CORRELATION OF PANORAMIC RADIOGRAPHIC FINDINGS AND CLINICAL FINDINGS OF DENTAL PATIENTS AT MOI TEACHING AND REFERRAL HOSPITAL, KENYA

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Abstract

Purpose: The purpose of this study was to determine the correlation of panoramic radiographic findings and clinical findings among dental patients at Moi Teaching and Referral Hospital (MTRH), Kenya.

Materials and Methods: This was a hospital based cross sectional study conducted at the Radiology and Imaging department and dental department at Moi Teaching and Referral Hospital from September, 2019 to June, 2020. A total of 93 consenting patients were enrolled using systematic random sampling. Standard chart review forms were administered, and clinical examination findings documented. Panoramic radiograph findings were then discussed with a consultant radiologists and findings recorded. Descriptive statistics were carried out. Categorical variables were summarized as frequencies and proportions, and reported in tables. Numerical variables were summarized as median and interquartile ranges. Cross tabulation was done to compare clinical examination and panoramic radiograph findings where total raw agreement was reported as proportions.

Results: 93 patients whose ages ranged from 5-73 years with a mean of 29 years were included into the study. Radiographic features of dental caries were present in 54% of panoramic radiographs compared to clinical examination (50.5%) while 23.7% of radiographs revealed impacted teeth compared to clinical examination (19.4%). Radiographic features of periodontitis were observed in 14% compared to clinical examination (16.1%). Fractures (12.9%) were observed radiographically compared to (10.7%) clinically. Periapical lesions (8.6%) were observed radiographically compared to clinical examination (6.4%). Temporo-mandibular disorder (6.5%) were observed both on radiographs and clinical examination. Radiographic features of missing teeth (3.2%) were observed compared to clinical examination (1.1%) while only 1.1% of malpositioned teeth were observed radiographically compared to clinical examination (2.2%). Notably, mandibular lesions (3.2%) and nasal congestion (14%) were only discovered radiographically. The overall raw agreement between panoramic radiograph and clinical examination was 75.3% (70/93) with a p value of less than 0.001.

Unique contribution to theory, practice and policy: The study recommends that all patients presenting with dental conditions should be done panoramic radiograph to improve diagnosis. Moi Teaching and Referral Hospital and the Ministry of Health to consider routine panoramic radiographs in the guidelines for the assessment of dental patients in all the hospitals offering, dental health services

Key words: *Panoramic Radiographic, Clinical Findings, Dental Patients, Moi Teaching and Referral Hospital (MTRH)*

INTRODUCTION

Oral health is an integral part of the general health of the human body. It contributes to the overall health and quality of life. The World Health Organization (WHO) defines oral health as "a state of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial well-being." Poor oral hygiene can lead to various dental conditions, and has well been linked to heart disease, cancer, and diabetes (Choi, 2011).

Panoramic radiography is a simplified extra-oral procedure which visualizes the entire maxilla-mandibular region on a single film. Panoramic radiography has become a popular and valuable diagnostic tool in dentistry. Panoramic radiography has been used for routine screening of dental patients because it allows examination of the entire dentition, alveolar bone, temporomandibular joints, and adjacent structures easily (Choi, 2011).

Panoramic radiography has become a common imaging modality in dental practice. It has proven to be a valuable imaging tool in the dentist's armamentarium. However, the panoramic radiograph produces a complex projection of both the mandible and maxilla with multiple superimpositions which may be exacerbated by technical errors in image acquisition. Furthermore, the panoramic projection shows many anatomic structures outside of the jaws that can result in additional challenges during interpretation (Perschbacher, 2012). Effective interpretation of panoramic radiographs starts with understanding the normal anatomy of the head and neck and how the structures appear in this type of the image. Some of the examples of challenges experienced during interpretations include variations of anatomy and radiological artefacts (Choi, 2011). However, to justify routine use of OPG, it would be necessary to demonstrate a significant diagnostic yield that outweighed the risks of radiation exposure (Rushton, Horner & Worthington, 2001).

