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Prevalence of incidental dental findings in a sample of Libyan Patients: orthopantomographic study.

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Abstract
Objective: The purpose of this investigation was to evaluate the prevalence of incidental findings in orthopantomograms (OPG) of a sample of Libyan patients.
Material and methods: panoramic radiographs (PRs) obtained for various reasons. Patient's information such as the age, gender and indication of OPG was recorded. The panoramic radiographs had been made using the same digital panoramic system. The PRs were examined by two specialists in Oral maxillofacial pathology and Oral maxillofacial surgery
Results: This included OPG X-ray of 136 males and 264 females and their ages ranged between 3 and 70 years with a mean age of 32.4 ± 14.98 years. Out of 400 OPGs, 64.25% had incidental findings. In terms of dental-related anomalies, the most common one was dilacerated root in approximately one third of participants (34.5%) followed by impacted teeth in 18.25% then congenitally missing permanent tooth in 4.5% whilst the least common one was supernumerary tooth, hypercementosis, taurodontism and root resorption in 0.75%, 0.75% and 0.25% respectively.
Conclusion: Dentists and oral radiologists are encouraged to carefully evaluate radiographs for incidental findings since panoramic radiograph has a high probability of incidental findings. Such incidental findings are beneficial in early diagnosis of some diseases.

Keywords: Prevalence, Impacted teeth, Incidental, Supernumarary.

Introduction

Incidental pathology findings in radiology refer to occult defects that show no clinical signs or symptoms but have been observed for any other reasons or an unrelated chief complaint in the radiograph taken. These may include tooth-related or intraosseous findings in dentistry. The presence of these incidental findings (IFs) could raise questions about the need for more diagnostic tests or for other specialists to be referred to. Therefore, the concentration on one specific region of the film/image should not be limited by a radiologist [1]

One of the most common plain film radiographic analyses of the oral and facial structures is the panoramic radiograph. Panoramic photography (also known as a panoramic x-ray, orthopantomogram) OPG) Is a two-dimensional image that creates a single tomographic image of both jaws and their supporting structures[2, 3].

Various imaging techniques such as intraoral periapical view (IOPA), (OPG), occlusal view, CT scan, and cone-beam computed tomography (CBCT) are used in dentistry, but OPG is considered a routine radiological diagnostic tool for the examination since it uses relatively low doses of radiation as compared to a full mouth radiographs, It is useful to see multiple anatomical points in a single film, which is not possible in IOPA or occlusal view, and it is Low-cost and easy availability also make it accept more than CT scan which gives better visualization of structures by section[4, 5].

After a clinical examination, OPG is explicitly recommended to examine impacted teeth, oral lesions, such as cysts, tumours, or other pathological disorders in the jaws and fractures of the jaw. Large numbers of IFs were identified in previous publications that identified the prevalence of incidental findings (IFs) observed on analogue (film) OPG series, the most frequent of which were affected by teeth and radiolucencies [5, 6]

It is of paramount importance to identify and report such findings because they may require medical and/or dental intervention. hence This study was conducted to report the incidental findings on panoramic

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radiographs.

Materials and Methods

This cross-sectional study was a retrospective analysis of 400 OPG to evaluate the incidental findings. Data acquired from the dental archives of private center in Almarj center, Libya from August 2021 to June 2022. This center is the only referral center in this city as it has the only panoramic device. The study protocol was approved by institutional research committee of Benghazi university, and all patients and parents/guardians of patients, in cases where participants were under 18 years of age, gave verbal consent for the use of their data for research.

panoramic radiographs (PRs) obtained for various reasons. Patient's information such as the age, gender and indication of OPG was recorded.

The panoramic radiographs had been made using the same digital panoramic system. The PRs were examined s by two specialists in Oral maxillofacial pathology and Oral maxillofacial surgery

Inclusion criteria: The OPGs were ordered for various reasons such as the evaluation of TMJ, Orthodontic treatment, implant assessment, endodontic purposes, impacted teeth. There were no age or gender restrictions

Exclusion criteria: Findings such as artifacts, and Images with poor quality were excluded.

