REVIEW

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Prevalence of Dental Anomalies in an Adult Dentate Najaf /Iraqi Population by Using Digital Panoramic Radiographs

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ABSTRACT

Background:

Studies were done across different populations showed a varying degrees of prevalence of dental anomalies. The present study was aimed to evaluate the dental anomalies prevalence for Najaf/Iraq population.

Methods:

Analysis was done for the standard Orthopantomograph of 750 subjects with ages ranging between 18 and 40 years. The teeth and jaws were examined radiographically for number, size, structure, position, and shape of the teeth. In addition, the presence of pulp stone and radio-opaque dental anomalies in the jaw was also studied. Chi-squared test was carried for the data analysis.

Results:

The prevalence of dental anomalies was (32.8%). Anomalies in number of teeth was (4.19%), size (10%), structure (0%), position (50.33%), shape (27.74%), pulp stone (5.48%), and the jaws radio-opaque anomalies constitutes (2.26%). The most common type of dental anomalies was anomalies of tooth position, and 55.48% of dental anomalies were associated with the maxillary teeth, and 44.52% were associated with the mandibular teeth.

The supernumerary teeth, congenital missing teeth, transposition, dens evaginatus, and dens invaginatus were mostly associated with the upper incisors, while the displacement was mostly seen associated with the upper canines. Upper molars were mostly associated with pulp stone, fused roots and microdontia.

The supernumerary roots were mostly associated with lower premolars, while inversion, impaction, dilaceration, taurodontism, and enamel pearls are mostly associated with lower molars. All radio-opaque jaws anomalies were seen associated with the lower jaw only.

Conclusion:

The determination of prevalence of dental anomalies is important for the early diagnosis and treatment planning of patients.

Keywords:

Dental Anomaly, Impaction, Fusion, Dilaceration, Pulp stone.

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الخلاصة

مقدمه:

أجريت دراسات مختلفة عبر مجموعات سكانية مختلفة وأظهرت درجات متفاوتة من انتشار تشوهات الأسنان. كان الهدف من هذه الدراسة هو تقييم انتشار تشوهات الأسنان بين سكان النجف / العراق.

طرق العمل:

تم إجراء دراسه للاشعات البانورامیه الاساسیه لـ 750 شخصًا تتراوح أعمارهم بين 18 و 40 عامًا ، وتم فحص أسنان وفكين المرضى بالأشعة من حيث العدد والحجم والتركيب والموقع وشكل الأسنان . بالإضافة إلى ذلك جود حجر فى اللب والتشوهات غير الشفافة في الفك تمت دراستها. تم تحليل النتائج باستعمال اختبار كاى سكوير

النتائج:

وأظهرت النتائج أن نسبة انتشار تشوهات الأسنان كانت (32.8٪). والتشوهات في عدد الأسنان كانت (4.19٪) ، الحجم (10٪) ، التركيب (0٪) ، الموقع (50.33٪) ، الشكل (27.74٪) ، حجر فى اللب (5.48٪) ، والتشوهات الفكيه غير الشفافة شكلت (2.26٪). كان أكثر أنواع التشوهات السنية شيوعًا هو تشوهات موقع الأسنان ، و 55.48٪ من الحالات الشاذة للأسنان كانت مرتبطة بأسنان الفك العلوي ، و 44.52٪ كانت مرتبطة بأسنان الفك السفلي.

كانت الأسنان الزائدة ، والأسنان الخلقية المفقودة ، والتبديل بالموقع ، والتخدد الداخلى والخارجى كانت مرتبطة في الغالب بالقواطع العلوية ، بينما لوحظ الإزاحة بالموقع في الغالب مرتبطة بالأنياب العلوية. ارتبطت الأضراس العلوية في الغالب بحجر اللب والجذور المندمجة وصغر الحجم السنى

ارتبطت الجذور الزائدة في الغالب مع الضواحك السفلية ، في حين أن الانقلاب ، والانحشار ، والتقوس ، وأسنان الثور ، ولآلئ المينا ترتبط في الغالب بالأضراس السفلية. شوهدت جميع التشوهات الفكيه غير الشفافة مصاحبة للفك السفلي فقط.

