Introduction

Radiographic examination is a critical component of comprehensive and accurate diagnosis and treatment planning for pediatric patients. Radiographs are used to diagnose oral diseases, monitor dentofacial development, and also used for evaluation of the treatment procedure. However, the risks associated with radiographic exposure should be taken into consideration. Different radiographic techniques available can be classified as intraoral and extraoral. Some of the intraoral techniques include intraoral periapical radiographs (IOPAR) and bitewing radiographs, and the extraoral techniques include panoramic radiographs and lateral cephalogram.

Justification of any radiographic examination in children and young adults is necessary as they are more radiosensitive than adults. They should be taken only when there is an expectation that the diagnostic yield will affect patient care. Effects of radiation exposure accumulate over time; every effort must be made to minimize the patient's exposure, especially for younger children. It is widely recognized that pediatric patients must be treated differently from their adult counterparts, partly because

Evaluation of requirement of taking panoramic radiographs in children less than 6 years of age - A retrospective study

Janvi M. Gandhi, Lavanya Govindaraju

Department of Pediatric and Preventive Dentistry, Saveetha Dental College, Saveetha Institute of Medical and Technical Science, Chennai, Tamil Nadu, India

Abstract

Aim: To evaluate the prevalence of prescribing panoramic radiographs in children less than 6 years of age. Materials and Methods: The retrospective study was conducted in a dental institution in Chennai between December 2019 and January 2021. Details of all the children less than 6 years subjected to panoramic radiographs were collected. The reason for taking panoramic radiographs was also recorded. Chi-square tests were done to statistically analyze the data, and the significance level was set at 0.05. Results: Out of 2,847 children less than 6 years of age visiting the dental institution, 1.08% (31 children) were advised to take an orthopantomogram (OPG) during the study period. Early childhood caries (75% in males and 66.7% in females) was found to be the most common reason for taking panoramic radiographs followed by developmental disturbances (12.5% in males and 13.3% in females). Chi-square test showed statistical significance between males and females (P value = 0.003 and 0.002) for the reasons for taking panoramic radiographs in children. Conclusion: Usage of radiographic techniques, especially panoramic radiographs should be limited for children under 6 years of age unless absolutely necessary.

Keywords: Children, developmental disorders, extraoral radiography, panoramic radiographs, pathologic conditions
infants and children have, on average, a higher risk of undergoing malignant transformation than adults receiving the same dose.\textsuperscript{[2,3]}

Panoramic radiographs, an extraoral radiographic technique, is widely used in pediatric dental practice as they offer the ability to capture both maxillary and mandibular teeth as well as the surrounding structures and tissues in one image. Though the radiation dose of exposure is low, and the method is more convenient in children, it requires an exposure time of several seconds during which is difficult to keep the children without any movement, and also it does not have a fine resolution resulting in low quality of images. According to the European Academy of Paediatric Dentistry (EAPD) guidelines for use of radiographs in children, panoramic radiography is not indicated in children for general screening purposes.\textsuperscript{[3]}

Although there are several guidelines and selection criteria relating to dental radiographs, there are currently no specific guidelines pertaining to the use of panoramic radiographs in children and young adults. According to the American Academy of Pediatric Dentistry (AAPD) guidelines,\textsuperscript{[4]} a child with primary dentition without evidence of disease and with open proximal contacts may not require a radiograph at this time. General primary care providers and family physicians should pay utmost interest to this area of study as it has been noted that radiographs are prescribed in children without the necessary indications and precautions taken for children and the health care provider.\textsuperscript{[3]} The aim of the retrospective study was to evaluate the prevalence of prescribing panoramic radiographs in children less than 6 years of age.

Materials and Methods

Study design and setting
The study was a university-based single cantered study. The present retrospective cohort study was conducted in a private dental college, and ethical approval was obtained from the Institutional Review Board, Saveetha Institute of Medical and Technical Sciences.

Data collection
The study population consisted of all the children under 6 years of age for whom a panoramic radiograph was prescribed from December 2019 to January 2021 in one university in Chennai, India. The purpose or indication of taking the panoramic radiograph, whether it was taken to assess 1) early childhood caries, 2) pathological conditions, 3) dental anomalies, 4) full mouth rehabilitation case involving multiple carious teeth, or 5) eruption status of succedaneous teeth was also recorded.

The data collected were entered in a methodical manner and tabulated in google sheets.

Statistical analysis
All the analyses were carried out using IBM SPSS version 23.0 IBM corporation, NY, USA.