Findings directly related to the primary indications for OPGs, and Normal anatomical variants, such as tori mandibularis and calcified stylohyoid complex, were excluded.

Findings such as implants, large caries, restorations, and impacted mandibular third molars that would have been visible clinically were not considered to be radiographic IFs. Other findings such as previously completed endodontic treatments and apicoectomy procedures that would have been part of the patient's known dental history were also not considered to be incidental.

The IFs detected on these radiographs were grouped into the following categories: 1. Dental related anomalies. 2. Radiographic lesions.

Statistical analysis

Statistical analysis was done by SPSS version 28 (IBM Co., Armonk, NY, USA). Numerical variables were presented as mean, standard deviation (SD) and range. Categorical variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test or Fisher's exact test when appropriate. A two tailed P value < 0.05 was considered statistically significant.

Results

Table 1: Characteristics of the study participants and their OPGs.

		Study participants (n=400)
Age (years)	Mean ± SD	32.4 ± 14.98
	Range	3 – 70
Gender	Male	136 (34%)
	Female	264 (66%)
Incidental findings	One or more	257 (64.25%)
	No	143 (35.75%)
Dental-related anomalies	Impacted teeth	73 (18.25%)
	Supernumerary tooth (impacted)	3 (0.75%)
	Congenitally missing permanent tooth	18 (4.5%)
	Dilacerated root	138 (34.5%)
	Root tips embedded in alveolar bone	13 (3.25%)
	Root resorption	1 (0.25%)
	Hypercementosis	3 (0.75%)
Radiographic lesions		
Radiolucent	Periapical	103 (25.75%)
	Peri-coronal	2 (0.5%)
	Residual like cyst	3 (0.75%)
Radio-opaque	Periapical	2 (0.5%)
	Associated with impacted teeth	2 (0.5%)
	Bone scar	11 (2.75%)
	Pulp stone	1 (0.25%)
Mixed	Premolar- molar area	2 (0.5%)
Mandibular impacted teeth	Third molar	48 (12%)
	Canine	3 (0.75%)
	Second premolar	5 (1.25%)
	First premolar	1 (0.25%)
Maxillary impacted teeth	Third molar	32 (8%)
	Canine	17 (4.25%)
	Second premolar	3 (0.75%)
	First premolar	2 (0.5%)
	Second molar	1 (0.25%)
	Central incisor	2 (0.5%)
	Supernumerary (central incisor)	3 (0.75)

Data are presented as frequency (%) unless otherwise mentioned, OPG: Orthopantomogram

This cross-sectional study included OPG X-ray of 136 males and 264 females and their ages ranged between 3 and 70

years with a mean age of 32.4 ± 14.98 years. Out of 400 OPGs, 64.25% had incidental findings. In terms of dental-related anomalies, the most common one was dilacerated root (fig 1) in approximately one third of participants (34.5%) followed by impacted teeth (fig 2) in 18.25% then congenitally missing permanent tooth (fig 3) in 4.5% whilst the least common one was supernumerary tooth (fig 4), hypercementosis (fig 5), taurodontism (fig 6) and root resorption (fig 7) in 0.75%, 0.75% and 0.25% respectively.

In terms of radiographic lesions, radiolucent ones were detected in 108 participants manifested as periapical (fig 8), peri-coronal or residual like cyst in 25.75%, 0.5% and 0.75%

of our participants, respectively. Regarding radio-opaque lesions, they were detected in 16 OPGs that were located either periapical in 0.5% or were associated with impacted teeth in 0.5% or were in the form of bone scar or pulp stones in 2.75% vs 0.25% of the studied participants. Only two participants had mixed lesions located in the premolar-molar area. As regards impacted teeth, the most common ones were third molars impacted into the mandible and maxilla in 12% vs 8% of our participants followed by maxillary impacted canines in 4.25% and mandibular impacted second premolars in 1.25% as shown in

Table **1**, Graph **1** - Graph 3

Fig 1. Root dilacerations of upper second molars.

Fig 2 Impacted upper left canine, upper third molars and lower right third molar

Fig 3 congenitally missing permanent lateral incisors.

