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Prevalence of Developmental Dental Anomalies Using Digital Panoramic Radiographs in Libyan Dental Patients

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ABSTRACT

Dental anomalies may occur due to the complex interactions among genetic, epigenetic, and environmental factors during dental development. The current study aimed to determine the prevalence and gender significance of developmental dental anomalies (DDA) in dental patients. This was a cross-sectional study of 260 subjects (123 males and 137 females) with an age range of 6–35 years old. Clinical and radiographic examinations were performed to determine the prevalence of anomalies in tooth number, shape, size, position, and structure. Descriptive statistics was performed, the chi-square test was used for analysis and p-value was set at 0.05. The findings showed that 203 subjects (78.1%) had DDA, which included 86 males (33.1%) and 117 females (45%). A significant gender difference was found regarding the prevalence of two anomalies ($p < 0.05$). The most prevalent anomaly was displacement 51.2%, followed by dilaceration 24.2%. A significant gender difference ($p < 0.05$) was found regarding hypodontia 16.5% and impaction 14.6%, with more predominant in females. Some anomalies were not observed such as microdontia, dentin dysplasia, ectopic eruption, gemination, and taurodontism. The study concluded that displacement and dilacerations were the common abnormalities. These findings may lead to various dental complications. Therefore, early diagnosis and follow-up observation are required to reduce the potential dental problems. In addition, it is helpful to increase the knowledge of practitioners with regards to DDA and its occurrence. Furthermore, it is good to highlight the importance of early diagnosis of DDA, especially in the mixed dentition, which can lead to reducing the complication of an orthodontic treatment plan.

Keywords: *Dental patients; developmental dental anomalies; digital panoramic radiograph; displacement; prevalence*

INTRODUCTION

Developmental dental anomalies (DDA) are considered an important category of morphological and structural dental variations (Vani *et al.*, 2016). Anomalies in tooth shape, size, and structure are caused by disturbances during the morph differentiation stage of tooth development, while ectopic eruption, impaction, and rotation are caused by disturbances in the eruption pattern of permanent teeth (Kathariya *et al.*, 2013). DDA is categorised into five groups including abnormalities in size, number, shape, position, and structure of teeth (Shokri *et al.*, 2014a). Recently

many researches have contributed in creating awareness of clinical significant associations among different dental abnormalities, since the diagnosis of one may be considered as an alert on the presence of the other (Al-Abdallah *et al.*, 2015; Laganà *et al.*, 2017). Previous studies have shown that there were regional and ethnic variations in the prevalence of dental anomalies (Ghabanchi *et al.*, 2010) and the inconsistent results between and within populations may be due to the difference in race, sampling methods, and diagnostic criteria (Bilge *et al.*, 2018).

Although dental anomalies are asymptomatic, they can lead to several clinical problems such as delayed or incomplete eruptions of teeth, attrition, compromised aesthetics, occlusal interference, difficulty in speech and mastication, temporomandibular joint pain and dysfunction, malocclusion, increased caries risk, and periodontal problems (Shrestha *et al.*, 2015; Yassin, 2016). Dental anomalies play an important role in the malocclusion aetiology, which affects the orthodontic treatment plan (Roslan *et al.*, 2018). Therefore, the early diagnosis of such dental anomalies will reduce future dental complications as well as help in choosing the appropriate treatment plan (Laganà *et al.*, 2017). The genetic and environmental factors are responsible for its development and it is often asymptomatic and may be discovered during the clinical and the radiographic examination (Mukhopadhyay & Mitra, 2014; Shokri *et al.*, 2014a). Although dental anomalies account for a relatively low number, they still have an important role in treatment planning (Patil *et al.*, 2013). Additionally, structural diseases of mineral tissue might have a primary genetic or a secondarily acquired aetiology. Hence, the family history of pathology is usually recorded to help in determining the possibility of genetic components (de La Dure-Molla *et al.*, 2015).

While many studies on dental anomalies had been conducted worldwide, most of them were focused on orthodontic patients since there is an association between dental anomalies and certain dentofacial features (Sogra *et al.*, 2012). However, the data on the prevalence of dental anomalies in Libyan patients was limited and only few studies were published. Therefore, this study aimed to determine the prevalence and the gender differences of DDA in the dental patients, and thus would help to increase the baseline data on DDA.

MATERIALS AND METHODS

Ethical Consideration

Ethical approval was given by the ethical research committee of the Faculty of Dentistry, Benghazi, Libya (Ref. no.: 2021/255). Before starting the data collection, the consent forms were signed by the adult participants and for children below the age of 18 years old, the forms were signed by their parents or legal guardians.

Sample Collection

This was a cross-sectional study of 260 subjects. The sample was collected from dental patients attending the clinic of the Faculty of Dentistry during the period from December 2018 to June 2019. The clinical and radiographic screening was done using digital panoramic radiographs, to determine the prevalence of DDA. Descriptive statistics was performed, the chi-square test was used for analysis and *p*-value was set at 0.05 the confidence interval of 95% and $\alpha = 0.05$.