الاستنتاجات:

يعد التشخيص المبكر وتحديد مدى انتشار تشوهات الأسنان أمرًا مهمًا في تخطيط العلاج للمرضى.

الكلمات المفتاحية:

تشوه الأسنان ، الانحشار ، الاندماج ، التقوس ،حجر الاسنان.

INTRODUCTION

Dental anomalies are considered as one of the most common developmental defects during dental formation caused by environmental and genetic factors. They are abnormalities which may affect both primary and permanent dentition, and jaw articulation [1].

Teeth anomalies including the size, number, shape, and changes in eruption time, site and can be an evidence of many systemic disease [2,3]. These anomalies can complicate the dental treatments, like the tooth extraction, root canal therapy, and can induce aesthetic problems and malocclusion [4,5].

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Studying the prevalence of dental anomalies will provide us with important information for the clinical management of the patients. In addition to that, the distribution and the incidence of the anomalies are essential to understanding the differences within and between the populations [6].

The dental anomalies had been studied in different populations and ethnic groups, but the variations in the sampling methods and the diagnostic criteria can be the causes of the different results. A few subtypes of these dental anomalies within a studied population have been also evaluated in previously published studies [7]. These all types of dental anomalies have been reported to have a wide geographical, racial and ethnic variations. Even the prevalence of such dental anomalies may be low, but the early detection of such anomalies may prevent the complex therapeutic intervention and the future complications. Therefore, the clinical and radiographic examination is required for the early diagnosis and the management of these conditions. The present study was aimed to evaluate the prevalence of dental anomalies in adult dentate Najaf/Iraqi population by using digital panoramic radiographs.

MATERIALS and METHODS

This retrospective cross-sectional research was conducted using panoramic radiographic data of the patients which were seeking the dental treatments for a different dental problems and were carried out in a different Private Radiographic Clinics in Al Najaf Governorate /Iraq. The study protocol was approved by the research ethics committee at Al-Zahrawi University College. This retrospective study involves the analysis of standard Orthopantomograph (OPGs) of 750 subjects with ages ranging between 18 and 40 years and fulfill the inclusion criteria, who visited different private Dental Clinics and referred to radiology department for different reasons in the period between 2010–2021in Al Najaf Governorate /Iraqi. The exclusion criteria include patients with syndromes that could cause dental developmental anomalies, cleft palate, low quality radiograph, patients under orthodontic treatment, traumatic injury or fracture.

To assess the inter-observer variations, 50% of the selected radiographs were reviewed also by other observer. Using Kappa statistics, the level of agreement between observers was tested. The dental anomalies were recorded depending on the following criteria [8,9,10].

1. Number: Hyperdontia and hypodontia.
2. Size: Macrodontia and microdontia.
3. Structure: Dentinogenesis imperfecta and amelogenesis imperfecta.

4. Position: Transposition, rotation, displacement, inversion, and impaction.
5. Shape: Dilaceration, fusion, gemination, taurodontism, dens evaginatu, dens invaginatus, supernumerary roots, fused roots, and enamel pearls.
6. Others like pulp stone, and radio-opaque dental anomalies (Figures 1-10).

All patient's data were obtained from their medical records. Using a digital machine (Kodak 9000 extra-oral imaging system, exposure time (12.5s), voltage (73 kV), and current (12 mA), all OPGs were captured, and images were stored in a digital database. Using descriptive statistics, data were analyzed, including percentage and frequency. By using the chi-squared test, the data analysis was carried out. Statistical analyses were considered significant at $P < 0.05$.

RESULTS and DISCUSSION

All OPGs of 750 patients were studied, the mean age of the patients was 24.2 year, 438 (58.4%) patients were male and 312 (41.6%) were female. All the studied dental anomalies, between the reference data set of the first and the second observer, the Kappa statistics revealed a good (k = 0.73–0.80) to an excellent agreement ($k \geq 0.80$).

Of 750 OPGs of patients, 246 patients had dental anomaly with a prevalence of 32.8%. The prevalence of dental anomalies was seen higher among males (64%) than females (36%) with a significantly association ($p<0.05$).