According to Han, Sheng, Li & Ma (2013) panoramic radiography is one of the most common dental imaging modality for oral examination. However, a minimal increase in the frequency of exposure of diagnostic x-rays is of considerable public health importance (Toossi, Akbari & Rosdi, 2012). A report by Panorama Dental (2021) reported that dental radiology is safe for pregnant women protected by a lead apron. However, Radfar et al (2003) argued against routine panoramic radiography since full mouth periapical x-rays was found to be more effective for complete oral examination. The American Academy of Pediatric Dentistry (2016) recommended a bi-annual full mouth x-ray examination for high risk patients and an annual examination for pediatric patients with a low risk for tooth decay. The report concluded that panoramic radiography with a lead body shield is safe for use in pediatric patients

According to World Health Organization, dental conditions are the most common non-communicable diseases (NCDs) affecting people throughout their lifetime, with dental caries (tooth decay) in permanent teeth being the most prevalent condition assessed (WHO, 2018). Res (2015) also reported an increase in the number of people with untreated oral conditions from 2.5 billion in 1990 to 3.5 billion in 2015, despite improvements in imaging modalities for dental

conditions. Untreated caries can progress to infection of tooth pulp, which can spread to supporting tissues and the jaws leading to a painful advanced disease (Peterson et al, 2001).

Medical examinations have shown marked improvements in recent years. However, dental examination methods have stagnated due to lack of proper equipment and limited time for thorough examination (Jung, 2009). This means that a lot of patients may be missing out on the benefits of enhanced diagnosis provided by panoramic radiography.

MTRH is a level six referral hospital in Kenya. It has a well-equipped radiology department with a digital OPG machine. However, panoramic radiography is highly underutilized at MTRH with an average of 200 (out of 821) patients referred for panoramic imaging per month (MTRH, 2018). While generally routine use of OPG is recommended in the developed countries, this does not seem to be the case in Kenya. Literature search did not reveal any studies that have been done in Kenya on this issue at the time of this study. Moreover, there is no policy requirement for routine use of OPG in Kenya.

It therefore becomes necessary to have studies that evaluate the benefits of panoramic radiography in diagnosing dental conditions in the Kenyan situation. This will inform policy and dental practice in the country. This study was therefore done to determine the correlation of panoramic radiographic findings and clinical findings among dental patients at Moi Teaching and Referral Hospital, Kenya

METHODOLOGY

This was a hospital based cross sectional study conducted at the Radiology and Imaging department and dental department at Moi Teaching and Referral Hospital from September, 2019 to June, 2020. A total of 93 consenting patients were enrolled using systematic random sampling. Standard chart review forms were administered, and clinical examination findings documented. Panoramic radiograph findings were then discussed with a consultant radiologists and findings recorded. Descriptive statistics were carried out. Categorical variables were summarized as frequencies and proportions, and reported in tables. Numerical variables were summarized as median and interquartile ranges. Cross tabulation was done to compare clinical examination and panoramic radiograph findings where total raw agreement was reported as proportions.

RESULTS

The results are based on 93 patients with dental health condition seen at MTRH and referred for a panoramic radiograph at the radiology and imaging department between September, 2019 and June, 2020. The age of the study participants ranged from 5 to 73 years with a median age of 27.5 (IQR 13.5, 41.5). The peak age was 10-19 years followed by 30-39 years. Table 1 present the socio-demographic characteristics of the participants

Table1: Socio-Demographic Characteristics

	Overall (N=93)
Age (years)	
N-Miss	1
Median (IQR)	27.5 (13.5, 41.5)
Range	5 – 73
Age Group	
0 – 9	13 (14.13%)
10 – 19	23 (25%)
20 – 29	14 (15.2%)
30 – 39	16 (17.4%)
40 – 49	12 (13%)
50 – 59	8 (8.7%)
60+	6 (6.5%)
Gender	
Male	47 (50.5%)
Female	46 (49.5%)
Occupation	
N-Miss	3
Employed	10 (11.1%)
Business	19 (21.1%)
Farmer/Unemployed/Retired	25 (27.8%)
Student	36 (40.0%)
Education level	
N-Miss	2
Nursery	8 (8.8%)
Primary	31 (34.1%)
Secondary	35 (38.5%)
Tertiary	17 (18.7%)