Fig 4 Supernumerary tooth in lower right premolar area.

Fig 5 Hypercementosis of lower right wisdom tooth.
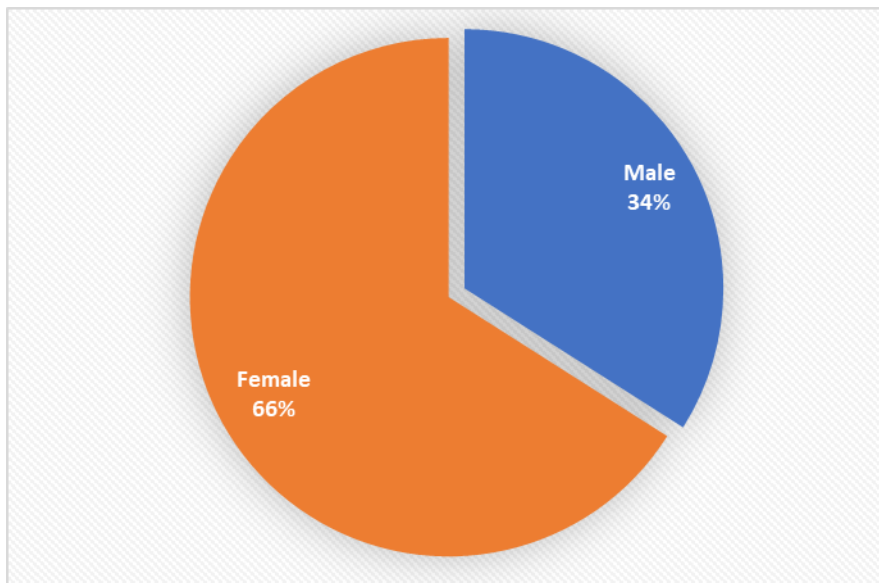
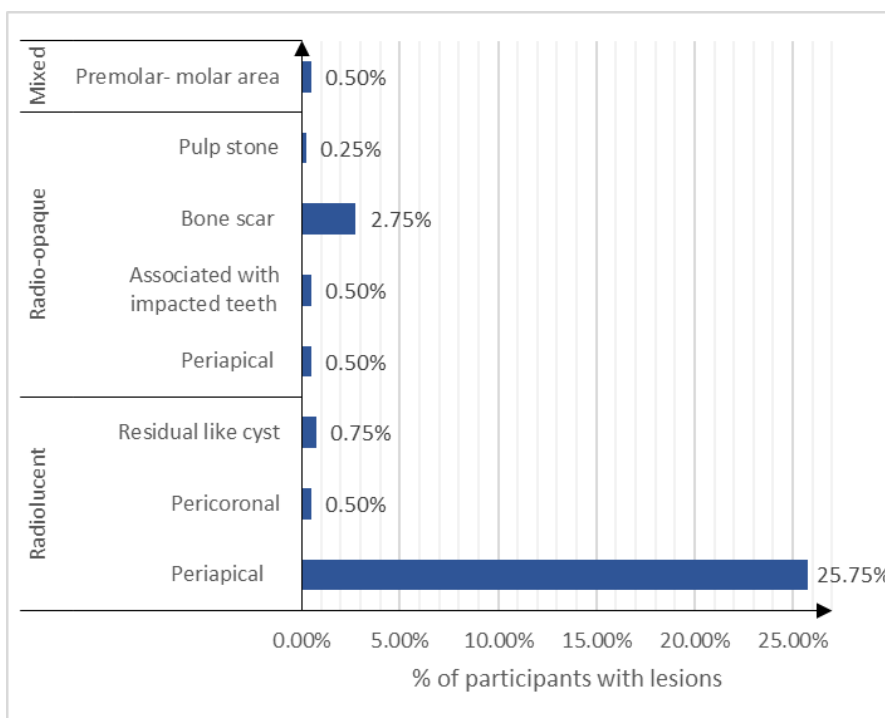**Fig 6** Taurodontism of lower right second molar.

