Prevalence of dental and maxillofacial developmental and acquired diseases on panoramic radiographs among Jeddah population, Saudi Arabia

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Abstract: *Panoramic radiographs are the mostly used for screening of teeth and maxillofacial bones for detecting diseases and abnormality as well as their extension and localization in relation to adjacent structures. This retrospective study is designed to scan all patients' digital panoramic images from 2014- 2016 at BatterjeeMedical College (BMC) dental clinics. Total of 3000 panoramic radiographs of adults and 207 panoramic radiographs of children were selected for evaluation. The purpose of this general overview was to evaluate abnormalities, prevalence of dental and maxillofacial diseases in Jeddah population. This step maybe helpful for future treatment plan and follow up. The most common prevalence of dental disease was dental caries (adults = 60.87% and children = 77.52%) while traumatic injury showed prevalence 0f 11.3%. Mostcommon dental anomaly observed was dilacerated root while 6 cases of Dens in dente were recorded.*
Keywords: Panoramic radiograph, dental anomalies, prevalence, dental caries.

I. Introduction

Panoramic radiographs are two-dimensional topographic images which are mostly used for screening of teeth and maxillofacial bones for detecting diseases and abnormality as well as the extension and localization of these diseases in relation to adjacent structures. General dentists and oral maxillofacial specialties prescribe panoramic radiographs routinely to get general overview of dental and jaws condition. Although radiographs are used frequently for detection of carious lesions, they also help in diagnosis of traumatic injuries, developmental disturbances of teeth (**1, 2**). Furthermore; limitations of interpreting dental and bone disease on panoramic radiographs could be related to image complexity, overlapping structures, image distortion, and ghost images. Yet these radiographs help for differential diagnosis and can be taken periodically for follow up progression of a disease (**3**).

Panoramic radiographic examinations are either digital imaging or conventional. Digital radiographs have many advantages like reduced radiation dose, viability of image manipulation and analysis using software tools. This improves image assessment and minimizes errors during panoramic examination (**4, 5**).

Many studies were done by different dental schools previously either to detect specific maxillofacial abnormalities or detect the prevalence of caries or periodontal disease among specific geographic groups. This step may help for future treatment planning as well as follow up of selected cases. Importance of this study rely upon the need of such prevalence documentation since no such study done in region. The aim for this survey is to detect diseases related to teeth and supporting bones on panoramic radiographs in our institution which will measure patients' care priority.

II. Material and Method

This retrospectivecross-sectional study was conducted at Batterjee medical college (BMC), Jeddah by screening of all available panoramic images from patients' files which were taken from 2014 to 2016.Patients visiting dental clinics of BMC hospital came from Jeddah city and neighbor areas to receive treatment at all

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dental specialty clinics. Ethical approval was obtained from the research ethics board at Faculty of Dentistry BMC.

The extracted data with a total number recordof3345panoramic radiograph were selected. All panoramic radiographs were digitally acquired using Orthopos XG Sirona machine [densply, Germany] and images were processed with Sidexis Next generation software. After careful evaluation for image quality and positioning error, 38 images were excluded. Thus 3000 panoramic radiographs of adults and 307 of children were included in study. Standardizationof participating dentist's experience was done by training of freshly graduated interns from BMC forinterpretationof panoramic radiographs. The process of evaluation was supervised by American Board certified Oral and Maxillofacial Radiologist.

Dental and maxillofacial developmental and acquired diseases included: caries, periodontal diseases (marginal bone loss) , apical periodontitis (rarifying osteitis and sclerosing osteitis), tooth fracture, remaining root, impacted teeth, missing teeth, retained deciduous, bone fracture, taurodontism, dilacerated root, hypodontia, hyperdontia, supernumerary root, teeth rotation, dens in dent, microdontia, macrodontia, ectopic eruption, amelogenesis imperfect, and abnormalities related to temporomandibular joint (TMJ) and maxillary sinus.