Participants were equally distributed in number between gender categories. Most (40%) of the patients were students followed by farmers (27.8%), and about 43% had nursery and primary level of education.
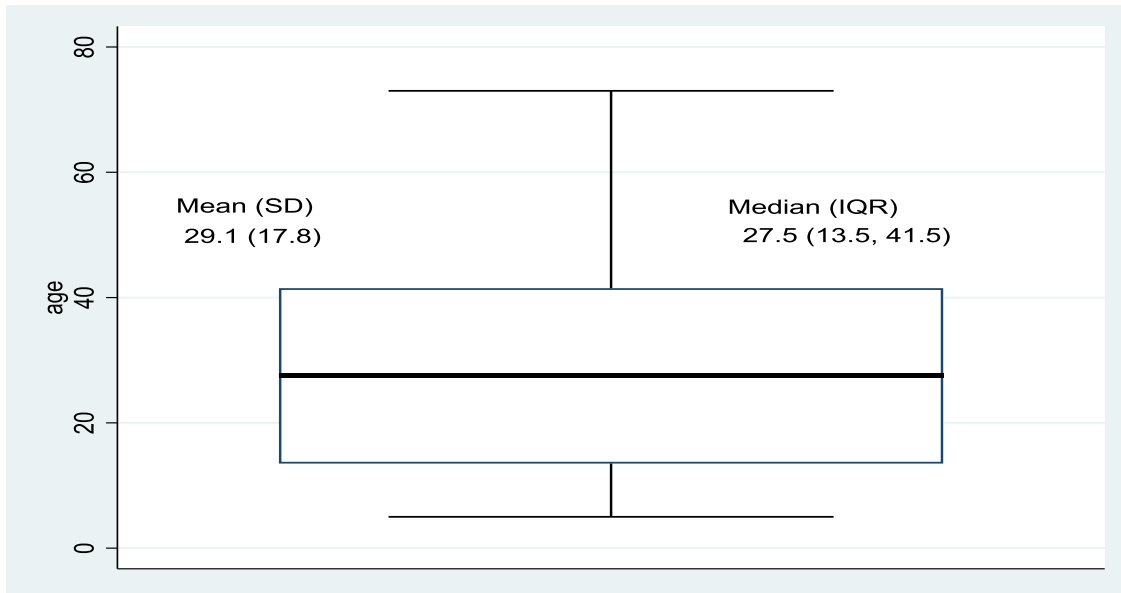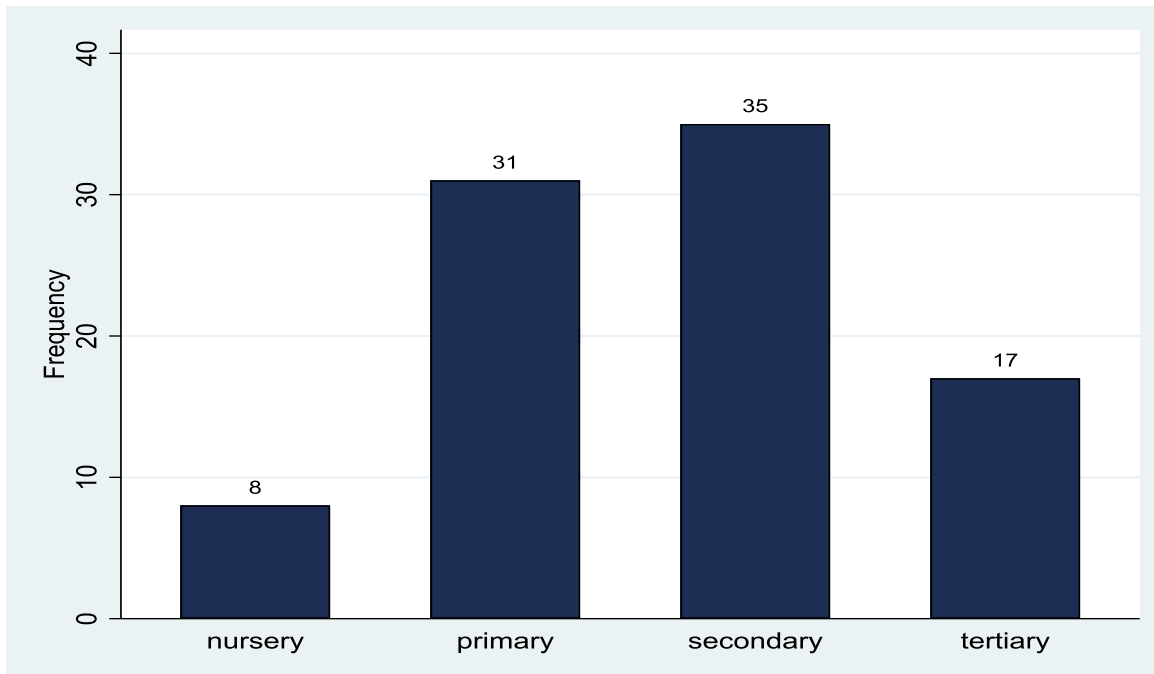
Figure 1: Age distribution