Reproducibility of the Study

To ensure the reproducibility of the diagnostic criteria, 10% of the sample was re-examined within two weeks. All dental examinations were performed by a single investigator. Cohen's kappa was used to measure the intra-examiner agreements which were almost perfect (0.85–1.00).

Clinical Examination

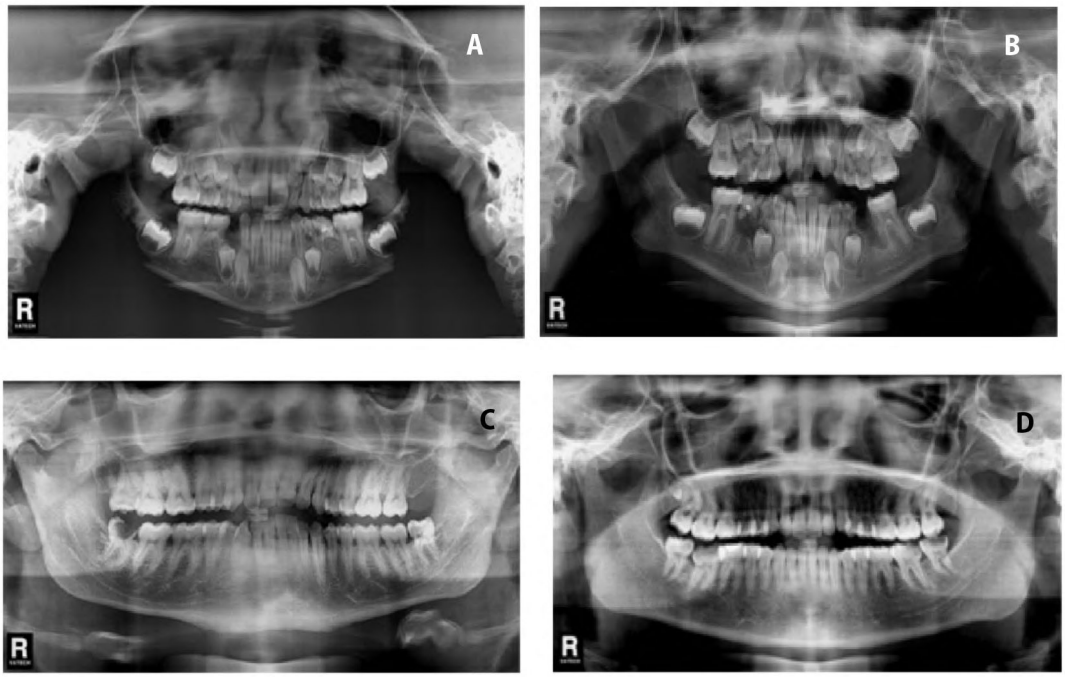
The subject information such as age, gender, medical, family history, and previous dental history was obtained from the patients' records. All subjects were initially screened from a single radiographic centre in Benghazi city. All participants should meet the inclusion criteria as follows: Libyan dental patients with an age range of 6–35 years old, and who had well diagnostic quality radiographs. The exclusion criteria were those of low-quality radiographs, subjects with syndromes, craniofacial malformation, had previous orthodontic treatment, wearing an orthodontic appliance, cleft palate, jaw fractures that may affect the eruption of the permanent dentition, crown restorations, root canal treatment that would interfere with the detection of certain anomalies such as taurodontism.

Dental anomalies were recorded under five types and 17 subtypes as follows:

1. Number (hypodontia, oligodontia, hyperdontia).
2. Size (microdontia, microdontia).
3. Structure (amelogenesis imperfecta, dentinogenesis imperfecta, dentin dysplasia).
4. Position (transposition, ectopic eruption, displacement, inversion, impaction).
5. Shape (fusion, gemination, dilacerations, taurodontism).

The previous dental history was considered in assessing anomalies of tooth numbers. Concerning the dental age, the calcification time was used and the absence of radiopacities of tooth bud was considered as missing (Shokri *et al.*, 2014b). In addition, panoramic radiographs were used to assess these anomalies (Figs. 1 and 2).

Hypodontia was recorded when one to six teeth are missing excluding the third molars, while oligodontia for more than six teeth are missing except the third molars, and anodontia for the complete absence of teeth (Fekonja, 2005). In the evaluation anomalies of tooth size, only gross deviations in sizes were considered which were easily discernible by clinical judgement.



