

## Original Research

### Prevalence and Distribution of Periapical Lesions Using Intra Oral Periapical Radiographs- A cross sectional Study

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#### ABSTRACT:

**Background:** Periapical lesions (PLs) are one among the most frequently occurring pathological lesions of alveolar bone. Even though there are numerous advanced radiographic imaging modalities to visualise periapical region of tooth radiographically, IOPA still remains mainstay for evaluation, diagnosis and treatment plan. **Aim:** The aim of the study is to evaluate the prevalence and distribution of apical periodontitis, periapical granuloma, periapical cyst and periapical abscess by using Intra- Oral Periapical Radiograph. **Material and methods:** 1000 intraoral periapical radiographs of patients taken from the department of Oral Medicine and Radiology from the year 2019. The information collected was analysed for distribution of various periapical lesion. **Statistical analysis:** statistical analysis was done using descriptive statistical study. **Result:** Among 1000 radiographs, 381 radiographs show periapical lesion and 619 shows other findings. Out of 381 radiographs with periapical lesions 214 radiographs show periapical abscess, 123 radiographs show apical periodontitis, 28 radiographs show periapical granuloma and 21 radiographs show periapical cyst. **Conclusion:** 1<sup>st</sup> molar is affected more when compared to other teeth in oral cavity. For assessing the periapical lesion, intraoral periapical radiographs play a tremendous role in investigation of periapical pathologies.

**Key words:** Intraoral, periapical abscess, Apical periodontitis, Periapical granuloma, Periapical cyst.

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#### INTRODUCTION

Radiographic examination is one of the primary diagnostic tools used in dentistry. In which intraoral periapical radiographs(IOPA) are used as an adjunct in clinical examination to determine the disease state and also to view the entire crown and root of teeth and its surrounding structures at least 2mm of periapical bone.<sup>[1]</sup>

Even though there are numerous advanced radiographic imaging modalities to visualize periapical region of tooth, IOPA still remains mainstay for evaluation, diagnosis, and treatment plan.<sup>[2]</sup>

Dentists are facing clinical challenges in diagnosing the periapical lesion because it completely relies on the radiographic changes surrounding the surface of root. Periapical

lesions (PLs) are one among the most frequently occurring pathological lesions of alveolar bone.<sup>[3]</sup>

Majority of the dental problems related to the periapical lesions are normally accessed by the periapical radiographs because identification and differentiation of periapical lesions are excellent compared to other modalities which help in easy diagnosis and treatment plan.

The main aim of this study is to get more knowledge and confidence in diagnosing the most frequent periapical lesions, (periapical abscess, periapical granuloma, periapical cyst and apical periodontitis) (Fig 1) (Table 1)<sup>[3][4]</sup> from which the clinician and the students can understand the frequency of periapical lesion in an individual tooth concern.

Table 1: Radiographic features of periapical lesions<sup>(3)</sup>

Periapical lesions (figure 1)	Radiographic features
Apical periodontitis	Widening of a radiolucent line of the periodontal ligament space.
Periapical abscess	Loss of radiopaque line of lamina dura at the apex and also area of bone loss at the tooth apex.
Periapical granuloma	Circumscribed, well defined radiolucent area of bone loss at the apex, may or may not be surrounded by dense sclerotic border (less than 1cm/200mm <sup>2</sup> )
Periapical cyst	Circumscribed, well defined radiolucent area of bone loss at the apex, surrounded by partial/ complete loss/ dense sclerotic border (1cm/ more in diameter/ 200mm <sup>2</sup> ) <sup>[4]</sup>

**MATERIAL AND METHODOLOGY**

1000 intraoral periapical radiographs of patients taken and manually processed by dental students of final year, interns, 3<sup>rd</sup> year and postgraduates in the Department of Oral Medicine and Radiology were included in the study.

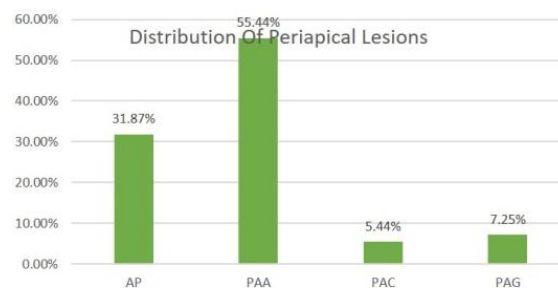
Radiographs were taken using the AMS-6010E intraoral x-ray machine by bisecting angle technique using E speed film with 70kvp and 10mA and exposure time of 0.4seconds. The radiographs were then digitalized by the Xdigi-USB IOPA X-Ray digitizer. Faulty radiographs were excluded from the study. There were limitations on visual interpretation of radiographs, this will be rectified by 2 experienced radiologist and concurrent opinion will be recorded as periapical lesion.