Figure 2: Education level

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Table 2: Presenting complaints

	Overall (N=93)
Presenting complaints	
Pain	79 (52.0%)
Swelling	34 (22.0%)
Bleeding gums	21 (14.0%)
Loose teeth	16 (10.0%)
Missing teeth	1 (1.0%)
Mal-positioned tooth	1 (1.0%)

Most of the participants presented with Pain (52.0%) followed by swelling (22.0%) and bleeding gums (14.0%). Only 10% of the participants presented with loose teeth (17.2%). Missing teeth and mal-positioned tooth was in 2.0% of the participants.

Table 3: Panoramic radiograph findings

	Overall (N=93)
Panoramic radiograph findings	
Dental Caries	51 (54.8%)
Tooth Impaction	22 (23.7%)
Periodontitis	13 (14.0%)
Fracture	12 (12.9%)
Peri-apical pathology	8 (8.6%)
TMJ disorders	6 (6.5%)
Mandibular cyst/lesion	3 (3.2%)
Missing teeth	3 (3.2%)
Mal-positioned tooth	1 (1.1%)
Soft tissues mass	0 (0%)
Nasal congestion	13 (14.0%)

As per the panoramic radiograph, half (54.8%) of the patients had dental caries, 23.7% had tooth impaction while nasal congestion and periodontitis were diagnosed in 14% each.
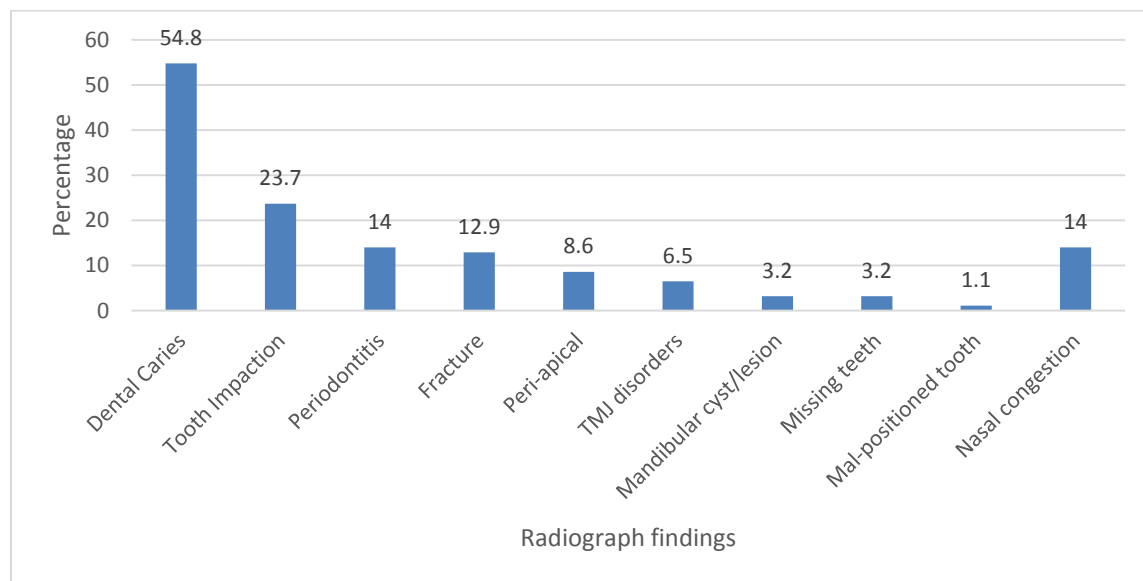
Figure 3: Panoramic radiograph findings