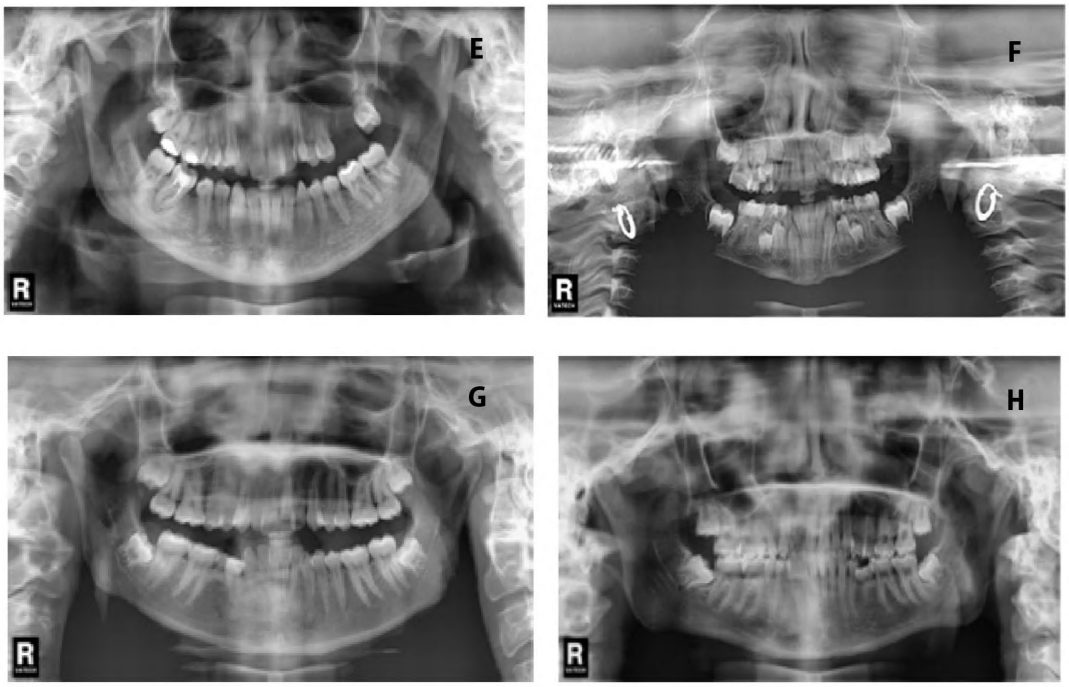
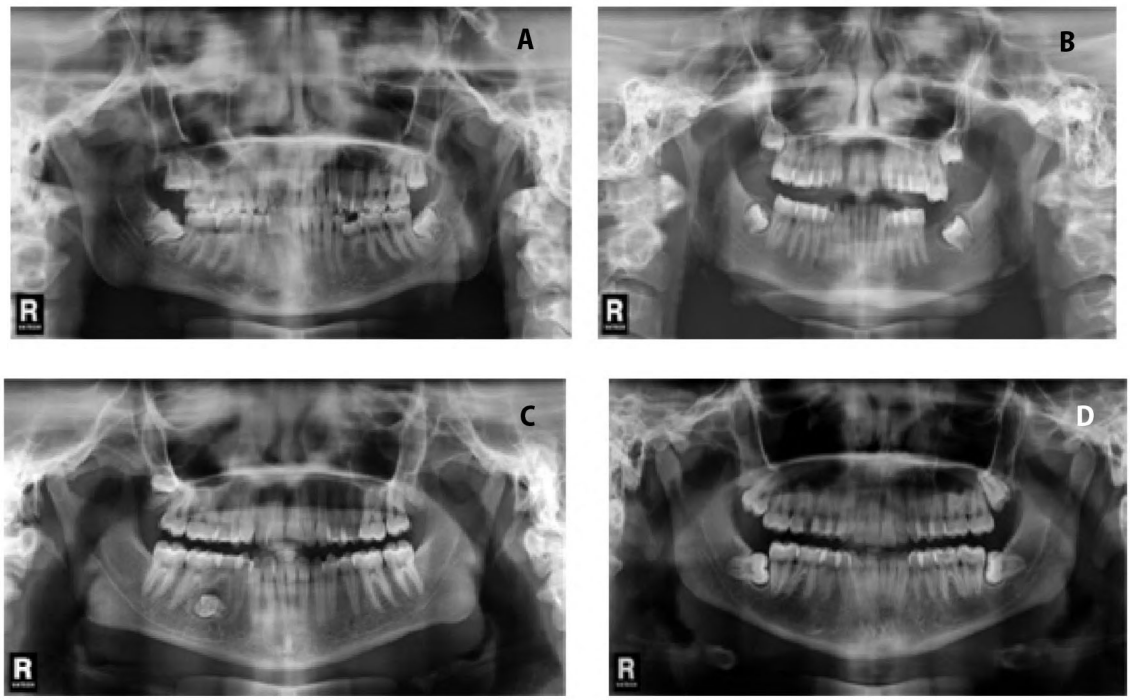


Fig. 1 (A) Congenitally missing lower premolars in 7-year-old female; (B) Congenitally missing lower premolars in 9-year-old male; (C) Hyperdontia of lower central in 18-year-old male; (D) Hyperdontia and distomolar in 20-year-old female; (E) Dilacerations and canines displacement in 19-year-old female; (F) Fusion of lower central incisors in 9-year-old female; (G) Impaction, congenitally missing premolars in 20-year-old female; (H) Impaction, congenitally missing premolar in 19-year-old female.