Among the patients who had dental anomalies, 186 (75.61%) patients had one type of anomaly, 56 (22.76%) had two types of anomalies, and 4 (1.63%) had three types of anomalies, with a total 310 dental abnormalities / 246 patients.

Anomalies of the number of teeth was (4.19%), size (10%), structure (0%), position (50.33%), shape (27.74%), pulp stone (5.48%), and the radio-opaque dental anomalies constitutes (2.26%). Anomalies of tooth position was seen the most common type of dental anomalies. Table- 1 shows the frequencies of different types and subtypes of dental anomalies in the study population. The result also showed that the anomalies of impaction (38.06%), microdontia (9.03%), dilaceration (8.39%), fused roots (7.42%%), and displacement (5.81%) were the most commonly seen subtypes of the dental anomalies.

Results showed that 172 (55.48%) of dental anomalies were associated with the maxillary teeth, and 138 (44.52%) were associated with the mandibular teeth with a significant association ($p<0.05$). The supernumerary teeth, congenital missing teeth, transposition, dens evaginatus, and

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dens invaginatus were mostly associated with the upper incisors, while the displacement was mostly seen associated with the upper canines (Table-2). Upper molars were mostly associated with pulp stone, fused roots and microdontia (specifically third molars).

Regarding the highest percentages of anomalies in the lower jaw (Table-3), the results showed that supernumerary roots were mostly associated with premolars, while inversion, impaction, dilaceration, taurodontism, and enamel pearls are mostly associated with lower molars. All radio-opaque dental anomalies were seen associated with the lower jaw only, six of them were seen associated with a sound tooth, and only one case seen associated with a restored tooth (Figure-10).

Table 1. Frequency distribution of type and subtype of each studied anomalies.

Types and subtypes of the dental anomalies		Frequency (%) for subtype	Frequency (%) for type
1.Number	Supernumerary tooth.	4 (1.29%)	13(4.19%)
	Congenital missing tooth.	9 (2.90%)	
2.Size	Microdontia	28(9.03%)	31(10%)
	Macrodontia	3(0.97%)	
3.Structure	Amelogenesis imperfecta	0%	0%
	Dentinogenesis imperfecta	0%	
4.Position	Transposition	2(0.65%)	156(50.33%)
	Rotation	16(5.16%)	
	Displacement,	18(5.81%)	
	Inversion	2(0.65%)	
	Impaction	118(38.06%)	
5.Shape	Dilaceration	26 (8.39%)	86(27.74%)
	Fusion	0(0%)	
	Gemination	1(0.32%)	
	Taurodontism	2(0.65%)	
	Dens evaginatus	4(1.29%)	
	Dens invaginatus	16(5.16%)	
	Supernumerary roots.	5(1.61%)	
	Fused roots.	23(7.42%)	
	Enamel pearls	9(2.90%)	
6.Others	Pulp stones	17 (5.48%)	17 (5.48%)
	Radio-opaque dental anomalies	7 (2.26%)	7 (2.26%)
Total		310 (100%)	310 (100%)

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Table-2. Frequency of dental anomalies in the maxillary arch according to the tooth type.

