18 years old or have multiple extractions (more than 10 teeth) were excluded from this study.

Collected Data were analysed using statistical package software system version 20 (SPSS 20.0[®], Chicago, Illinois, United States).

Descriptive statistical analysis was used to calculate the prevalence of dental anomalies; Chi-square and Fisher's exact test were used to evaluate the gender relations. The level of significance was set at $P \leq 0.05$.

RESULTS

After applying the exclusion criteria on the study sample, 981 radiographs were excluded from this study. The included radiographs were 1019; 49.3% were for males and 50.7% were for females.

Five hundred sixty eight radiographs (56%) had at least one developmental dental anomaly; 50.5% were for males patients and 49.5% were for females patients. Four hundred twenty nine (75.5%) showed only one developmental dental anomaly and 139 showed more than one developmental anomalies; with no statistical significant between the two genders Table 1.

Table 1: Distribution of developmental dental anomalies in the study sample according to gender

| | One Anomaly | | Two Anomalies | | | Three Anomalies | | | Four Anomalies | | | Total | |
|---------|-----------------|------|-----------------|----|------|-----------------|----|-----|-----------------|----|-----|-----------------|-------|
| | Number of cases | % | Number of cases | of | % | Number of cases | of | % | Number of cases | of | % | Number of cases | % |
| Males | 215 | 37.9 | 64 | | 11.3 | 8 | | 1.4 | 0 | | 0.0 | 287 | 50.5 |
| Females | 214 | 37.7 | 58 | | 10.2 | 8 | | 1.4 | 1 | | 0.2 | 281 | 49.5 |
| Total | 429 | 75.5 | 122 | | 21.5 | 16 | | 2.8 | 1 | | 0.2 | 568 | 100.0 |

Table 2 shows the prevalence of each of the selected developmental dental anomalies in relation to the gender.

The most prevalent dental anomaly was dental impaction (48.1%) followed by dilacerations (33.5%). The least prevalent

anomalies were gemination (0.6%), fusion (0.1%) and dens in dent (0.1%). Not a single transposition case was reported. Chi-square test results showed that only supernumerary had significant relation with males ($p=0.006$).

Table 2: Distribution of selected developmental dental anomalies in the study sample in relation to gender

| | Gender | | | | Total | | p value |
|---------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|---------|
| | Males | | Females | | Number of Cases | Percentage (%) | |
| | Number of Cases | Percentage (%) | Number of Cases | Percentage (%) | | | |
| Supernumerary | 14 | 3.8 | 3 | 0.8 | 17 | 2.3 | 0.006 |
| Hypodontia | 19 | 5.2 | 30 | 8.4 | 49 | 6.8 | 0.050 |
| Macrodonia | 8 | 2.2 | 12 | 3.4 | 20 | 2.8 | 0.233 |
| Microdonia | 17 | 4.6 | 12 | 3.4 | 29 | 4.0 | 0.241 |
| Fusion | 1 | 0.3 | 0 | 0 | 1 | 0.1 | 0.505 |
| Gemination | 2 | 0.5 | 2 | 0.6 | 4 | 0.6 | 0.680 |
| Dilaceration | 129 | 35.1 | 114 | 31.8 | 243 | 33.5 | 0.166 |
| Dense in dent | 0 | 0 | 1 | 0.3 | 1 | 0.1 | 0.495 |
| Taurodontism | 6 | 1.6 | 6 | 1.7 | 12 | 1.7 | 0.600 |
| Impaction | 171 | 46.6 | 178 | 49.7 | 349 | 48.1 | 0.200 |
| Transposition | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 287 | 100 | 281 | 100 | 725 | 100 | |

Table 3 shows the distribution of supernumerary teeth according to the location in cross tabulation with the gender.

The most prevalent was mesiodens (50%) and found to be significantly associated with males (p=0.017).

Table 3: Distribution of supernumerary teeth in the study sample in relation to gender

| | Gender | | | | Total | | p value |
|------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|---------|
| | Male | | Female | | Number of teeth | Percentage (%) | |
| | Number of teeth | Percentage (%) | Number of teeth | Percentage (%) | | | |
| Mesiodens | 8 | 53 | 1 | 33 | 9 | 50 | 0.017 |
| Paramolar | 3 | 20 | 1 | 33 | 4 | 22 | 0.301 |
| Distomolar | 4 | 27 | 1 | 33 | 5 | 28 | 0.178 |
| Total | 15 | 100 | 3 | 100 | 18 | 100 | 0.006 |

Table 4 reveals the most prevalent teeth found to be missed in cross tabulation with the gender. The total number of cases

having hypodontia in relation to the gender shows more association with females (32) than males (21).

Table 4: Distribution of hypodontic teeth in the study sample in relation to gender

| | Gender | | | | Total | | p value |
|-----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|---------|
| | Male | | Female | | Number of teeth | Percentage (%) | |
| | Number of teeth | Percentage (%) | Number of teeth | Percentage (%) | | | |
| Lateral incisor | 6 | 28.6 | 11 | 34.4 | 17 | 32.1 | 0.180 |
| Canine | 0 | 0.0 | 4 | 12.5 | 4 | 7.5 | 0.066 |
| premolar | 12 | 57.1 | 16 | 50.0 | 28 | 52.8 | 0.311 |
| Others | 3 | 14.3 | 1 | 3.1 | 4 | 7.5 | 0.301 |
| Total | 21 | 100 | 32 | 100 | 53 | 100 | 0.050 |

Table 5 reveals the distribution of dental impaction according to the tooth involved and its relation to gender. Canine impaction

was found to be significantly more associated with females (p=0.04).