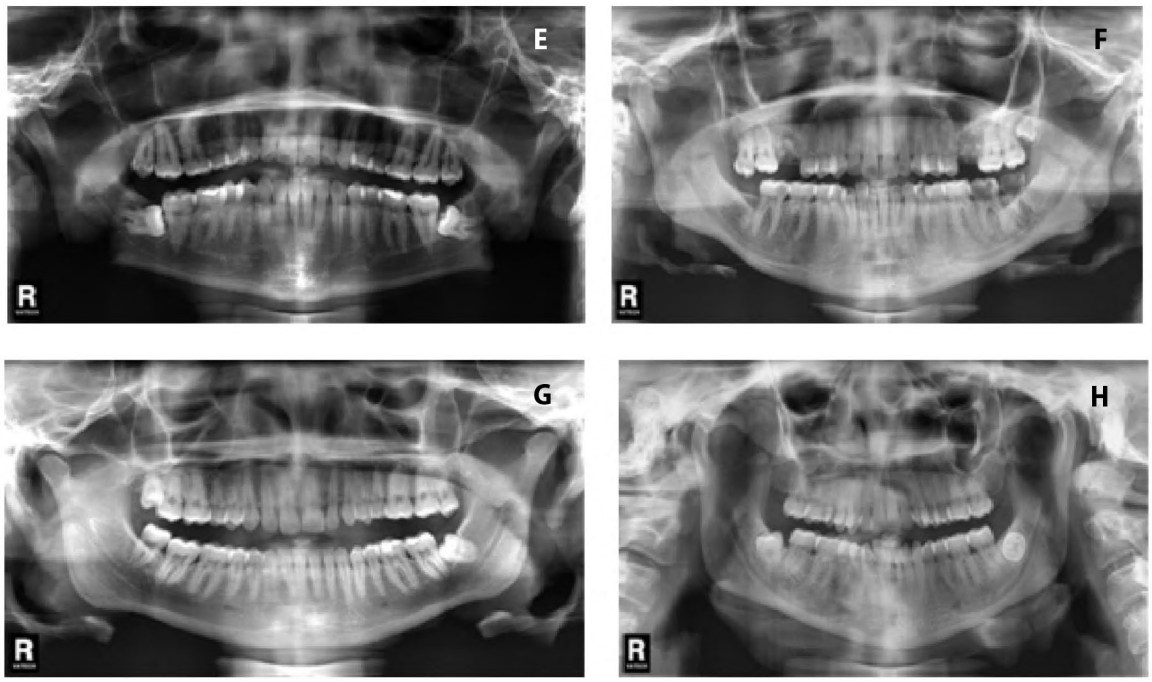


Fig. 2 (A) Impaction, canine displacement in 20-year-old female; (B) Impaction, congenitally missing lateral in 19-year-old female; (C) Odontom, congenitally missing lower right second premolar in 20-year-old female; (D) Impaction in 24-year-old female; (E) Impaction in 24-year-old male; (F) Impaction in 29-year-old female; (G) Impaction in 20-year-old male; (H) Impaction in 35-year-old female.

The diagnosis of structure anomalies was also confirmed by the clinical examinations (Bilge *et al.*, 2018). In dentinogenesis imperfecta, the colour of the affected teeth crown are range from blue to brown and in radiograph, it would appear as having bulbous crowns and short constricted roots (Rajshekar *et al.*, 2016).

Position anomalies which included tooth transposition, was diagnosed as present in the case of positional interchange of two adjacent teeth, or the development or eruption of the tooth in a position normally occupied by a non-adjacent tooth. Tooth impaction was diagnosed according to the developmental age, unseating functional tooth partial position, or some physical barriers in their path.

Fusion is diagnosed in the case of unions of two different dental germs, whereas gemination is a partial division of a tooth germ (Gomes *et al.*, 2014). Dilacerations are considered to present in the case of root bend of the long axis of the tooth, while concrescence is a cementum union of two adjacent teeth (Van Parys *et al.*, 2011; Shrestha *et al.*, 2015). Taurodontism is diagnosed according to the features observed on the radiograph, which is characterised by enlargement of pulp chamber with an apical displacement of furcation area (Dineshshankar *et al.*, 2014; Rajshekar *et al.*, 2016).