Types and subtypes of the dental anomalies		Incisors (No.&%)	Canines (No.&%)	Premolars (No.&%)	Molars (No.&%)
1.Number	Supernumerary tooth.	**3 (0.97%)**	0 (0%)	1 (0.32%)	0(0%)
	Congenital missing tooth.	**7 (2.26%)**	0(0%)	0(0%)	0(0%)
2.Size	Microdontia	9 (2.90%)	0(0%)	0(0%)	**19 (6.12%)**
	Macrodontia	2 (0.65%)	0(0%)	0(0%)	1(0.32%)
3.Structure	Amelogenesis imperfecta	0(0%)	0(0%)	0(0%)	0(0%)
	Dentinogenesis imperfecta	0(0%)	0(0%)	0(0%)	0(0%)
4.Position	Transposition	**2(0.65%)**	0(0%)	0(0%)	0(0%)
	Rotation	1(0.32%)	3(0.97%)	0(0%)	0(0%)
	Displacement,	1(0.32%)	**7(2.26%)**	1(0.32%)	0(0%)
	Inversion	0(0%)	0(0%)	0(0%)	0(0%)
	Impaction	3(0.97%)	19(6.13%)	0(0%)	32(10.32%)
5.Shape	Dilaceration	0(0%)	0(0%)	4(1.29%)	8(2.59%)
	Fusion	0(0%)	0(0%)	0(0%)	0(0%)
	Gemination	1(0.32%)	0(0%)	0(0%)	0(0%)
	Taurodontism	0(0%)	0(0%)	0(0%)	0(0%)
	Dens evaginatus	**4(1.29%)**	0(0%)	0(0%)	0(0%)
	Dens invaginatus	**11(3.55%)**	0(0%)	0(0%)	2(0.65%)
	Supernumerary roots.	0(0%)	0(0%)	0(0%)	0(0%)
	Fused roots.	0(0%)	0(0%)	0(0%)	**19(6.13%)**
	Enamel pearls	0(0%)	0(0%)	0(0%)	3(0.97%)
6.Others	Pulp stones	0(0%)	0(0%)	0(0%)	9(2.90%)
	Radio-opaque dental anomalies	0(0%)	0(0%)	0(0%)	0(0%)
Total		44	29	6	93

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Table 3. Frequency of dental anomalies in the mandibular arch according to the tooth type.

Types and subtypes of the dental anomalies		Incisors (No.&%)	Canines (No.&%)	Premolars (No.&%)	Molars (No.&%)
1.Number	Supernumerary tooth.	0(0%)	0(0%)	0(0%)	0(0%)
	Congenital missing tooth.	0(0%)	0(0%)	1(0.32%)	1(0.32%)
2.Size	Microdontia	0(0%)	0(0%)	0(0%)	0(0%)
	Macrodontia	0(0%)	0(0%)	0(0%)	0(0%)
3.Structure	Amelogenesis imperfecta	0(0%)	0(0%)	0(0%)	0(0%)
	Dentinogenesis imperfecta	0(0%)	0(0%)	0(0%)	0(0%)
4.Position	Transposition	0(0%)	0(0%)	0(0%)	0(0%)
	Rotation	1(0.32%)	11(3.55%)	0(0%)	0(0%)
	Displacement,	6(1.94%)	2(0.65%)	1(0.32%)	0(0%)
	Inversion	0(0%)	0(0%)	0(0%)	**2(0.65%)**
	Impaction	0(0%)	3(0.97%)	0(0%)	**61(19.68%)**
5.Shape	Dilaceration	0(0%)	1(0.32%)	2(0.65%)	**11(3.55%)**
	Fusion	0(0%)	0(0%)	0(0%)	0(0%)
	Gemination	0(0%)	0(0%)	0(0%)	0(0%)
	Taurodontism	0(0%)	0(0%)	0(0%)	**2(0.65%)**
	Dens evaginatus	0(0%)	0(0%)	0(0%)	0(0%)
	Dens invaginatus	0(0%)	0(0%)	0(0%)	3(0.97%)
	Supernumerary roots.	0(0%)	0(0%)	3(0.97%)	**2(0.65%)**
	Fused roots.	0(0%)	0(0%)	0(0%)	4(1.29%)
	Enamel pearls	0(0%)	0(0%)	0(0%)	**6(1.94%)**
6.Others	Pulp stones	0(0%)	0(0%)	0(0%)	8(2.59%)
	Radio-opaque dental anomalies	0(0%)	0(0%)	**4(1.29%)**	3(0.97%)
Total		7	17	11	103