Fig 7. Root resorption of upper right molar.
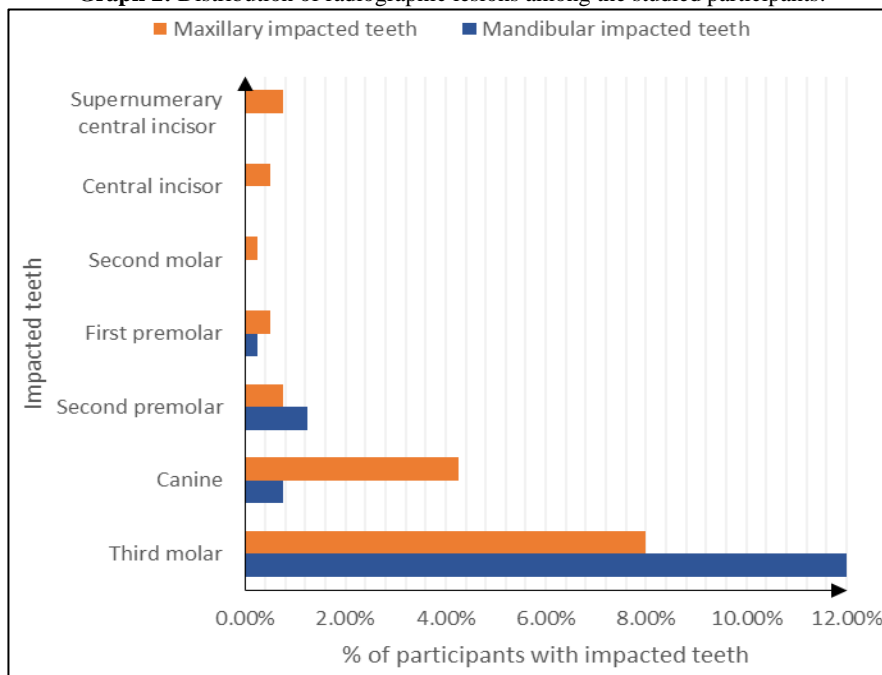

Fig 8. Periapical radiolucency at lower left area of mandible.

Graph 1: Gender distribution of the studied participants

Graph 2: Distribution of radiographic lesions among the studied participants.

Graph 3: Distribution of impacted teeth among the studied participants.

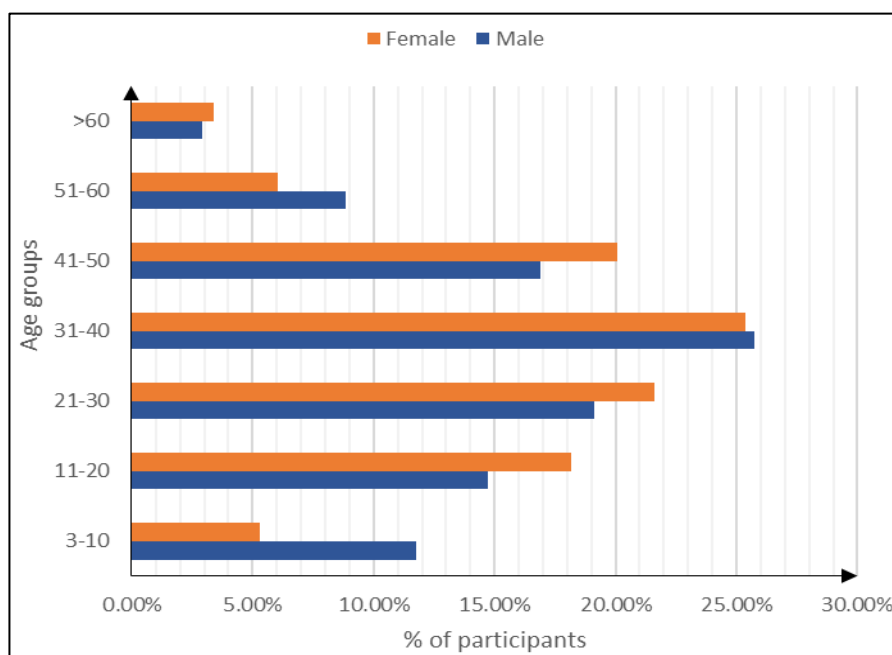**Table 2:** Distribution of the studied patients according to age.