Statistical Analysis

Data analysis was conducted by Statistical Package for Social Science (SPSS) version 16.0. The descriptive statistics, the chi-square test was performed to show the statistical significance which was set at ($p < 0.05$). The intra-examiner reliability was analysed by weighted kappa statistics.

RESULTS

As shown in Table 1 among the 260 radiographs examined, 203 subjects (78.1%) had DDA which included 86 males (33.1%) and 117 females (45%). The subjects who had at least one anomaly were 103 (39.6%) while 83 (31.9%) of cases had two anomalies, and 17 (6.5%) exhibited more than two anomalies. A significant gender difference was found regarding the prevalence of two anomalies ($p < 0.05$).

In Table 2, the most prevalent anomaly was the displacement which was observed in 133 subjects (51.2%) followed by the dilacerations with a frequency rate of 63 subjects (24.2%). A statistically significance ($p < 0.05$) was found regarding the prevalence of hypodontia in 43 subjects (16.5%) and the impacted teeth were found in 58 subjects (14.6%) with more frequent occurrence in females. The prevalence rate of oligodontia, fusion, and dentinogenesis imperfecta was rare, and one case was reported in females for each anomaly (0.4%). However, some anomalies were not reported such as microdontia, dentin dysplasia, ectopic eruption, gemination, and taurodontism.

Table 1 Distribution of DDA in subjects by gender

Subjects	Male	Female	Total	*p*-value
	n (%)	*n* (%)	*n* (%)	
All subjects	123 (47.3)	137 (52.7)	260 (100)	
Distribution of DDA				
No anomaly	37 (14.2)	20 (7.7)	57 (21.9)	0.005*
One anomaly	50 (19.2)	53 (20.4)	103 (39.6)	0.849
Two anomalies	29 (11.2)	54 (20.7)	83 (31.9)	0.019*
> Two anomalies	7 (2.7)	10 (3.8)	17 (6.5)	0.600
Total subjects with DDA	86 (33.1)	117 (45)	203 (78.1)	

Note: The chi-square test was used, *whereas $p < 0.05$ is considered statistically significant.

Table 2 Prevalence and gender differences of DDA

DDA		Male *n* (%)	Female *n* (%)	Total *n* (%)	*p*-value
Number	Hypodontia	12 (4.6)	31 (11.9)	43 (16.5)	0.005*
	Oligodontia	–	1 (0.4)	1 (0.4)	0.342
	Hyperdontia	3 (1.2)	1 (0.4)	4 (1.5)	0.264
Size	Macrodontia	4 (1.5)	1 (0.4)	5 (1.9)	0.139
Structure	Amelogenesis imperfecta	2 (0.8)	5 (1.9)	7 (2.7)	0.314
	Dentinogenesis imperfecta	–	1 (0.4)	1 (0.4)	0.342
Position	Transposition	–	3 (1.2)	3 (1.2)	0.099
	Displacement	60 (23.1)	73 (28.1)	133 (51.2)	0.468
	Inversion	–	3 (1.2)	3 (1.2)	0.099
	Impaction	20 (7.7)	38 (14.6)	58 (14.6)	0.026*
Shape	Fusion	–	1 (0.4)	1 (0.4)	0.342
	Dilaceration	29 (11.2)	34 (13.1)	63 (24.2)	0.816

Note: The chi-square test was used, *whereas $p < 0.05$ is considered statistically significant.

DISCUSSION

The present study was conducted on a wide age range sample because all permanent teeth have sufficient enamel calcification. As malocclusion is prevalent in mixed dentition, early detection of DDA is important for all practitioners to reduce the complication of orthodontic treatment planning (Hasanin & ElNaghy, 2021). Some anomalies such as the third molar impaction can only be diagnosed in the older ages (Shokri *et al.*, 2014b). Furthermore, impactions have great role in the aetiology of malocclusion.

The present study showed that the number of subjects without anomalies was 57 (21.9%). This finding is lower than that reported in Saudi Arabia where 62.2% of the subjects had no anomaly (Vani *et al.*, 2016). The differences in this finding could be due to the variations in sample size and race. On the other hand, the subjects in the present study who had DDA were 203 (78.1%) which includes 86 males (33.1%) and 117 females (45%). This finding is higher than those reported in previous studies which were (37.8%, 28.4%, 29%, 20.9%, 18.67%, 8.2%, and 5.14%) in Saudis (Vani *et al.*, 2016), Malaysians (Roslan *et al.*, 2018), Iranians (Shokri *et al.*, 2014b), Italians (Laganà *et al.*, 2017), Greeks (Pallikaraki *et al.*, 2020), Nigerians (Folayan *et al.*, 2020), and Australians (Dang *et al.*, 2017), respectively. In contrast, only 1.8% of Brazilian children (Gomes *et al.*, 2014) and 1.8% of Bengali subjects (Mukhopadhyay & Mitra, 2014) had anomalies. The variations in dental anomalies prevalence could be due to the differences in ethnic race, environmental and dietary factors.

