

# Prevalence of Dental Caries Using Periapical Radiographs in Adult Population Visiting a Private Dental Hospital

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## ABSTRACT

### BACKGROUND

The use of radiographic methods to diagnose dental caries was based on the principle that as the caries precedes the mineral content of enamel and dentin decreases and is prone to the attenuation of the x - ray beam.

### AIM

The aim of this study was to assess the prevalence of dental caries using periapical radiographs.

### MATERIALS AND METHODS

This was a comparative, descriptive study, where all the data of the patients who reported to the dental clinics in Saveetha dental college, SIMATS, Chennai, India, was obtained from the Dental Information Archiving Software (DIAS). Patient records were collected between March 2020 and March 2021. Data was collected and tabulated. The collected data was further analyzed, recorded in Microsoft Excel software and was subjected to statistical analysis using IBM SPSS statistics analyzer v.23.0.

### RESULTS

The total sample size of the current study was 12617 cases. In this study, the data was analyzed for the presence of various carious lesions. Satisfactory results demonstrating the presence of carious lesions were obtained. The highest prevalence was seen in males and in the age group of 18 to 28 years. The most common type of dental caries was caries involving dental pulp. The most common site was the upper anterior region. Significant association was observed between the location and the type of caries, age and the type of caries and the gender and type of caries.

### CONCLUSION

It was found that caries involving pulp were the most common dental caries diagnosed using periapical radiographs. It was also found that caries was more prevalent in males and in the age group of 18 to 28 years. This study will hopefully provide insight into the prevalence of dental caries and about periapical radiographs.

### KEYWORDS

Caries involving pulp, Deep occlusal caries, Dental caries, Periapical radiographs

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## INTRODUCTION

Dental caries is an irreversible disease of microbial origin where there is demineralization of the inorganic portion of the teeth and the subsequent destruction of the organic portion of the teeth which leads to cavitation.<sup>1,2</sup> Dental caries is the most prevalent or facial pathology in the whole world followed only by periodontal disease.<sup>3,4</sup> The etiology of this dental caries can be explained using the modified key's triad which includes susceptible host, plaque microorganisms, favorable substrate and time.<sup>5-7</sup> The use of periapical radiography has been advocated for the diagnosis of dental caries as they are cost effective with higher resolution and have a lower amount of radiation exposure.<sup>8-11</sup> However if multiple carious sites are involved in the oral cavity, the use of panoramic radiographs are sought after.<sup>12-14</sup> It was found that over a 100 years back, a man by the name of G.V. Black classified dental caries from class I to class VI, where class I caries is the caries involving pits and fissures of posterior teeth and the facial surfaces of molar along with the palatal surface of maxillary incisors. Class II dental caries involves the proximal surfaces of molars and premolars. Class III and class IV dental caries involve the proximal surfaces of anteriors where class III does not involve the incisal angle whereas class IV dental caries does. Class V dental caries indicate caries on the cervical third of the facial and lingual surfaces of teeth. Class VI dental caries involve the incisal edges of anterior teeth and the cusp tips of posterior teeth.<sup>15-20</sup> On assessment of previous literature, it was found that dental caries was a dynamic process where at its early stages, it was reversible (white spot lesion) and even at its advanced stages, it could be arrested.<sup>21</sup> It was also observed that children were the most commonly affected with dental caries and every 6 - 9 children out of 10 were affected with tooth decay.<sup>22</sup> The use of radiographic methods to diagnose dental caries was based on the principle that as the caries proceeds, the mineral content of enamel and dentin decreases and is prone to the attenuation of the x - ray beam.<sup>23</sup> For single site dental caries, implant diagnosis, periapical pathologies, etc use of periapical radiographs is sought after as it is having higher sensitivity and resolution compared to panoramic radiographs.<sup>24</sup> Use of these radiographs can aid in the early diagnosis of dental caries which will effectively reduce the time and cost of repair or replacement of teeth.<sup>25</sup> When coming to oral microbiology, it was found that the organisms most commonly associated with dental caries were streptococcus mutans, streptococcus salivarius and lactobacillus.<sup>26</sup> The requirement of this study is due to the increased prevalence of dental caries in recent decades where the percentage of the patients with a disease worldwide increased to 46.6 %.<sup>27,28</sup> Early diagnosis, intervention and prevention can help improve global oral hygiene. This study can aid dental professionals gain awareness about the radiographic diagnosis of dental caries for the prevention of caries and overall better treatment prognosis. Our team has extensive knowledge and research experience that has translated into high quality publications.<sup>29-48</sup> The aim of the current study is to assess the prevalence of dental caries using periapical radiographs.