	Male (n=136)	Female (n=264)	P value
3-10	16 (11.76%)	14 (5.3%)	
11-20	20 (14.71%)	48 (18.18%)	
21-30	26 (19.12%)	57 (21.59%)	
31-40	35 (25.74%)	67 (25.38%)	0.283
41-50	23 (16.91%)	53 (20.08%)	
51-60	12 (8.82%)	16 (6.06%)	
>60	4 (2.94%)	9 (3.41%)	

Data are presented as frequency (%), Statistical significance at P value<0.05

As demonstrated in Table 2, the highest percentage of males (25.74%) and females (25.38%) aged between 31 and 40 years followed by the age group (21-30 years) with 19.12% males and 21.59% females. Older age (>60 years) was the least common among the studied participants with 2.94% males and 3.41% females.

There was no statistically significant difference between males and females (P value= 0.283). [Graph **4**]

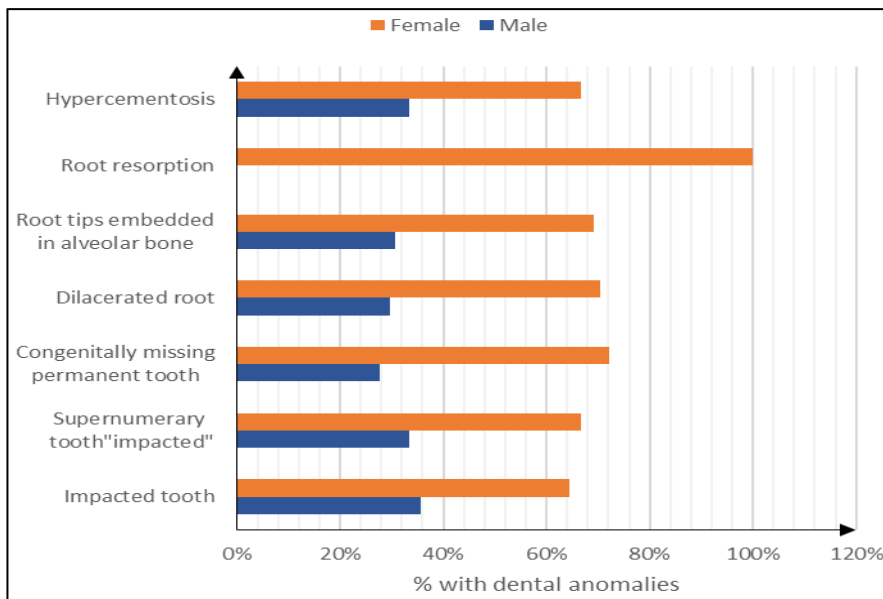**Graph 4:** Distribution of the studied patients according to age.

Table 3: Association between Dental-related anomalies and sex of the studied participants.

	Male (n=136)	Female (n=264)	P value
Impacted tooth	26 (35.62%)	47 (64.38%)	0.785
Supernumerary tooth (impacted)	1 (33.33%)	2 (66.67%)	>0.999
Congenitally missing permanent tooth	5 (27.78%)	13 (72.22%)	0.8
Dilacerated root	41 (29.71%)	97 (70.29%)	0.189
Root tips embedded in alveolar bone	4 (30.77%)	9 (69.23%)	>0.999
Root resorption	0 (0%)	1 (100%)	>0.999
Hypercementosis	1 (33.33%)	2 (66.67%)	>0.999

Data are presented as frequency (%) unless otherwise mentioned, Statistical significance at P value<0.05

Table 3 shows no association between sex and dental-related anomalies represented by (impacted teeth and supernumerary ones, congenitally missing permanent tooth, dilacerated root, root tips embedded in alveolar bone, root resorption and hypercementosis). [Graph 5]