In the present study, those subjects who had at least one anomaly were 103 (39.6%). This finding is in agreement with similar reported results in India (36.7%) (Patil *et al.*, 2013). However, it is higher than those reported in previous studies which were (28.7%, 24.6%, 24.5%, 23%, 17.9%, and 16.92%) in Saudis (Vani *et al.*, 2016), Libyans (Abdelgader *et al.*, 2015), Iranians (Haghanifar *et al.*, 2019), Malaysians (Roslan *et al.*, 2018), Italians (Laganà *et al.*, 2017) and Greeks (Pallikaraki *et al.*, 2020), respectively. In contrast, the finding in Turkey showed 4.74% of subjects who had one anomaly (Aren *et al.*, 2015).

In the present study, 83 subjects (31.9%) had two anomalies and only 17 subjects (6.5%) exhibited more than two anomalies. A significant gender difference was found with regards to the prevalence of the two anomalies. This result is consistent with the finding in Libya where 28.9% of the patients had more than one anomaly (Abdelgader *et al.*, 2015). A study in India reported 13.4% of cases had more than one anomaly (Kathariya *et al.*, 2013). Other research conducted in Saudi Arabia showed 7.9% of cases had two anomalies while 1.2% of cases had more than two anomalies (Vani *et al.*, 2016). A similar finding was reported in Turkey which found that 7% had two anomalies while 0.3% had more than two anomalies (Laganà *et al.*, 2017). Nevertheless, in Malaysia, 4.05% of cases had two anomalies and 1.35% had more than two anomalies (Roslan *et al.*, 2018). In contrast, the result in Iran showed 3.3% of cases had two anomalies and 0.2% had more than two anomalies (Haghanifar *et al.*, 2019), in Greek the prevalence rate of two anomalies and more than two anomalies were slightly low (1.58% and 0.17%, respectively) (Pallikaraki *et al.*, 2020).

In the present study, the prevalence of macrodontia was 1.9%, while microdontia was not observed. This finding is in agreement with a reported study in Saudi Arabia where macrodontia was 1.8% and microdontia was 2.6% (Yassin, 2016). In Iran, microdontia was 1.6% (Sogra *et al.*, 2012), in Malaysia, the microdontia was 1.08% (Roslan *et al.*, 2018), in Brazilian children was 0.12% (Gomes *et al.*, 2014), in India, the macrodontia was 0.2%, while microdontia was 1% (Patil *et al.*, 2013). On the other hand, the prevalence of macrodontia and microdontia were equally distributed with the rate of 1% in Nigerians (Folayan *et al.*, 2020). Another study in

Saudi Arabia revealed that macrodontia was 0.6% and microdontia was 0.9% (Vani *et al.*, 2016). However, in the Turkish population microdontia was 0.54% (Aren *et al.*, 2015). Another recent study in Turkey reported macrodontia was 0.16% and microdontia was 3.08% (Bilge *et al.*, 2018). In contrast, a study in Indians revealed only one case of macrodontia (Guttal *et al.*, 2010). Another research in India showed microdontia was not reported (Singhal *et al.*, 2017). A similar study in India showed microdontia was 0.10% (Bandaru *et al.*, 2019). On the other hand, a study in Korea showed that in the mixed dentition the presence of microdontia of lateral incisors and hypo-occlusion primary molars can help in the detection of teeth agenesis at an early stage (Choi *et al.*, 2017).

Anomalies such as amelogenesis imperfecta, dentinogenesis imperfecta, and dentin dysplasia can be a symptom of syndrome, and lead to severe decay and tooth sensitivity, hence early detection will help in preventing such dental complications and maintain the tooth structure for the aesthetic and social reasons (Shokri *et al.*, 2014b). In this study, the prevalence of amelogenesis imperfecta was 2.7%, while dentinogenesis imperfecta was found in only one case (0.4%). However, dentin dysplasia was not reported. This finding is in agreement with the results reported in Saudi Arabia, where the amelogenesis imperfecta and dentinogenesis imperfecta was 0.3% and 0.1%, respectively (Yassin, 2016). In contrary, the finding in Iranians (0.17%) had dentinogenesis imperfecta and amelogenesis imperfecta was 0.68%, while dentin dysplasia was not reported (Shokri *et al.*, 2014b). In Nigeria, amelogenesis imperfecta was 0.7% (Folayan *et al.*, 2020). Another study in Iran showed dentinogenesis imperfecta was 0.01% while amelogenesis imperfecta and dentin dysplasia were not reported (Haghanifar *et al.*, 2019). A similar finding was reported in Turkey where amelogenesis imperfecta was 0.08%, while dentinogenesis imperfecta and dentin dysplasia were not reported (Bilge *et al.*, 2018). In contrast, a study reported in India showed that 0.02% of subjects had amelogenesis imperfecta (Bandaru *et al.*, 2019).