## MATERIALS AND METHODS

This research study was defined as a descriptive study where the entire patient's data that reported to Saveetha dental college and hospitals, SIMATS, Chennai, India and were diagnosed with secondary caries were obtained from the Dental Information Archiving Software (DIAS). This study

setting was a university setting and the research study was conducted in the dental clinics of Saveetha dental college. This setting came with various pros and cons. The pros included the presence of a larger population and an abundant availability of data. Some of the cons included the study taking place in a unicentred setting and possessing a very limited demographic. This population was selected from the patients over the age of 18 years who visited the undergraduate and postgraduate dental clinics in Saveetha dental college. The approval to undertake this research study had been approved by the ethical board of Saveetha University (applied). n = 12617 cases were reviewed and cross verification was performed by an additional reviewer. The minimization of sample bias was performed by an additional reviewer, acquiring all the data from within the university and as an additional measure, simple random sampling was performed. There was a presence of high internal and low external validity. Sample collection was performed from March 2020 to March 2021. The data was then arranged in a methodical manner using Microsoft Excel software and was tabulated on the basis of 4 parameters namely, age of subject, gender of subject, the type of dental caries and the location of the dental caries. The data was validated by an additional reviewer. Any incomplete or censored data that was present in the collected data was excluded from the study.

## Statistics

Statistical analysis of the compiled data was performed using IBM SPSS statistical analyzer V.23.0. *Chi square test* was done for statistical analysis. The inclusion criteria for this study were outpatients with dental caries who have had periapical radiographs taken irrespective of their age or gender. The exclusion criteria included outpatients who did not have the presence of dental caries.

## RESULTS AND DISCUSSION

The data was collected and sorted based on the 4 parameters mentioned previously. Figure 1 explains about the age wise distribution of the study population. Out of 12617 cases, 33.21 % were of the ages between 18 to 28 years which was the most common followed by 29 to 38 years with 27.81 %, 39 to 48 years with 22.63 %, 49 to 58 years with 11.52 %, 59 to 68 years with 4.14 %, 69 to 78 years with 0.67 % and 79 to 88 years with 0.02 %. The reason that a younger population presented with a larger prevalence could be due to the increased awareness regarding dental caries and the increase in the dental visits by a younger population between the ages of 20 to 30 years.<sup>49,50</sup> The reason for the very limited prevalence of dental caries in a population above the age of 69 years was unclear especially because literature suggests that caries experience increases with age.<sup>51,52</sup> In a study conducted by Ralph H, 2004, it was suggested that this could be due to the increase in edentulousness over the age of 65 and also mentioned that the risk of development was proportional to the number of teeth present.<sup>53-55</sup>

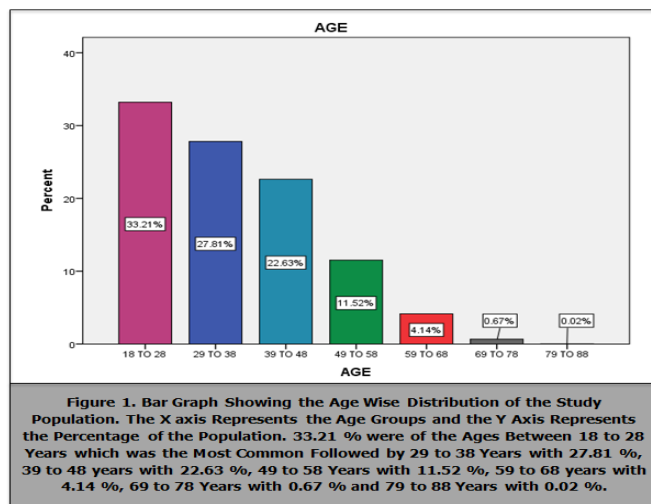


Figure 2 demonstrates the gender wise distribution of the study population. Out of the entire study population, 50.2 % of the patients were male and 49.8 % of the patients were female indicating a mild male predominance. On analysis of literature, it was observed that, the majority of the studies suggested higher caries prevalence in females compared to males contradictory to the current study.<sup>56-60</sup> The reasons suggested for the female prevalence include early tooth eruption, hormonal changes, poorer oral hygiene and difference in dental attendance.<sup>61-63</sup> The reason for the male prevalence in the current study is not understood clearly.