The collected data were classified to either adult or pediatric subjects. Patients are selected to be in pediatric category when observed radiographically as cases with mixed dentition that show dental age of maximum developing a 2ndmolar. These subjects were collected in a separate chart for evaluating the prevalence of dental findings. All data prevalence was assisted as "present or absent" of the dental finding without recording the quantity or severity of the disease.
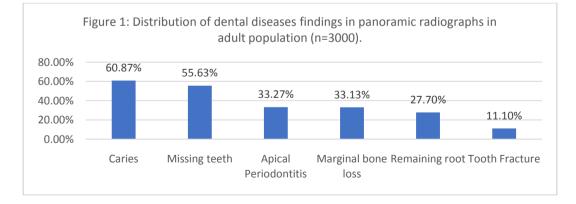
Simple descriptive statistics in form of counts and percentage were calculated by using a Microsoft office excel sheet 2016 [Microsoft office, USA].

III.Results

This study reviewed 3000 adult panoramic radiographs for presence of dental and maxillofacial diseases. Study results were divided into 3 categories; as dental diseases findings, maxillofacial findings, and dental anomalies findings and each was evaluated for adult and pediatric patients. The prevalence of dental diseases from highest to lowest respectively was fromcaries, missing teeth, apical periodontitis, marginal bone loss, remaining roots to tooth fracture (Table 1, Figure1).

Table 1: Distribution of dental diseases findings in panoramic radiographs in adult population (n=3000).

Dental diseases	Number	percentage
Caries	1826	60.87%
Missing teeth	1669	55.63%
Apical Periodontitis	998	33.27%
Marginal bone loss	994	33.13%
Remaining root	831	27.70%
Tooth Fracture	333	11.10%

Figure 1: Distribution of dental diseases findings in panoramic radiographs in adult population (n=3000).

Furthermore, distribution of maxillofacial findings in adult population were found to be TMJabnormalities (n=271, 2.03%), followed by maxillary sinus disease (n=124, 4.13%), and bone fracture (n= 2, 0.07%) (Table 2, Figure 2).
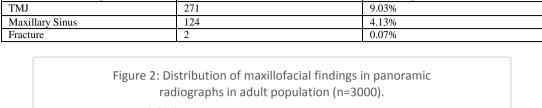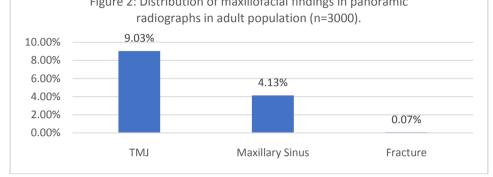
Table 2: Distribution of maxillofacial findings in panoramic radiographs in adult population (n=3000).

Maxillofacial findings	Number	Percentage
TMJ	271	9.03%
Maxillary Sinus	124	4.13%
Fracture	2	0.07%

Figure 2: Distribution of maxillofacial findings in panoramic radiographs in adult population (n=3000).
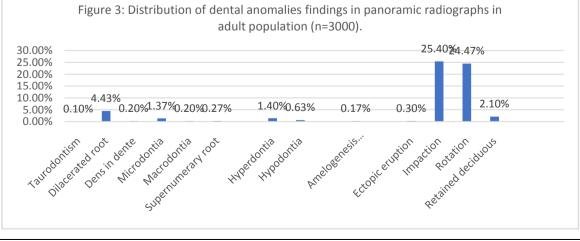
Speaking about dental anomalies, among shape anomalies dilacerated root (n=133, 4.43%) had the highest prevalence, followed by Microdontia (n=19, 0.63%), supernumerary roots (n=8, 0.27%), macrodontia and dens in dente (each n=6, 0.20%), and Taurodontism(n=3, 0.10%) respectively.Furthermore; concerning number anomalies,hyperdontia had higherprevalence (n=42, 1.4%) than hypodontia (n=41, 1.37%). However, structural anomaly in the form of amelogenesis imperfecta was found in 5 cases (0.17%) (Table 3, Figure 3).

Lastly among adult population; in relation to tooth position anomalies, impaction had the highest prevalence of 762 (25.4%), followed by rotation (n=734, 24.47%), retained deciduous teeth (n=63, 2.1%), and 9 cases of ectopic eruption (0.30%) respectively as shown in Table 3 and Figure 3.

Table 3: Distribution of dental anomalies findings in panoramic radiographs in adult population (n=3000).