In the present study, transposition was found in 1.2%, which is in agreement with the finding in Italy where 1.49% of cases had transposition (Laganà *et al.*, 2017), and in contrast with the finding in India, which was 0.1% (Patil *et al.*, 2013).

In the present study, the prevalence of hypodontia was estimated at 16.5% with more frequently occurring in females than males (11.9% and 4.6%, respectively). This is consistent with the result in India, where hypodontia was 16.3% (Patil *et al.*, 2013), and Iran 15.88% (Shokri *et al.*, 2014b), while it is higher than the previously reported results (12.17%, 11.3%, 9.7%, 7.1%, 7.03%, 5.50%, 5.2%, and 4.28%) in India (Singhal *et al.*, 2017), Slovenia (Fekonja, 2005), Saudi Arabia (Yassin, 2016), Italy (Laganà *et al.*, 2017), Malaysia (Roslan *et al.*, 2018), Turkey (Bilge *et al.*, 2018), Saudi Arabia (Vani *et al.*, 2016) and Australia (Dang *et al.*, 2017), respectively. On the other hand, the hypodontia prevalence rate was low in the Turkish population 1.77% (Aren *et al.*, 2015), Iranians (1.7%) (Haghanifar *et al.*, 2019), Nigerians (1.2%) (Folayan *et al.*, 2020), Australian (2.2%) (Symons *et al.*, 1993) and in India (0.10%) (Bandaru *et al.*, 2019). The variations in dental anomalies prevalence between different populations and within populations could be due to the differences in races, environmental and dietary factors.

In another perspective, the prevalence of missing teeth in Malay school children was equally distributed in boys and girls (16.4% and 15.2%, respectively) (Elfseyie, 2013; Elfseyie *et al.*, 2014). Another finding reported in Malaysia, had more females frequently missing teeth than males (22.9% and 16.8%, respectively) (Elfseyie *et al.*, 2020). The differences between these findings could be due to the differences in environmental and genetic factors. In addition, the permanent teeth can be lost due

to traumatic injury, caries and periodontal diseases.

In the present study, the prevalence of oligodontia was only at 0.4%. This finding is in agreement with the results obtained in Italy (Laganà *et al.*, 2017) which reported 0.08% cases of oligodontia. In contrast, with the finding in Turkey and Iran, no cases of oligodontia were reported in Iran (Shokri *et al.*, 2014b) and Turkey (Bilge *et al.*, 2018). However, a study conducted in Greeks with mixed and permanent dentitions showed that oligodontia was 5.78% in males and 6.93% in females (Pallikaraki *et al.*, 2020).

In the present study, the prevalence of hyperdontia was estimated at 1.5% (1.2% in males and 0.4% in females). A similar finding is reported in Malay adult males (1.4%) and females (1.7%) (Elfseyie *et al.*, 2020), Turkey (1.16%) (Bilge *et al.*, 2018), Libya (1.19%) (Abdelgader *et al.*, 2015), Saudi Arabia (1%) (Vani *et al.*, 2016) and in Malaysian children was 2.6% (Elfseyie, 2013). Another study in Malaysia found hyperdontia was 2.70% (Roslan *et al.*, 2018), in Saudi Arabia was 3.5% (Yassin, 2016), in India was 0.2% and 1.2% (Patil *et al.*, 2013; Bandaru *et al.*, 2019), in Iranians were (0.8% and 0.69%) as reported by (Haghanifar *et al.*, 2019) and (Sogra *et al.*, 2012), respectively. In Turkey was 0.79% (Aren *et al.*, 2015), in Italy was 0.66% (Laganà *et al.*, 2017), in Bengali subjects was 0.4% (Mukhopadhyay & Mitra, 2014) and in Australia was 0.28% (Dang *et al.*, 2017). On the other hand, the finding in the Indian population was higher 10.43% (Singhal *et al.*, 2017). In Iran, the prevalence of hyperdontia was 6.76% and the extraction of extra teeth in the mixed dentition stage is the most suitable treatment for such cases (Shokri *et al.*, 2014b).

The present study revealed the prevalence of transposition was 1.2% and this finding agreed with results in Turkey (0.41%) (Bilge *et al.*, 2018), Saudi Arabia (0.3%) (Vani *et al.*, 2016), and Iran (0.5%) (Sogra *et al.*, 2012). In the present study, the prevalence of ectopic eruption was not observed; this is in disagreement with the previous study in Libya where the ectopic eruption was estimated at 34.9% of orthodontic patients (Abdelgader *et al.*, 2015). In contrary, the prevalence of ectopic eruption were (2.3%, 7.6%, 5.15%, 0.7%, and 1.75%) in Saudi Arabia (Yassin, 2016), Saudi Arabia (Vani *et al.*, 2016), Iran (Sogra *et al.*, 2012), India (Patil *et al.*, 2013) and in Turkey (Bilge *et al.*, 2018), respectively.