Table 4: Clinical examination findings

	Overall (N=93)
Clinical diagnosis	
Dental caries	47 (50.5%)
Tooth impaction	18 (19.4%)
Periodontitis	15 (16.1%)
Fractures	10 (10.7%)
Periapical lesions	6 (6.4%)
TMJ disorders	6 (6.5%)
Mal-positioned tooth/Displaced teeth	2 (2.2%)
Missing tooth	1 (1.1%)
Soft tissue mass	1 (1.1%)

Clinically, dental caries was identified in 50.5% of the patients while tooth impaction, periodontitis and fractures were identified in 19.4%, 16.1% and 10.7% respectively.
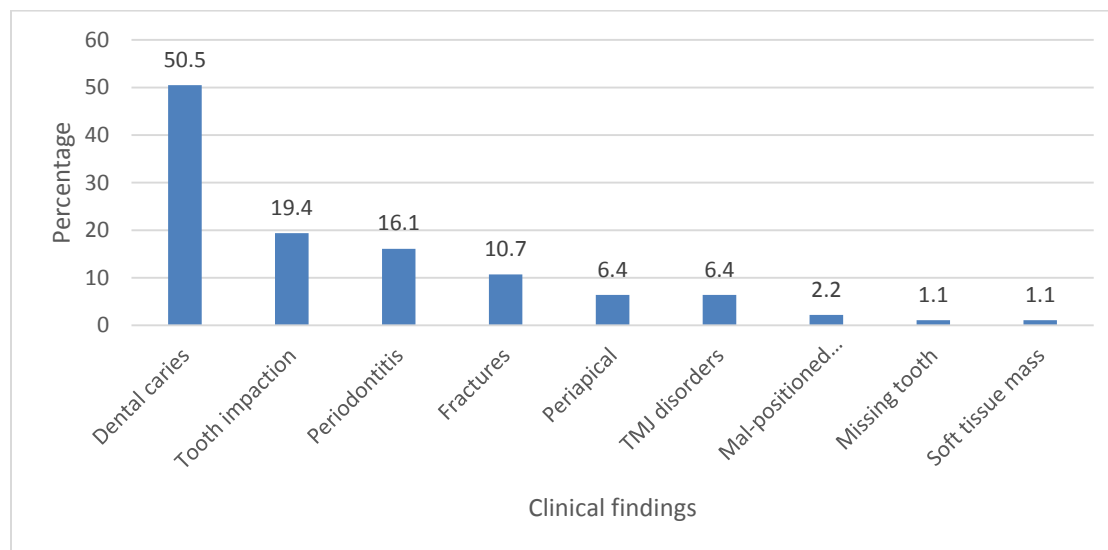
Figure 4: Clinical examination findings

Table 5: Agreement between radiograph and clinical examination findings

	Overall (N=93)
Diagnosis	
Dental Caries	83 (89.3%)
Tooth Impaction	89 (95.7%)
Mandibular cyst/lesion	90 (96.8%)
Periodontitis	91 (97.8%)
Fracture	91 (97.8%)
Periapical pathology	91 (97.8%)
TMJ disorders	91 (97.8%)
Missing teeth	91 (97.8%)
Soft tissue mass	92 (98.9%)
Mal-positioned tooth	92 (98.9%)

Dental caries had a total raw agreement of 89.3% while tooth impaction and mandibular lesion had 95.7% and 96.8% respectively. The overall raw total agreement between clinical examination and radiograph findings was 75.3% (70/93) with a p value of less than 0.001.

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Table 6: Summary of agreement between clinical and panoramic findings

Diagnosis	Radiology	Clinical	Agreement Level	p-value
Dental Caries	51	47	83	<0.001c
Tooth Impaction	22	18	89	<0.001f
Periodontitis	13	15	91	<0.001f
Fracture	12	10	91	<0.001f
Peri-apical pathology	8	6	91	<0.001f
TMJ disorders	6	6	91	<0.001f
Missing teeth	3	1	91	<0.001f
Mal-positioned tooth	1	2	92	<0.001f

There was a significant agreement between clinical and panoramic findings in all the diagnosis made with p value less than 0.001.