The information collected was analyzed for distribution of various periapical lesions and the data were entered in Microsoft Excel and statistical analysis was done.

**RESULT**

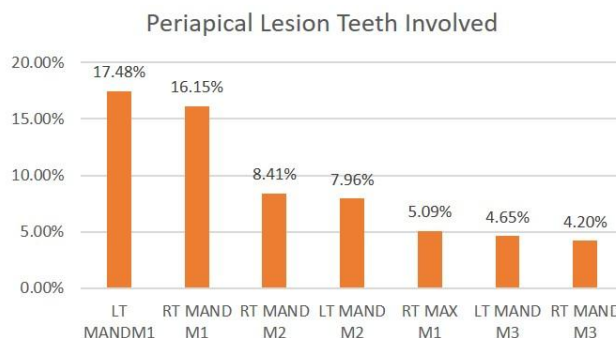
All the 1000 radiographs were viewed for periapical changes. The data were entered in Microsoft excel. All the radiographs were rechecked by 2 radiologists with an experience of more than 10years. Among 1000 radiographs, 381 radiographs show periapical lesion and 619 shows other findings.

Out of 381 radiographs with periapical lesions 214 radiographs show periapical abscess, 123 radiographs show apical periodontitis, 28 radiographs show periapical granuloma and 21 radiographs show periapical cyst.



**Chart 1: Distribution of Various Forms of Periapical Lesions**

Among the 386 radiographs, mandibular teeth were commonly affected by periapical lesion particularly posterior left mandibular molar.

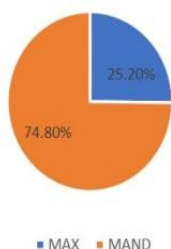


**Chart 2: Distribution of Periapical Lesion In Individual Teeth (LT- left, RT- right, MAND-mandible, MAX- maxilla, M- molar**

For apical periodontitis and periapical abscess, mandibular teeth were affected more in posterior left mandibular molar, when compared to maxillary teeth.

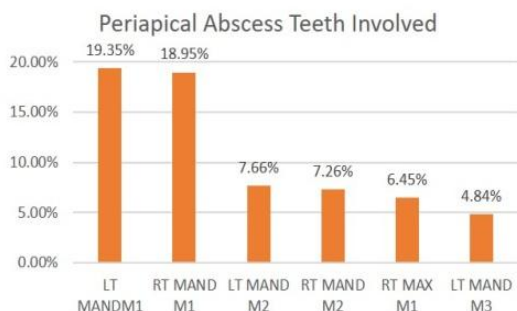
Among 123 case of apical periodontitis, 31 were distributed in maxilla and 92 were distributed in mandible.

Apical Periodontitis Distribution



**Chart 3: Distribution of Apical Periodontitis In Maxilla And Mandible**

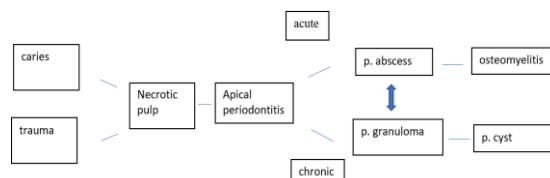
Among 1000 radiographs, 248 radiographs were reported to have periapical abscess, among which left mandibular molar had a higher distribution of about 19.35%.



**Chart 4: Distribution of Periapical Abscess In Individual Teeth.**

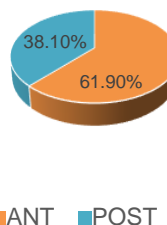
Among 21 periapical cysts, 13 were distributed in anterior and 8 were distributed in posterior, in which maxillary left central incisor were more commonly affected.

In periapical granuloma both maxillary and mandibular teeth were commonly affected, mainly posterior left mandibular molar which is similar to apical periodontitis and periapical abscess.



**Fig 2: Interrelationship of possible results of inflammation (5) (p. abscess- periapical abscess, p. granuloma- periapical granuloma, p. cyst- periapical cyst).**

Periapical Cyst Distribution



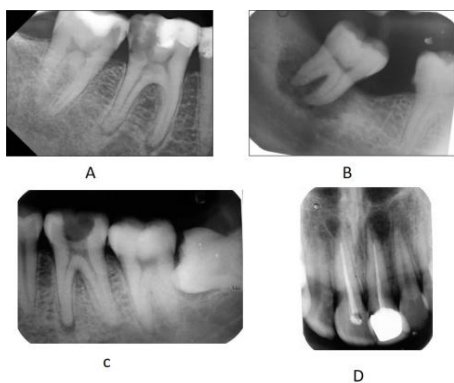
**Chart 5: Distribution of Periapical Cyst In Anterior (ANT) And Posterior (POST).**

Out of the 28 periapical granulomas, 14 were diagnosed in maxilla and 14 presents in mandible.