Dental anomalies	Type of anomaly	Number	Percentage
Shape Anomaly	Dilacerated root	133	4.43%
	Microdontia	41	1.37%
	Supernumerary root	8	0.27%
	Macrodontia	6	0.20%
	Dens in dente	6	0.20%
	Taurodontism	3	0.10%
Number Anomaly	Hyperdontia	42	1.40%
	Hypodontia	19	0.63%
Structure Anomaly	Amelogenesis Imperfecta	5	0.17%
Position Anomaly	Impaction	762	25.40%
	Rotation	734	24.47%
	Retained deciduous	63	2.10%
	Ectopic eruption	9	0.30%

Figure 3: Distribution of dental anomalies findings in panoramic radiographs in adult population (n=3000).

Furthermore; in 307 panoramic radiographs of children we found that prevalence of dental diseases from highest to lowest as 238 (77.52%) caries, 25 (8.14%) remaining root, 22 (7.7%) missing teeth, 19 (6.19%) apical periodontitis with pulpal pathology, 12 (3.91%) tooth fracture respectively, and marginal bone loss showed only one case (0.33%) (Table 4, Figure 4).
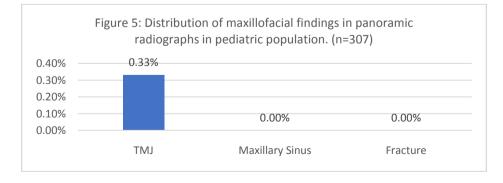
Table 4: Distribution of dental diseases findings in panoramic radiographs in pediatric population (n=307)

Dental diseases	Number	percentage
Caries	238	77.52%
Remaining root	25	8.14%
Missing Teeth	22	7.17%
Apical Periodontitis/furcation involvement	19	6.19%
Tooth Fracture	12	3.91%
Marginal bone loss	1	0.33%

Figure 4: Distribution of dental diseases findings in panoramic radiographs in pediatric population. (n=307)

Concerning children for maxillofacial findings, TMJ abnormalities showed only 1 case (0.33%). As shown in (Table and figure5).

Table 5: Distribution of maxillofacial findings in panoramic radiographs in pediatric population (n=307)

Maxillofacial findings	Number	Percentage
TMJ	1	0.33%
Maxillary Sinus	0	0.00%
Fracture	0	0.00%

Figure 5: Distribution of maxillofacial findings in panoramic radiographs in pediatric population. (n=307)

Speaking of dental anomalies for children population, for the teeth anomalies dens in dent was found in 2 cases (0.65%), while only 1 case ofTaurodontism was found (0.33%). Among teeth number anomalies; hypodontia was found in 6 cases (1.95%), and teeth structural anomaly (amelogenesis imperfecta) 1 (0.33%). Lastly amid position anomalies; 40 (13.03%) Rotation, while ectopic eruption and impaction were found only two cases each (0.65%), and finally, retained deciduous 1 (0.33%) as shown in table and figure 6.

Table 6: Distribution of dental anomalies findings in panoramic radiographs in pediatric population (n=307)

Dental anomalies	Type of anomaly	Number	Percentage
Shape Anomaly	Dens in dente	2	0.65%
	Taurodontism	1	0.33%
	Microdontia	0	0.00%
	Macrodontia	0	0.00%
	Supernumerary root	0	0.00%
	Dilacerated root	0	0.00%
Number Anomaly	Hypodontia	6	1.95%
	Hyperdontia	0	0.00%
Structure Anomaly	Amelogenesis Imperfecta	1	0.33%
Position Anomaly	Rotation	40	13.03%
	Ectopic eruption	2	0.65%
	Impaction	2	0.65%
	Retained deciduous	1	0.33%

Figure 6: Distribution of dental anomalies findings in panoramic radiographs in pediatric population. (n=307)

IV. Discussion

Panoramic radiographs are the most commonly prescribed imaging examination usually used to provide a full view of teeth and its surrounding structures. They help in demonstration of the entire dentition and detect gross abnormalities related to number and position of teeth and are usefulinpatient education (**6, 5**). The panoramic exposure offers ease of operation, shorter working time, and greater coverage than does the intraoral full-mouth series. However, certain shortcomings like appearance of rotated maxillary premolars due to distortion, and confusion about finding of supernumerary teeth in anterior region due to overlap of cervical spines. Because of this it is prudent to supplement the panoramic image with anterior periapical films and posterior bitewings (**7, 3**).