The present study showed that displacement was the most common anomaly with a rate of 51.2%. This finding is in agreement with the results in Malay, where the buccally displaced canines were 53.4% (Elfseyie *et al.*, 2021; Shokri *et al.*, 2014b). A similar finding was reported in Italy where the displacement of maxillary canine was the most prevalent anomaly in 7.5% of cases (Laganà *et al.*, 2017). This disagrees with the finding in Turkey where the displacement was detected in 3.58% of cases (Bilge *et al.*, 2018).

In the present study, the prevalence of inverted teeth was found in three females (1.2%). However, this anomaly is very rare and two cases were reported in India of inverted impacted third molar (Mohan *et al.*, 2012).

The present study revealed that impacted teeth were present in 14.6% of cases with more frequent in females. This is consistent with the previous finding (14.32%, 15.5%, 15.2%, and 17.83%) in Malaysia (Roslan *et al.*, 2018), India (Patil *et al.*, 2013), Iran (Haghanifar *et al.*, 2019), and Turkey (Bilge *et al.*, 2018), respectively. In contrast, this finding is higher than the previously reported results (7.5%, 4.34%, 2.6%, 3.9%, 1.52%, and 0.6%) in Libya (Abdelgader *et al.*, 2015), Iran (Ghabanchi *et al.*, 2010), Iran (Sogra *et al.*, 2012), Italy (Laganà *et al.*, 2017), Turkey (Bekiroglu *et al.*, 2015), and Australia (Dang *et al.*, 2017), respectively. On the other hand, the previous studies showed the impaction was the most common anomaly with a prevalence rate of 39.2% in India (Kathariya *et al.*, 2013) and 44.76% in Iran (Shokri *et al.*, 2014b).

The present study showed the prevalence of fusion was 0.4% while gemination was not reported. This result is consistent with the finding in Saudi Arabia, where fusion was 0.8% (Yassin, 2016), in Brazilian children fusion was 0.8%, gemination was 0.18% (Gomes *et al.*, 2014), in Nigeria gemination and fusion were equally distributed with the rate of 0.7% (Folayan *et al.*, 2020), in Turkey fusion and gemination was 0.08% (Bilge *et al.*, 2018) and in Iran, fusion was not reported (Shokri *et al.*, 2014b). Another study in Turkey showed fusion was 1.89% (Bekiroglu *et al.*, 2015). In contrast, a study in India showed that fusion was 1.85% while gemination was 0.28% (Guttal *et al.*, 2010). Another study in India showed that fusion was 0.04% (Bandaru *et al.*, 2019).

The present study revealed dilacerations are present in 24.2% of subjects. This finding agrees with the results in India showing that dilacerations were 22.5% (Guttal *et al.*, 2010) and in Iran was 21.11% (Shokri *et al.*, 2014a). In contrast, it is higher than the results in Iran which were 7.7% (Haghanifar *et al.*, 2019), Saudi Arabia (7.2%) (Vani *et al.*, 2016), Turkey (6.41%) (Bilge *et al.*, 2018) Libya (0.39%) (Abdelgader *et al.*, 2015), India (0.43%) (Singhal *et al.*, 2017) and Malaysia (0.27%) (Roslan *et al.*, 2018).

In the present study, the prevalence of taurodontism was not observed. This finding is in agreement with a study in India (Singhal *et al.*, 2017), while in Iran was 0.2% (Haghanifar *et al.*, 2019). Another study in Iran showed that 0.18% of cases had taurodontism (Sogra *et al.*, 2012). However, it is disagreeing with the results in another study in Iran where the taurodontism was a higher rate of 9.29% (Shokri *et al.*, 2014b), where else in Turkey was 4.41% (Bilge *et al.*, 2018). Also, another result in Turkey showed 0.54% of cases had taurodontism (Aren *et al.*, 2015), Saudi Arabia were 2.9% (Vani *et al.*, 2016) and 1.4% (Yassin, 2016).

For a similar future study, it is recommended to have a larger sample size to make it more representative. Such study increases the knowledge of professional clinics with regards to the early detection of these anomalies that could help choose an appropriate treatment plan. In addition, the parents should be educated regarding their children's anomalies as well as the benefits of early treatment in reducing the complexity of the treatment plan.

CONCLUSION

The finding of this study revealed a higher prevalence of displacement and dilacerations among the Libyan dental patients. However, some anomalies were not reported such as microdontia, dentin dysplasia, ectopic eruption, gemination, and taurodontism. Despite most of these dental anomalies being symptomatic, they may lead to several dental complications. Therefore, early detection and diagnosis of such anomalies will help in choosing an appropriate treatment plan that will reduce the severity of problems in the permanent dentition.

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