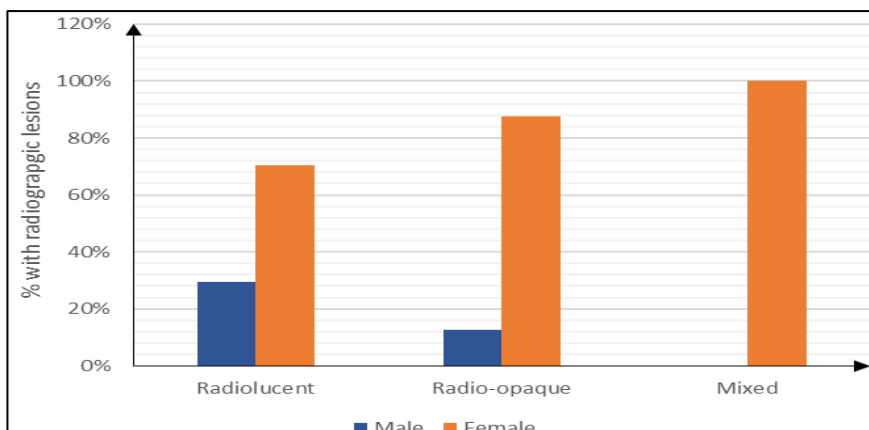**Graph 5:** Association between dental anomalies and sex of the studied participants.

Table 4: Association between different types of radiographic lesions and sex of the studied participants.

	Male (n=136)	Female (n=264)	P value
Radiolucent	32 (29.63%)	76 (70.37%)	0.262
Radio-opaque	2 (12.5%)	14 (87.5%)	0.103
Mixed	0 (0%)	2 (100%)	>0.999

Data are presented as frequency (%), Statistical significance at P value<0.05

There was no statistically significant relation between radiographic lesions (radiolucent, radio-opaque and mixed lesions) and sex of the studied participants as shown in Table 4, Graph **6**
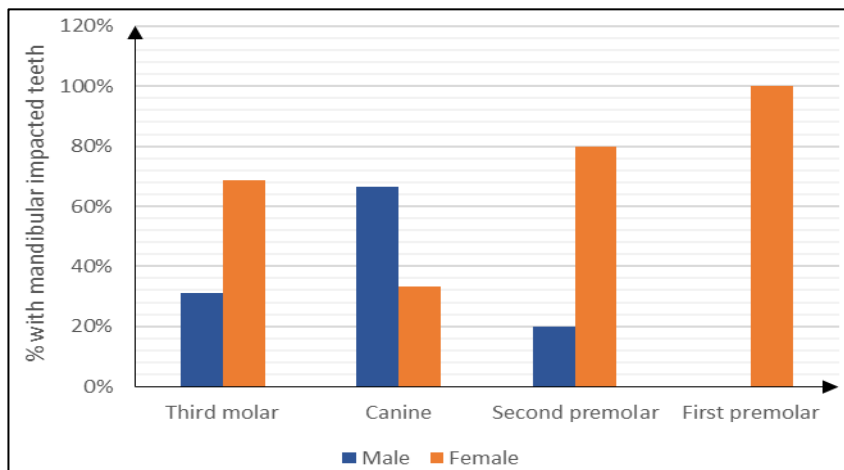
Graph 6: Association between different types of radiographic lesions and sex of the studied participants.

Table 5: Association between mandibular impacted teeth and sex of the studied participants.

	Male (n=136)	Female (n=264)	P value
Third molar	15 (31.25%)	33 (68.75%)	0.747
Canine	2 (66.67%)	1 (33.33%)	>0.999
Second premolar	1 (20%)	4 (80%)	0.666
First premolar	0 (0%)	1 (100%)	>0.999

Data are presented as frequency (%) unless otherwise mentioned, Statistical significance at P value<0.05