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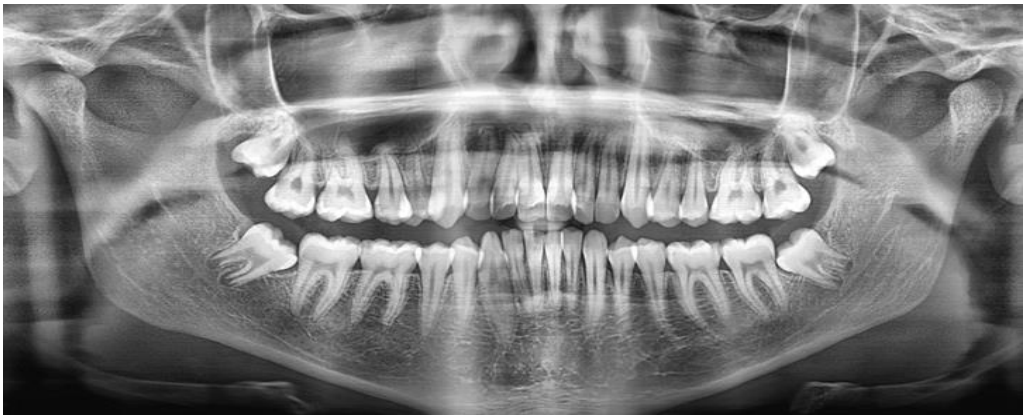

Figure 1. Super Supernumerary upper incisors.

Figure 2. Congenital missing upper lateral incisors and lower wisdom teeth, and radicular dens in dente of the lower left second molar.

Figure 3. Congenital missing lower second premolars, with a microdontia of upper laterals.

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Figure 4. Microdontia of upper left wisdom tooth (upper arrow), dilaceration of lower left wisdom tooth (lower arrow), and rotation of canines.

Figure 5. Mesiodens between the upper central incisors, with a microdontia of upper wisdom teeth.

Figure 6. Congenital missing upper left lateral incisor with a supernumerary premolar tooth.

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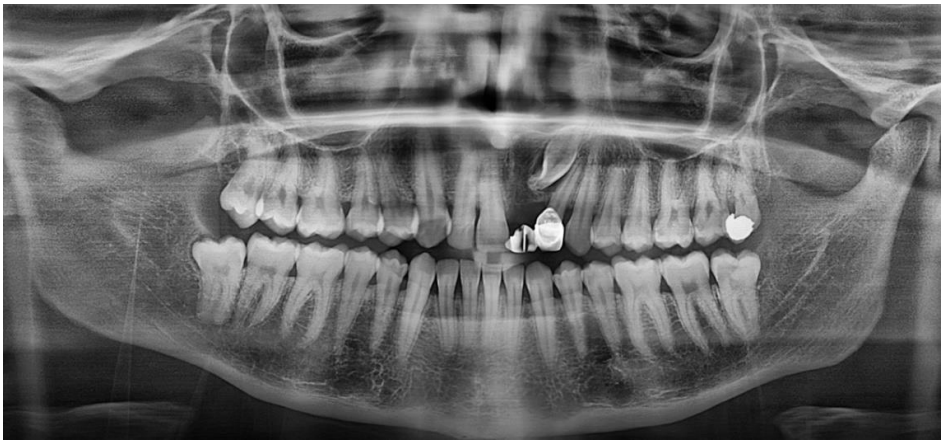

Figure 7. Impaction of upper left central incisor and microdontia of upper left wisdom tooth.

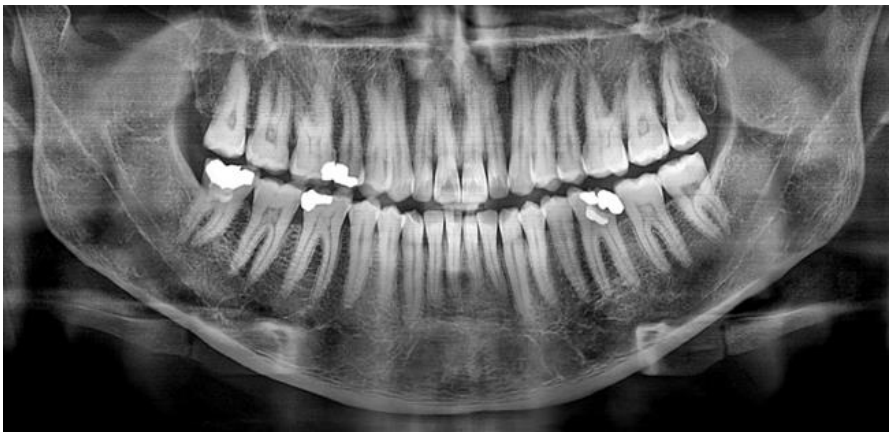

Figure 8. Pulp stones associated with the molars, dens invaginatus of upper anterior teeth, and fused roots of upper wisdom teeth.