Table 5: Distribution of impacted teeth in the study sample in relation to gender

| | Gender | | | | Total | | p value |
|----------|-----------------|----------------|-----------------|----------------|-----------------|----------------|---------|
| | Male | | Female | | Number of teeth | Percentage (%) | |
| | Number of teeth | Percentage (%) | Number of teeth | Percentage (%) | | | |
| Canine | 8 | 4.4 | 19 | 9.8 | 27 | 7.2 | 0.04 |
| Premolar | 6 | 3.3 | 6 | 3.1 | 12 | 3.2 | 0.586 |
| Wisdom | 165 | 91.7 | 168 | 86.6 | 333 | 89.0 | 0.247 |
| Others | 1 | 0.6 | 1 | 0.5 | 2 | 0.5 | 0.741 |
| Total | 180 | 100 | 194 | 100 | 374 | 100 | 0.200 |

DISCUSSION

Several studies have investigated the prevalence of dental anomalies in different parts of the world; none have investigated the prevalence of developmental dental anomalies in the population of Makkah as representative population of western region of Saudi Arabia. The results of our study revealed that the prevalence of the selected developmental dental anomalies was associated with 568 out of 1,019 included patients (56% of the total study sample). This is higher than the prevalence reported by previous local studies (36.5% and 45.1%) [7,8] and international. [9-12] The difference in prevalence can be attributed to the number of anomalies included in the study design. Most of the previous studies investigated the prevalence of few developmental anomalies, while in this study we investigated 11 different developmental dental anomalies.

In this study we counted the prevalence of hypodontia of lateral incisors, canines and premolars with exclusion of third molars. We found that 6.8% of study sample have hypodontia. This was quite similar to a previous local study by Ghaznawi [1] in Jeddah (9.41%) and some international studies. [11-14] Other studies showed higher prevalence locally (20% and 25.7%). [7,8] A study done on a sample of orthodontic patients in Kuwait by Al Enezi *et al.* [15] reported the prevalence of hypodontia as 52.7% and they referred it to racial differences. Some other international studies also showed higher prevalence (16-26%). [5,9,10,16] This disagreement could be due to difference in sample design, sample size and race. In this study, the most commonly missing teeth were the premolars (52.8%) followed by lateral incisors (32.1%). Hypodontia was found to be more common in females, which also comes in agreement with previous published studies. [12,17]

Supernumerary teeth or hyperdontia describes the condition of having excess in the number of teeth in any area of the dental arch. Most of supernumerary teeth are

impacted and diagnosed incidentally during radiographic examinations. Therefore, panoramic radiographs are essential for early detection of supernumerary teeth. The data in this study indicate that the prevalence of supernumerary teeth was 2.3% in permanent dentition. This agrees with the previous local studies (0.3-5%) [1,7] and many international studies. [5,10,13,16,18,19] Our results showed a significant relation between supernumerary teeth and males, which is also in agreement with previous studies. [16,18]

Microdontia and macrodontia have been included in this study as part of shape abnormality category. Previous studies have shown that macrodontia is usually less common than microdontia [5,19] and the results of this current study were similar in this respect. The prevalence of macrodontia and microdontia was 2.8 and 4% respectively.

For fusion and germination; our results showed prevalence of 0.1% and 0.6% respectively. This match with the results of other previous studies. [9,10,16]

Dilaceration results showed 33.5% prevalence. This is considered to be higher than what have been reported from previous studies in Saudi Arabia and internationally. [8,9,20] This could be related to two main factors; first, we considered any sharp bend in the root or the crown of a tooth as dilacerations while other studies only account curves about 90° angle or more. [10,14] Second, some studies used periapical radiographs with different angulations in addition to the OPGs in order to diagnose dilacerations, while we depended entirely on the OPGs in our diagnosis. [21]

Dens in dent was observed in 0.1% of the included OPGs and was more prevalent in females than males. This agrees with the previous studies. [5,10]

In this study, taurodontism was observed in 1.7% of the sample size. Different studies from different parts of the world showed higher prevalence. Darwazeh *et al.* [20] reported 8% taurodontism

prevalence among adult Jordanian patients. In Chinese adult population, taurodontism was reported as high as 46.4%. [22] The difference in prevalence of taurodontism might be attributed to racial factors.

The most prevalent anomaly found in this study was dental impaction. It has been calculated for wisdom teeth, premolars and canines. Impactions were found in 48.1% of the study sample. This goes in line with some local previous studies, [7,9] but not in agreement with other studies that showed higher rates. [5,23,24] There was a significant relation between canine impaction and females ($p=0.04$). This has been confirmed by a study on the prevalence of impacted and supernumerary teeth in the north Indian population. [18]

Teeth transposition is a rare eruption abnormality that involves permanent dentition. In this study not a single case of transposition was reported. This matches the conclusion of a meta-analysis on prevalence of tooth transposition done by A. Papadopoulos *et al.* [25] Other studies show higher prevalence rate of transposition that could be due to racial differences. [11,15,16]

This study gives a good insight on the radiographic prevalence of selected developmental dental anomalies among the population of the western region of Saudi Arabia. At least 1 in every 2 patients had one or more developmental dental anomaly that requires early detection and diagnosis prior to dental treatment. Dentists should spend enough time on radiographic examination and interpretation prior to commencing dental treatment on patients as dental anomalies may alter the treatment planning.

CONCLUSION

In the light of the present study, the following conclusions can be drawn:

1. The radiographic prevalence of the selected developmental dental anomalies in the studied population is considered high as 1:2 of the studied sample had at least one developmental dental anomaly.

2. The most prevalent developmental dental anomalies were impactions followed by dilacerations.
3. Impaction and hypodontia were more prevalent in females while dilacerations and supernumerary were more prevalent in males.

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