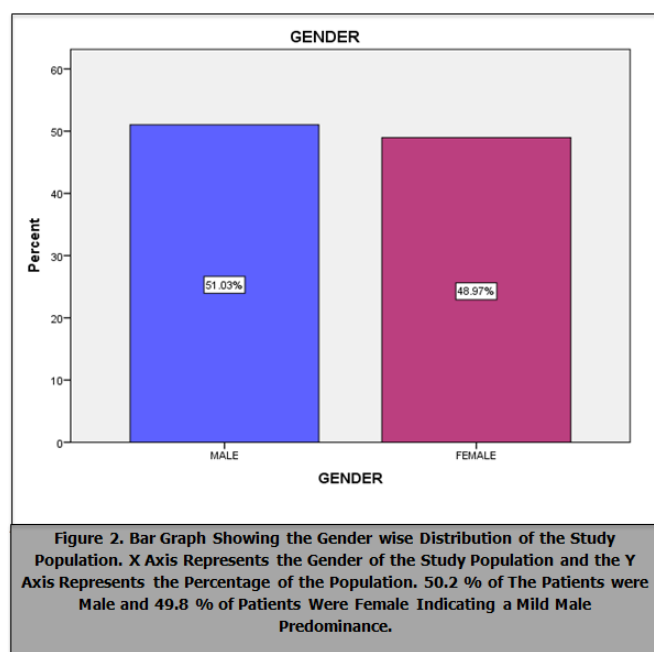


Figure 3 demonstrates the type of dental caries observed in the population. Caries involving pulp were commonly observed with 31.96 % of the study population; the least commonly observed was deep occlusal caries with a mere 5 %. The reason why caries involving pulp was the most commonly observed radiographically could be due to increased demineralisation and destruction of tooth structure and also due to the increased presentation of patients when the tooth turned symptomatic.<sup>64-66</sup>

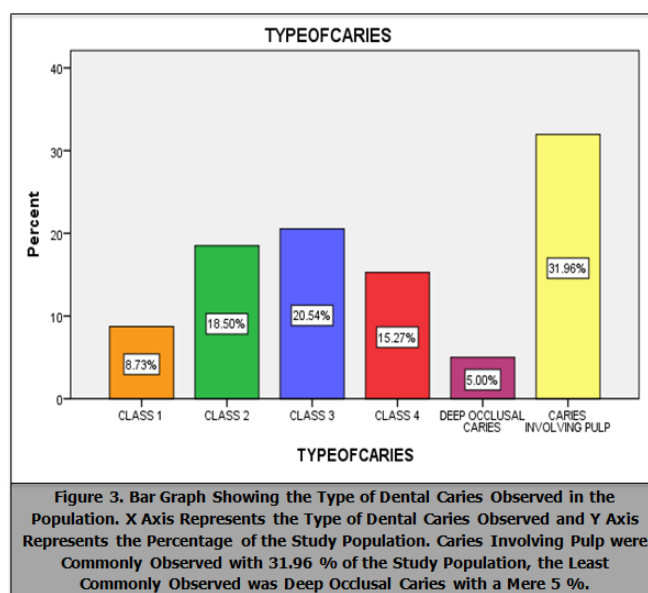


Figure 4 demonstrates the location of the dental caries where radiographs were taken. Surprisingly the upper anterior region was the most common site of radiographic examination with 39.8 % followed by lower posterior (30.9 %), upper posterior (22.9 %) and lower anterior (6.4 %). On review of literature, it was found that the highest prevalence of caries was noted in the lower posterior region and the least observed caries prevalence in the lower anterior region which was in concordance with the study.<sup>67-71</sup> The reasons for the upper anterior prevalence need to be assessed and could provide insight into the oral hygiene of the Indian population.