There was no statistically significant relation between the distribution of mandibular impacted teeth (third molar, canine, first and second premolars) and sex of the studied participants as shown in Table 5, Graph **7**
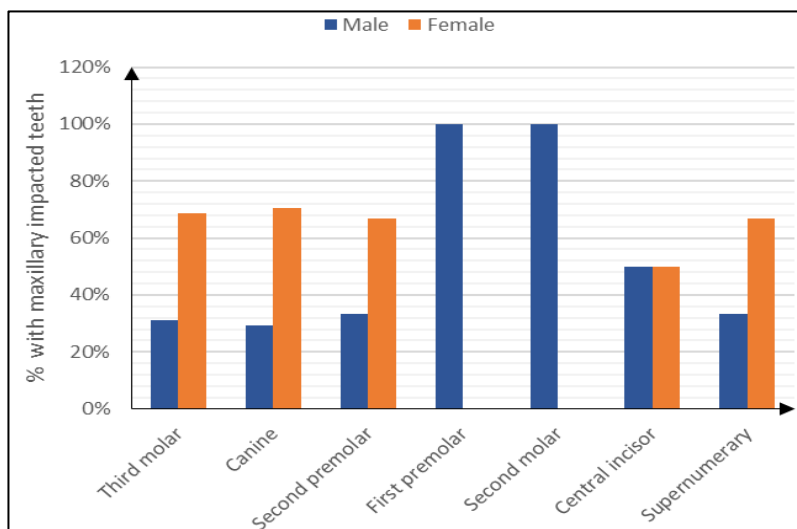

Graph 7: Association between mandibular impacted teeth and sex of the studied participants.

Table 6: Association between maxillary impacted teeth and sex of the studied participants.

	Male (n=136)	Female (n=264)	P value
Third molar	10 (31.25%)	22 (68.75%)	0.847
Canine	5 (29.41%)	12 (70.59%)	0.798
Second premolar	1 (33.33%)	2 (66.67%)	>0.999
First premolar	2 (100%)	0 (0%)	0.115
Second molar	1 (100%)	0 (0%)	0.34
Central incisor	1 (50%)	1 (50%)	>0.999
Supernumerary (central incisor)	1 (33.33%)	2 (66.67%)	>0.999

Data are presented as frequency (%) unless otherwise mentioned, Statistical significance at P value<0.05

There was no statistically significant relation between the distribution of maxillary impacted teeth (third molar, canine, first and second premolars, central incisors and supernumerary ones) and sex of the studied participants as shown in Table 6, Graph **8**

Graph 8: Association between maxillary impacted teeth and sex of the studied participants.

Discussion

The reported prevalence of incidental finding in OPG is highly variable, ranging from 6.2% to 70%. This high range of variability may relate to differences in population, sample size, study design and observer experience, among other factors [7].

In our study, the prevalence rate of 64.25% was seen with incidental finding out of 400 OPG. However, Hernández, G et al in 2018 reported 88% of finding. The different in prevalence may be due to less number of examined panoramic radiograph on our study.

It is interesting that the most prevalent dental anomaly in our study was root dilaceration (53.7%) which is more common in female (70.3) than in male (29.7) in accordance with studies in Saudi (30.2%)[8], Brazil (14.01%) [9] and Iran (5.29%)[10]. In contrast, other studies published significantly lower rate of dilaceration prevalence in Nigerian (1.4%)[11],1% in India[6] and 0.8% in Canadian[12]. A clear definition of tooth root dilaceration is lacking, with some authors describing dilaceration as a 90° or greater root deflection, 20° or greater deflection or as a distorted root form [13]. The different results in different studies may be due to the criteria for acknowledging root dilaceration vary in the literature[14].in our study we reported that the most commonly affected teeth were the maxillary second molars(17.8%) followed by mandibular third molars(14%) which in contrast with finding by ALHumaid et al and Neville et al [8] [15] which reported mandibular third molars(21%) as the most common teeth to be affected by dilaceration.