Figure 9. Enamel pearls in the bifurcation areas of lower first and second molars.

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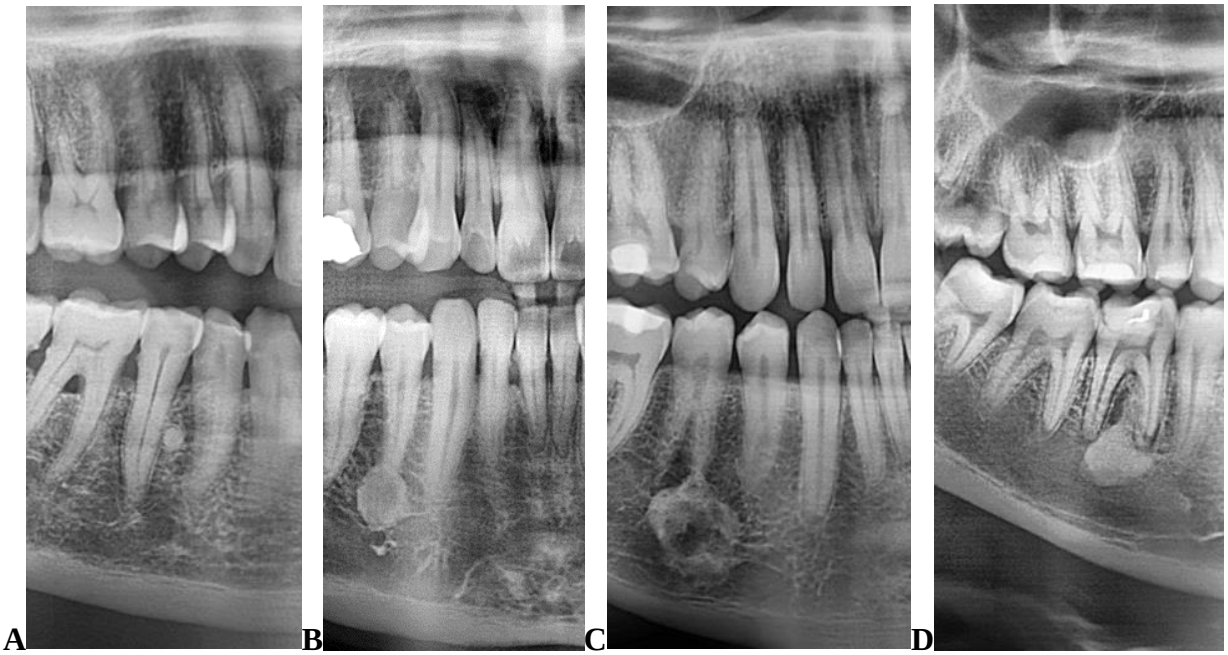

Figure 10. Different radio-opaque dental anomalies. In (A, B and C) they are associated with sound teeth. (C) the second premolar shows root bifurcation. While in (D) it is associated with a restored tooth.

In the present study, we used OPGs to evaluate all types of the prevalence of dental anomalies in patients with age ranging from 18 to 40 years. These OPGs are very beneficial because they allow examination of the jaws and the teeth at the same time, with a low dose of radiation. It is used in the most of the dental procedures, like surgery, prosthetics, and, orthodontics, and sometimes can be used to follow up the prevalence of different types of dental anomalies [11,12].

The present result revealed that the prevalence of dental anomaly in the study population was higher in males than females, and this may be attributed to the fact that the females always tried to find a dental treatment faster than the males. The anomalies in position constitutes the highest percentage followed by the anomalies in shape (Table-1). Bilge *et al* [13] study found that the prevalence of dental anomalies was higher in females (54%) than in males (46%), and the anomalies of position (60.8%) and shape (27.8%) were also the most common types of dental anomalies, whereas the anomalies in the size (8.29%), structure (0.21%), and number (17.02%)

were the least commonly found. The differences might be due to the different diagnostic criteria used to classify these anomalies, in addition to the genetic and racial factors.