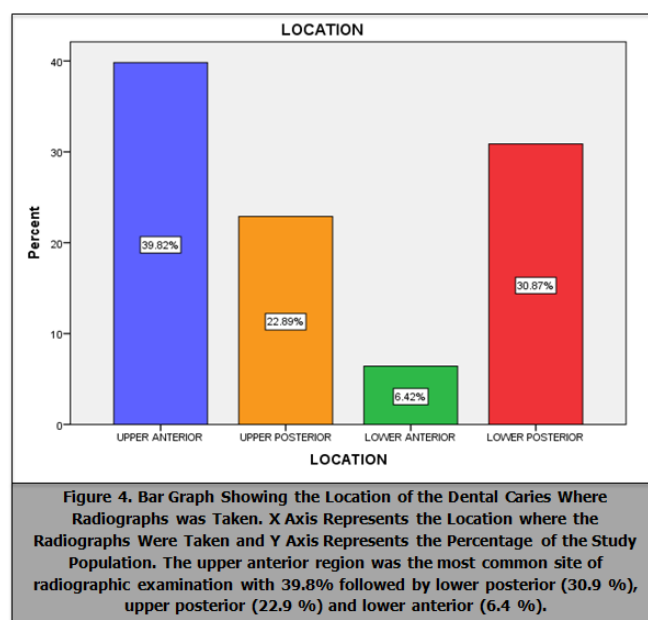
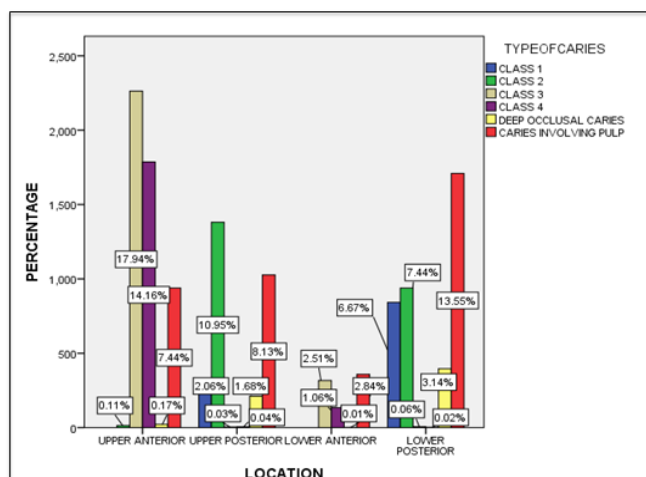
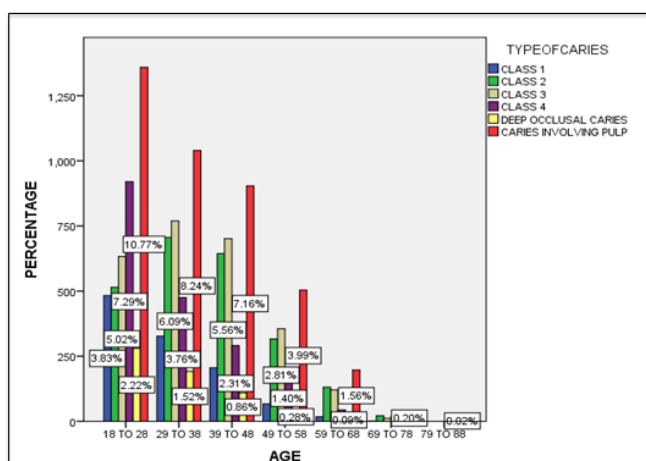


Figure 5 explains the association between the location and the type of dental caries. We observed significant association between the location and the type of caries ( $p = 0.00$ ). It was observed that class III caries was more prevalent in the upper anterior whereas class II caries was more prevalent in the upper posteriors. Both in the lower anterior and posterior region, caries involving pulp were most common.