In order to evaluate the prevalence of dental and maxillofacial developmental and acquired diseases among Jeddah population; we used 3307 panoramic radiographs (3000 adults and 307 children) that were taken at Batterjee Dental Clinics between the year of 2014-2016 that have satisfied the inclusion criteria.

In the category of dental diseases; caries, remaining root, missing teeth, apical periodontitis, tooth fracture, marginal bone loss were evaluated and found that in both adult and pediatric population the dental caries had the highest prevalence for both adults (60.87%) and children(77.52%).

In the category of maxillofacial findings; TMJ problems, maxillary sinus, and fracturewere evaluated. Results have shown highest prevalence in TMJ as 9.03% for adults and 0.33%for pediatric patients followed by maxillary sinus problems for adult population (4.13%).In similar study by Jadu et al, incidental findings of maxillary sinus problems were 10.7% of the cases while TMJ problems were 1.7% (**1**). In a study in evaluation of panoramic radiographs of edentulous patients, Awad EA found 51.7% of films having maxillary sinus related pathoses (**8**).

The third category related to dental anomalies was divided into shape, number, structural and positional anomalies. The shape anomaly included dents in dente, taurodontism, microdontia, macrodontia, supernumerary root, dilacerated root. Among them in adult population, maximum number of shape anomaly found was dilacerated roots (4.33%) and the lowest anomaly was taurodontism (0.1%). Vani et al observed 7.2% of dilacerations cases while 2.9% of taurodontism in their study in adult Jazan population (**9**).

Present study reported 1.37% microdontia and 0.2% macrodontia while Vani et al reported 0.9% and 0.6% respectively. A study by Afify et al reported 1.1% of dilacerated roots and one case of taurodontism (**10**). Nevertheless we observed 6 cases of dens in dente in adult population; no other study reported this anomaly.

While evaluating number anomalies, 1.40% of hyperdontiaand 0.63%hypodontia were observed. Although diagnosisof this anomalydepends mainly on clinical examination, it wasreviewed radiographically in our study as retained deciduous with missing successor tooth. However high frequencies of hypodontia cases were reported by Vani et al (**9**). Further in structural anomaly only one case of amelogenesisimperfecta was reported as seen by Afifyet al in study in Jeddah population (**10**).

Under position anomaly, it comprised of rotations, ectopic eruption, impaction and retained delicious teeth in which its eruption time has been exceeded. In this category; impaction had highest prevalence in adults (25.40%) not related to a specific tooth followed by rotation (24.47%), retained deciduous (2.1%) and ectopic eruptions (0.3%).

Although dental caries was the prominent finding among child population, we observed 3.91% fractured teeth and 1.95% of hypodontia. A study in Turkish population indicated 0.85% cases with hyperdontiawhile in our study no child was found with supernumerary teeth (**2**). In the shape anomaly 2 cases of dens in dente and 1 case of taurodontism, but no case of microdontia and macrodontia was found.However, Yassin et al reported 2.6% microdontiaand 1.8% macrodontia cases and 1.4% of taurodontisminAbha region. Among position anomalies in children, rotation topped the chart with involvement of 13.03% teeth while 2 cases each of ectopic eruption and impaction were found. Only one case of amelogenesis imperfecta was recorded in structural anomaly as seen by Yassin (**11**). On contrary Shokri et al in his study reported 44.76% of impacted teeth and 0.68% of transpositions (**12**).

V. Conclusion

Panoramic radiographs provide a full view of teeth and its surrounding structure. They can be useful in patient education and obtain an overview of the dental and jaw related problems in the patient. But it is important to correlate those findings with other modalities such as periapical and bitewing radiographsin order to distinguish diagnosis. Nevertheless, further studies on more panoramic radiographs are needed to be collected from other clinics and hospitals in order to have a larger sample size andcoverage area for Jeddah population to understand the radiographic prevalence of dental diseases.

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