SAMPLE IMAGES
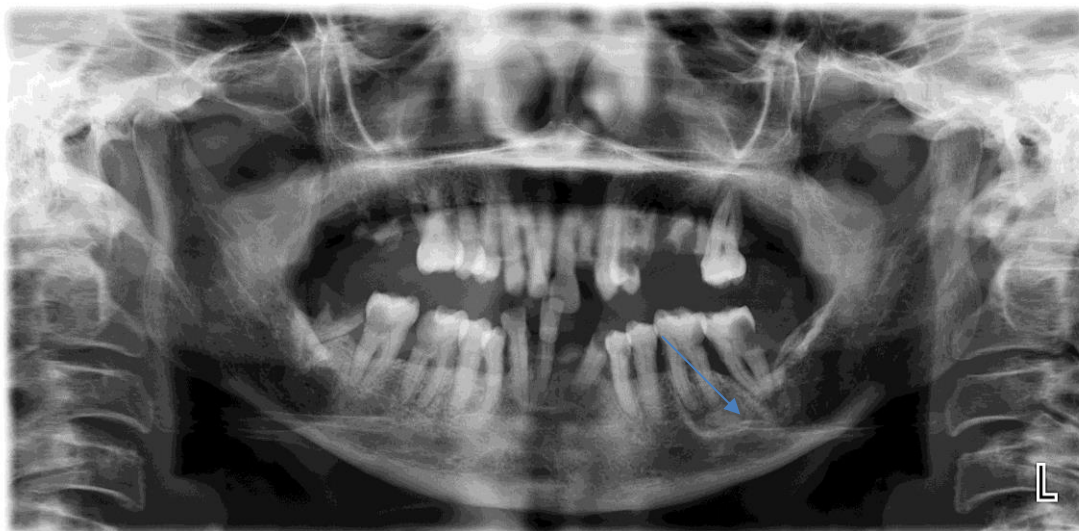
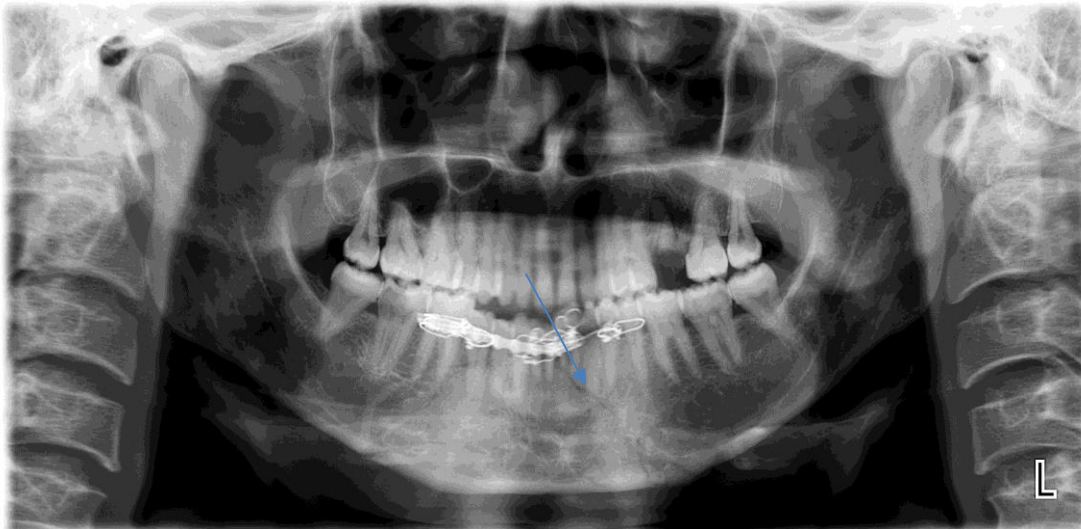**Figure 5: 68 year old with multiple dental caries**