Chi-square tests were done to statistically analyze the data, and the significance level was set at 0.05.

Results
The present study included children less than 6 years of age with only primary dentition. A total of 2,847 children less than 6 years of age reported to the Department of Pediatric and Preventive dentistry for treatment. Out of which only 1.08\% (31 children) were advised for OPG. The mean age of the children who were advised an OPG was 2.77 years, and it involved 16 males and 15 females.

Early childhood caries (ECC) was found to be the most common reason for taking panoramic radiographs in all the included age groups followed by developmental disturbances and pathologies [Figure 1]. With regards to the age group of children included in this study, 5- and 6-year-old children showed a statistically significant difference (P value = 0.044 and 0.013, respectively) in the reasons for prescribing panoramic radiographs and with regard to the gender of the children included, both males and females showed a statistically significant difference (P value = 0.002 and 0.003, respectively) [Table 1].

Discussion
Radiographs serve as an important aid in diagnosing and monitoring the oral health care of children. However, the risks associated with the radiographs should be looked upon.\textsuperscript{[3]} Good radiological practices help in reducing unnecessary radiation exposure in children.\textsuperscript{[3]} The pediatric population is more susceptible to the risks of ionizing radiation. This is because of the higher mitotic activity which leads to the higher radiation sensitivity of tissues as the tissues are less developed and contain more undifferentiated cells in children. Children have smaller heads which, when exposed to conventional radiation techniques like panoramic radiographs, makes their thyroid gland and brain at a higher risk as it is closer to the dental area being exposed to radiation. Thus, children's anatomical features increase the chance of malignant transformation.\textsuperscript{[6,7]} Hence, every possible measure should be taken to reduce patient exposure to radiation in children.\textsuperscript{[8,9]}

In the present retrospective study, it was found that only 1.08\% of the children were subjected to OPG. Early Childhood Caries (ECC) was
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The most common reason for prescribing panoramic radiographs as these children with multiple caries involvement were most likely to undergo full mouth rehabilitation under general anesthesia. But the drawback of OPG is the inability to obtain high-quality images due to low resolution. In this case, the dentists should explain to the parent about the appropriate management techniques with associated relative risks and benefits of the various treatment options for the patient according to the AAPD guidelines. This study helps general primary care providers and family physicians in understanding the risks of panoramic radiography in children and also highlights that radiography in children below 6 years of age is not indicated unless absolutely necessary.

The next most common reason for prescribing OPGs according to this study was developmental disturbances like ectodermal dysplasia, supernumerary teeth, or growth disturbances.

Use of panoramic radiographs should be limited in children and not prescribed in children below 6 years unless absolutely necessary. It is also the duty of the dentists to weigh the benefits against the risks in obtaining radiographs. Even if taking an OPG is mandatory, all radioprotective measures should be followed, and it is the responsibility of the dentists to follow the as low as reasonably achievable (ALARA) principle to minimize the radiation exposure dose.

The limitations of the present study were that it included only a brief period of observation, and the data were collected only from one university, limiting the geographic location and hence having no external validity. Future longitudinal studies need to be conducted to evaluate the awareness of dentists about the right usage of radiographs and radioprotective equipment.

Conclusion

- A total of 1.08% of the children less than 6 years of age were advised to take an OPG.
- The use of panoramic radiography for caries detection is not indicated unless absolutely necessary as the extent of caries involvement is not clear in OPGs.
- Adherence to the AAPD guidelines for prescribing radiographs in children should be mandatory. If panoramic radiographs are prescribed for necessary reasons, all measures should be taken to reduce the radiation dose.
- All radioprotective precautions should be considered, after justification and keeping As Low as Diagnostically Achievable being Indication and Patient-specific (ALADAIP) in mind.

Take home message

Any radiographic examination provides a net benefit to the individual, by measuring the diagnostic benefits against the individual damage the exposure might cause. It is the duty of the dentists to weigh the benefits against the risks in obtaining radiographs. One must remember that the damage caused by the radiographic exposure is more detrimental in children than adults; hence, radiographs (especially OPG’s) should not be prescribed in children unless absolutely necessary.

Novelty

- This study highlights the risks of radiographs in children and based on data collected and mentioned, tells us that the use of panoramic radiography for caries detection is not indicated unless absolutely necessary as the extent of caries involvement is not clear in OPGs. It throws light upon the subject of radiation exposure in children which is not given importance as much as required and suggests the need for guidelines pertaining to the use of panoramic radiographs in children and young adults.

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Conflicts of interest

There are no conflicts of interest.

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