**Figure 5.** Bar Graph Showing the Distribution of Dental Caries in the Different Locations of the Oral Cavity. X Axis Represents the Location where the Radiographs were taken and Y Axis Represents the Percentage of the Study Population. The Blue Colour Represents Class 1 Dental Caries, Green Colour Represents Class 2 Dental Caries, Brown Represents Class 3 Dental Caries, Purple Represents Class 4 Dental Caries, yellow Represents Deep Occlusal Caries and Red Represents Caries Involving Pulp. It was observed that Class III Caries was Significantly More Prevalent in the Upper Anterior Whereas Class II Caries was More Prevalent in the Upper Posteriors. Both in the Lower Anterior and Posterior Region, Caries Involving Pulp were Most Common. Chi Square Statistical Test was done and the p Value was Found to be 0.00 (p value  $\leq 0.05$ , statistically significant).

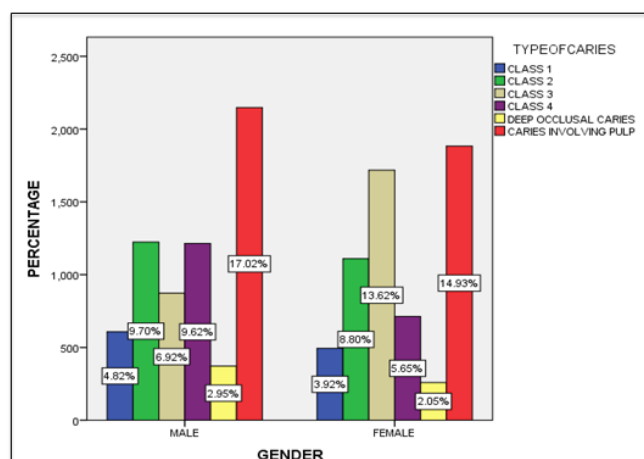
Figure 6 explains the association between the age of the subject and the type of dental caries. It was observed that there was significant association between age and the type of dental caries. Caries involving pulp were found to be the most prevalent type of dental caries diagnosed using periapical radiographs in all the age groups assessed in this study (Figure 6).



**Figure 6.** Bar Graph Showing the Distribution of Dental Caries in the Different age groups of the Study Population. X axis Represents the Age Groups of the Study Population and Y axis Represents the Percentage of the Study Population. The Blue Colour Represents Class 1 Dental Caries, Green Colour Represents Class 2 Dental Caries, Brown Represents Class 3 Dental Caries, Purple Represents Class 4 Dental Caries, yellow Represents Deep Occlusal Caries and Red Represents Caries Involving Pulp. Caries Involving Pulp were Found to be the Most Prevalent Type of Dental Caries Diagnosed using Periapical Radiographs in all the Age Groups Assessed in this Study. Chi Square Statistical Test was Done and the P Value was Found to be 0.00 (P Value  $\leq 0.05$ , Statistically Significant).

Figure 7 demonstrates the association between the gender of the subject and the type of dental caries. This association was found to be statistically significant ( $p = 0.00$ ). In both males and females, the most prevalent type of dental caries

was caries involving pulp. However, it was also found that females had a greater degree of class 3 dental caries compared to males.



**Figure 7.** Bar Graph Showing the Distribution of Dental Caries in the Different Genders of the Study Population. X Axis Represents the Genders of the Study Population and Y Axis Represents the Percentage of the Study Population. The Blue Colour Represents Class 1 Dental Caries, Green Colour Represents class 2 Dental Caries, Brown Represents Class 3 Dental Caries, Purple Represents Class 4 Dental Caries, Yellow Represents Deep Occlusal Caries and Red Represents Caries Involving Pulp. Caries Involving Pulp were Found to be the Most Prevalent Type of Dental Caries Diagnosed Using Periapical Radiographs in all the Age Groups Assessed in this Study. Chi Square Statistical Test was Done and the P Value was Found to be 0.00 (p value  $\leq 0.05$ , Statistically Significant).

## CONCLUSION

Within the limitations of the current study, it was found that caries involving pulp were the most common dental caries diagnosed using periapical radiographs. It was also found that caries was more prevalent in males and in the age group of 18 to 28 years. The caries that were frequently seen were in the upper anterior region. This study will hopefully provide insight into the prevalence of dental caries and about periapical radiographs.

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