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Figure 6: 35 year old with body of the mandible fracture post-operative
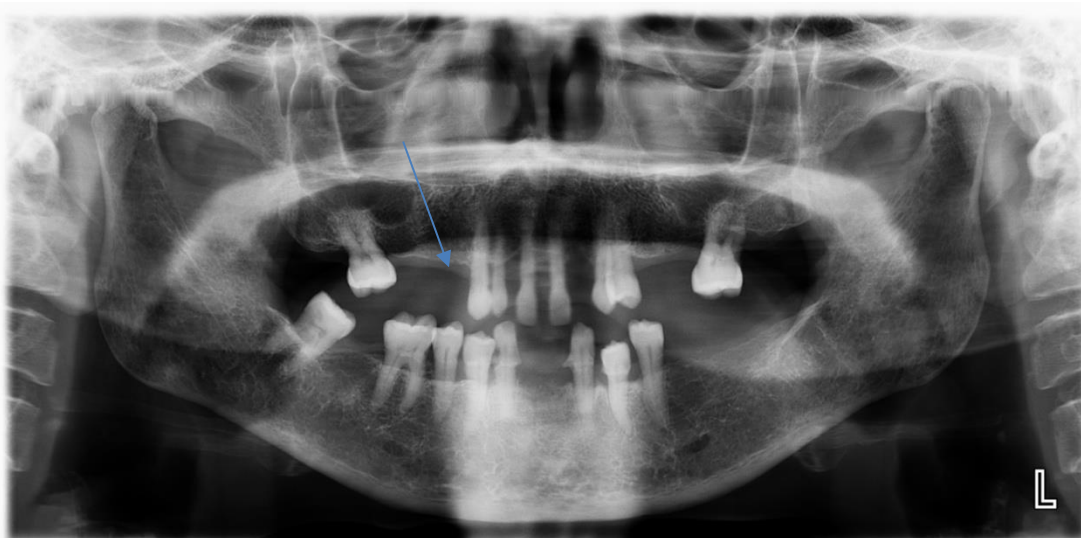

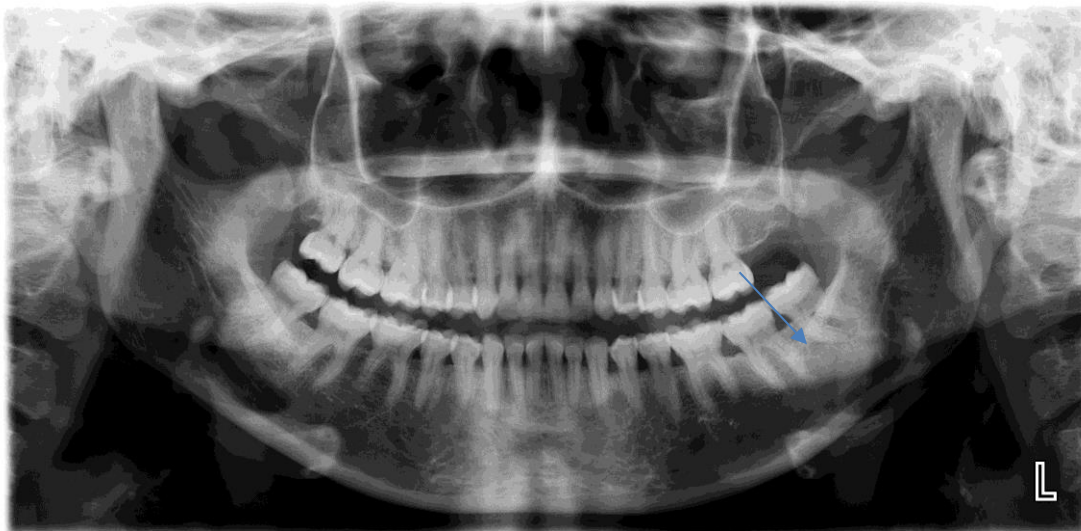**Figure 7: 73 year old with periodontitis and missing teeth**