The present study also showed that the anomalies of impaction, followed by microdontia, dilaceration, fused roots, and displacement were the most commonly seen subtypes of dental anomalies (Table-1). Bilge *et al* [13] study found that anomalies of impaction (45.5%), dilaceration (16.3%), hypodontia (14.4%), and taurodontism (11.27%) were the most common subtypes of these anomalies.

Saberi and Ebrahimipour [14] revealed that the most common dental anomalies was in the morphology (71.70%), position (19.81%), and number (8.49%), and the most prevalent dental anomalies seen were taurodontism (5.38%), followed by dilacerations (5.29%) and impaction (3.41%). A prevalence of impaction was seen 2.95% by Ghabanchi *et al* [15] study, which are much lower than that in the present study. This may be due to the method used, age group, and the cause of referring the patient for the radiology department.

Results showed that the distribution of these dental anomalies was higher in the maxilla. Supernumerary teeth, congenital missing teeth, transposition, dens evaginatus, and dens invaginatus were mostly associated with the upper incisors, while the displacement was mostly seen associated with the upper canines (Table-2). Upper molars were mostly associated with fused roots and microdontia. Regarding the highest percentages of anomalies in the lower jaw (Table-3), the results showed that supernumerary roots were mostly associated with premolars, while inversion, impaction, dilaceration, taurodontism, and enamel pearls are mostly associated with lower molars. Radio-opaque dental anomalies were seen associated with the lower jaw only.

Bandaru *et al* [16] also found that the prevalence of anomalies in the maxillary was (83.30%) compared to (16.70%) in mandibular arch, and the supernumerary teeth and congenital missing teeth were more commonly observed in the maxillary arch than the mandible. In Temilola *et al* [17] clinical study, they also found that children had dens evaginatus, macrodontia, peg-shaped laterals in the maxilla more than in the mandible. ALHumaid *et al* [18] study found that the maxillary molar was the most affected area, and exhibited (36.2%) dental anomalies, followed by the mandibular molar , maxillary and mandibular premolars, the maxillary anterior, and the least anomalies were associated with the mandibular anterior.

In the present study, the frequency of enamel pearls and pulp stone was (2.90%) and (5.48%) respectively. Enamel pearls was seen mostly associated with the lower molars. Çolak *et al* [19]

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study found that enamel pearls were detected in 0.85% of the teeth examined, and the mandibular molars were the most commonly affected teeth. Alaajam *et al* [20] study found that out of total 600 patients, pulp stones were found in 14.7% of the patients.

The present result also found that of 750 OPGs examined, only 7 (2.26%) cases were seen associated with a radio-opaque dental anomaly in the lower posterior teeth region. Of the 3,513 radiographs examined by Avramidou *et al* [21] study, only (1.96%) were seen exhibited radiopaque lesions in the jaws. Only a single radiopacity was seen in the maxilla, in the area of lateral incisor and the rest were found in the mandible.

CONCLUSIONS

The prevalence of dental anomalies was (32.8%). The most common type of dental anomalies was anomalies of tooth position, and 55.48% of dental anomalies were associated with the maxillary teeth, and 44.52% were associated with the mandibular teeth. The supernumerary teeth, congenital missing teeth, transposition, dens evaginatus, and dens invaginatus were mostly associated with the upper incisors, while the displacement was mostly seen associated with the upper canines. Upper molars were mostly associated with pulp stone, fused roots and microdontia. The supernumerary roots were mostly associated with lower premolars, while inversion, impaction, dilaceration, taurodontism, and enamel pearls are mostly associated with lower molars. All radio-opaque dental anomalies were seen associated with the lower jaw only. It is recommended to study the prevalence of these dental anomalies in the Kurdish areas in Iraq like Erbil and Duhok.

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Conflict of interests.

There are non-conflicts of interest.

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