Periapical Granuloma Distribution



**Chart 6: Distribution of Periapical Granuloma In Maxilla And Mandible**



**Fig 1: Periapical lesions (A- Apical Periodontitis B- Periapical Abscess C- Periapical Granuloma D- Periapical Cyst)**

The left mandibular quadrant is the most affected, in the left mandibular quadrant the posterior region is the most affected site. In that 1<sup>st</sup> molar was affected the most when compared to other individual teeth. (table 2).

The rest 619 radiographs showed restoration, periodontitis, pulpitis, RC treated teeth, attrition, impaction, root stump, periodontal abscess, radiographs without any change and teeth fracture.

Table 2: periapical lesion affecting the teeth with quadrant involved

Periapical lesions	Quadrant affected	Teeth involved
Periapical abscess	3 <sup>rd</sup> quadrant	1 <sup>st</sup> molar
Apical periodontitis	3 <sup>rd</sup> quadrant	1 <sup>st</sup> molar
Periapical cyst	2 <sup>nd</sup> quadrant	Central incisor
Periapical granuloma	3 <sup>rd</sup> quadrant	1 <sup>st</sup> molar

## DISCUSSION

Intraoral periapical radiographs are conventional screening aids used to visualise the tooth and its surrounding structure. The advantages of IOPA are to visualize the periapical region, to diagnosis the periapical pathology, to study crown and root length, to determine root morphology, to study the integrity of the lamina dura, as a part of routine radiographic examination.

Periapical lesions are the most common pathological lesion that show countless presentations on radiographic appearance. The main cause of periapical lesion is due to inflammatory reaction resulting from necrosis of the pulp or through the destruction of the periapical tissues by extensive periodontal disease. Sequelae of pulpal inflammation / necrosis with inflammatory mediators spreading through the apical foramen will end up in periapical lesion. (figure 2).<sup>[5]</sup> These periapical lesions are confined to the local bone adjacent to the apex of the tooth. Sometimes these lesions may be large but the epicenter will be at the apex of the tooth. In imaging, Periapical lesions may be lytic or sclerotic or both. These changes depend upon the duration and nature of the lesions.

These periapical lesions can also occur without pulpal involvement. The pulpal infection may drain not only through the apical foramen, but also through an accessory canal which will appear as peri-radicular radiolucency in radiography.

Disease that affects the periodontium usually is a result of the direct extension of pulpal disease or due to apical progression of periodontal disease. When the pulp becomes infected, the disease can progress beyond the apical foramen and inflame the PDL. The inflammatory process results in replacement of the periodontal ligament by inflammatory tissue.

The endodontium and periodontium are closely related and diseases of one tissue may lead to secondary diseases in the other. The differential diagnosis of endodontic and periodontal diseases can sometimes be difficult but it is of vital importance to make a correct diagnosis so that the appropriate treatment can be provided.<sup>[6]</sup>

There are some normal anatomical landmarks which mimics periapical radiolucency. In maxilla, the landmarks are maxillary sinus, nasal fossa, incisive fossa and in mandible, the landmarks are mental foramen, interdental nutrient canal, mandibular canal and submandibular fossa.<sup>[4]</sup>

There are some radiopaque shadows which complicate periapical interpretation by obscuring / obliterating the detailed shadows of periapical lesions such as mylohyoid ridge, body of zygoma, area of zygomatic bone (dense bone islands).

The commonly encountered radiolucent periapical lesions are periapical abscess, periapical granuloma, periapical cyst and apical periodontitis. All these lesions were included in our study and these have specific features that helps to differentiate between one another. (table 1) Sometimes, there may be persistent periapical radiolucency near root canal treated teeth. This may be because of the root canal being infected, extraradicular infection, periapical true cyst, foreign body reaction, or periapical scar. These may get confused with other periapical lesions.<sup>[7]</sup>

There is also radiopaque lesion but are limited in nature in our study condensing osteitis was appreciated in 4 radiographs.