Tooth that fail to erupt before emergence are impacted[15]. The second anomaly in terms of prevalence in this study is impaction (28.4%) Which in consistent finding reported by previous study[12]. The rate in this study is far to reported rate in the Iran (3.41)[10].a possible reason for the low prevalence is that Saberi & Ebrahimipour were excluded third molars in term of impaction and dilaceration to reduce the error of radiograghic interpretation.

the most impacted tooth was mandibular third molars (41%) followed by maxillary third molars (27.4%)and maxillary canine (14.5%).Which in consistent finding reported by MacDonald & Yu[12]. However Mandibular Third molars in this study were less frequently observed than in study by MacDonald & Yu (72. 2%). It is reasonable to suppose that many patients unerupted third molar had been detected by a previous dentist and removed prior to their visit to present practice. In the study conducted among the southeast Iranian population, it was reported that the maxillary canine was the most impacted tooth. This is possibly due to the previously mentioned reason.

Impacted tooth showed a higher prevalence in females than males. this could have been due to larger number of females in this study.

The prevalence of supernumerary teeth in permanent dentition ranges from 0.1 to 3.8% [8, 10, 15]. Similarly, our data showed the prevalence of 2.7% for supernumerary teeth which was the same as theses rate. Further all 3 supernumerary teeth in our study were maxillary anterior teeth and they were impacted. Neville et al reported that 75% of in anterior maxilla fail to erupt[15].

Failure of teeth to form (congenitally missing teeth) is one of the common dental anomalies with a prevalence range of 1.6 to 45.7%[8, 11, 15, 16]. Our study showed a prevalence of 7.8% congenitally missing permanent teeth and significantly higher occurrence in female patients (75%) which is consistent with findings reported by previous studies[8, 10-12]. The most common congenitally missing teeth in our study were the maxillary lateral incisors. This is consistent with other studies among Nigerian[11] and Iranian [10] but in contrast to study on Saudi Arabians in the Eastern Province[8] also finding reported by MacDonald & Yu,[12] which reported mandibular second premolars as the most common congenitally missing teeth.

Hypercementosis is also termed as cementum hyperplasia. It is an adaptive modification of the periodontium characterized by an increased cementum thickness on the root surface beyond the level necessary to fulfill its normal function. This excessive amount of cementum might lead to an abnormal thickness of the apex that becomes round-shaped and/or with the root appearance altered macroscopically. Whilst mandibular molars were the most commonly affected teeth by hypercementosis [8, 17].the result of current study were with earlier published literatures wherein 66.7% of hypercementosis were recorded in maxillary molars.

The prevelance of taurodontism 0.39% was lower than that observed in the Iranian and Nigerian population [10, 11]. It is likely that the differences indicate differences in ethnic background.

Odontogenic and nonodontogenic jaw lesions are all part of the jaw lesion spectrum. They may be cysts, tumors, or tumor like lesions. Clinical presentation of this vast spectrum of pathology is nonspecific. On imaging may be classified as radiolucent, mixed, or radioopaque. In our study the radiolucent lesions (27%) were the more prevalent than radiopaque ones. This is consistent with other studies among Iranian [10] and Pakistani population[18] but in contrast to study by kashmoola et al in 2020 [1] also finding reported by MacDonald & Yu,[12] which reported radiopaque lesions were more prevalence one.

Pulp stones are calcified discrete masses that occur in the dental pulp. They are found in healthy, diseased, and even unerupted teeth. In our study the prevalence of pulp stones was only 0.25% and the teeth affected were mandibular molars. However, 30.2% was the prevelance of pulp stones in study by Alawjali in 2019 [19] on agroup of dental patients and the most affected teeth were the maxillary molars.

The panoramic radiographs have well known limitation in detecting caries. There for such findings were not recorded in this study.

With the intention to reduce the exposure to ionization, most the panoramic radiographs did not depict the temporomandibular joint, and therefore it was not possible to assess the prevalence of finding of pathology and abnormality in this region.

Conclusion

Dentists and oral radiologists are encouraged to carefully evaluate radiographs for incidental findings since panoramic radiograph has a high probability of incidental findings. Such incidental findings are beneficial in early diagnosis of some diseases.

Limitation of the study: The study included only patients attended our clinics and this is considered non-representative sample as it lacks randomization.

Conflict of interest: The authors declare that they have no

conflict of interest.

Ethical approval:

The study was in accordance with the ethical standards of the institutional research committee of Benghazi university and approval was obtained.

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