Figure 8: 35 year old with periapical pathology
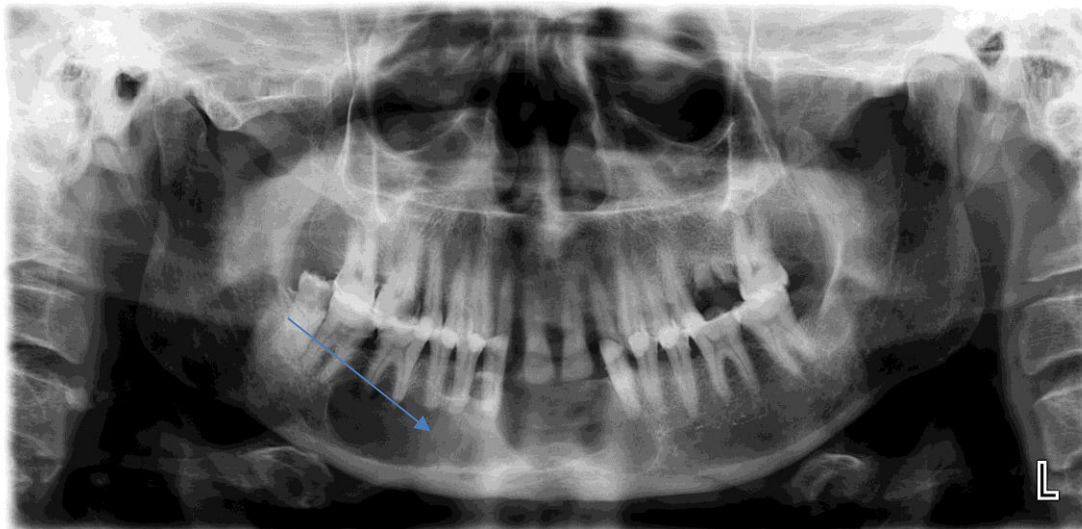

Figure 9: 73 year old with multiple cystic lesions in the mandible
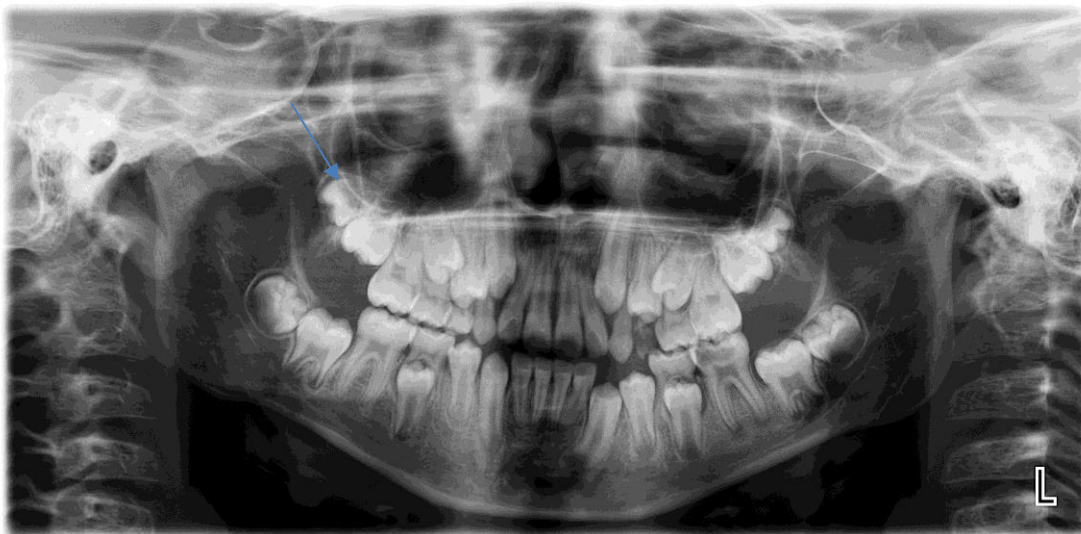
Figure 10: 25 year old with dental caries

Figure 11: 15 year old with tooth impaction

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The most common radiographic presentation is dental caries followed by tooth impaction and periodontitis. The most common clinical examination finding is dental caries followed by tooth impaction and periodontitis. The level of agreement between panoramic radiograph findings and clinical examination findings for dental conditions at MTRH was statistically significant. Notably, radiographs did reveal slightly more cases for more of the condition than had been

diagnosed clinically, with the exception of periodontitis. Incidentally, some dental and non-dental conditions were only discovered following radiographic examination

Recommendations

Agreement between Panoramic and Clinical findings in the diagnosis of dental health conditions is substantial, therefore all patients presenting with dental conditions should be done panoramic radiograph to improve diagnosis. Moi Teaching and Referral Hospital and the Ministry of Health to consider routine panoramic radiographs in the guidelines for the assessment of dental patients in all the hospitals offering, dental health services

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