In our study, periapical lesions in IOPA were evaluated quadrantally ( maxilla, mandible), segmentally (anterior, posterior) ,and also individually (individual teeth involvement). Whereas Nausheen et al in 2015, same maxillary/mandibular teeth involvement and anterior/ posterior teeth involvement were mentioned but individual teeth involvement was not mentioned. By doing so we found that mandibular posteriors mainly 1<sup>st</sup> molars were mostly involved.<sup>[8]</sup>

In Subashin et al study, radiographs with periapical radiolucent alone were selected in which apical periodontitis shows a higher prevalence. But In our study, 1000 radiographs were randomly selected and the radiographs which showed periapical lesions were separated. Among these selected radiographs, periapical abscess show higher prevalence.<sup>[2]</sup>

In Akinyamoju et al study, periapical lesions were diagnosed by compelling clinical and histopathological findings whereas in our study IOPA was used to diagnose periapical lesions. They included periapical cyst and granuloma in which granuloma showed higher prevalence and it was encountered higher in maxillary anterior. Similarly in our study, comparing to the periapical cyst, periapical granuloma shows higher prevalence but it was encountered higher in posteriors.<sup>[9]</sup>

Teresa Berlinck et al concluded that apical periodontitis was more common in central and lateral incisor whereas in our study apical periodontitis was more common in first molar.<sup>[10]</sup>

Even though IOPA has numerous advantages, there are also disadvantages with IOPA includes it gives 2D shadows of 3D image as a result the Buccolingual dimensions cannot be assessed, only suggestive diagnosis can be made and they are not the final evidence in judging clinical problem and Cannot be used in high gag reflex patients.

Lofthag- Hansen et al concluded that during apical surgery for better knowing the anatomical structure without overlapping of unwanted structure 3D image is required. In 2D periapical view, the divergence and location of the root near maxillary sinus and the mandibular canal will not be accurate for management.<sup>[11]</sup>

Eduardo M. Villoria et al suggested that for better accuracy, CBCT showed high resolution in diagnosing the periapical lesions when compared to digital and conventional intraoral periapical radiography.<sup>[12]</sup>

### LIMITATIONS

Because of cross-sectional study gender and age group category was not mentioned due to improper data collection and also symptomatic and asymptomatic category was also not mentioned in our study.

Increasing the sample size can give much more confidence about radiographic interpretation of periapical lesions.

Periapical radiographs have certain limitations like anatomical noise, two dimensional and geometric distortion. To overcome this CBCT (3D imaging) is used to eliminate the superimposition of anatomical structures and also it will improve the observation of bone structures.<sup>[10]</sup>

### CONCLUSION

It was observed that the 1<sup>st</sup> molar was more affected more when compared to other teeth in oral cavity probably because 1<sup>st</sup> molar is the first permanent tooth to be erupted in an earlier stage and retained in the oral cavity for a prolonged time.

Radiographic interpretation plays a main role in diagnosis and treatment planning. And also for assessing the periapical lesion, intraoral periapical

radiographs play a tremendous role in the investigation of periapical pathologies.

To get proper knowledge about anatomical landmarks and pathological sequelae of the periapical lesion, we should follow an appropriate systematic approach that will end up in definitive diagnosis.

### REFERENCES

1. Gupta A, Devi P, Srivastava R, Jyoti B. Intra oral periapical radiography - basics yet intrigue: A review. *Bangladesh J Dent Res Educ.* 2014 Aug 30;4(2):83–7.
2. Suyambukesan S, Chandran Lenin Perumal G, Somasundaram E, Jeyavel Pandian N, Manigandan T. Analyzing Periapical Lesions on Intraoral Periapical Radiographs: Incongruity in Diagnosis. Kailasam S, editor. *J Indian Acad Oral Med Radiol.* 2013;25:5–9.
3. Wood NK, Goaz PW, Wood NK. Differential diagnosis of oral and maxillofacial lesions. 5th ed. St. Louis: Mosby; 1997. 656 p.
4. Whaites E. *Essentials of Dental Radiography and Radiology.* :444.
5. White SC, Pharoah MJ. *Oral radiology: principles and interpretation.* St. Louis, Mo.: Mosby; 2009.
6. Prof. Dr. Iman Mohammed perio endo lesion. Al-Mustansiria University College of Dentistry Endodontics lectures 5th year
7. Abbott PV. Diagnosis and management planning for root-filled teeth with persisting or new apical pathosis: Diagnosis and management planning. *Endod Top.* 2008 Sep;19(1):1–21.
8. Mobeen N. Incidence of Common Periapical Lesions - An Intra Oral Periapical Radiographic Study. *J Pharm Sci.* 2015;7:2.
9. Periapical lesions of the jaws: a review of 104 cases in Ibadan.
10. Epidemiological evaluation of apical periodontitis prevalence in an urban Brazilian population.
11. Lofthag-Hansen S, Huuonen S, Gröndahl K, Gröndahl H-G. Limited cone-beam CT and intraoral radiography for the diagnosis of periapical pathology. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontology.* 2007 Jan;103(1):114–9.
12. Villoria EM, Francio LA, da Cunha CHR, Manzi FR. Identification of simulated periapical diseases using five different diagnostic imaging methods. *Rev Port Estomatol Med Dentária E Cir Maxilofac.* 2016 Jul;57(3):138–45.