



# Knowledge, Attitude, and Practices of Parents toward Pediatric Dental Radiography

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## Abstract

**Background** Pediatric dental radiography is a field with numerous uses as well as concerns regarding radiation safety. This study was undertaken to assess the knowledge that parents have regarding the same. This questionnaire survey was conducted with the aim of assessing the knowledge, attitude, and practices of parents toward pediatric dental radiography.

**Material and Methods** In total, 280 questionnaires were answered by parents of children visiting the Pediatric Dental Department. The first 10 questions served to evaluate the knowledge and attitude of parents toward pediatric dental radiography. The last three questions were designed to assess the practices of parents in relation to dental radiography and protective gear. The answers were collected and analyzed.

**Results** From the survey it was seen that most parents were aware that the harmful effects from dental radiography were minimal (51%). A fairly significant number of parents lacked the knowledge regarding the harmful effects of dental radiography in children compared to adults (63%), in comparison to the harmful effects from cell phones (66%) and in comparison to harmful effects of medical radiography (42%). A fair number of parents seemed to be aware of the detrimental cumulative nature (47%) of radiation. It was found that a large number of parents do not ask for an explanation regarding the need for the dental radiograph for their children before the dental treatment (50%). Most parents (64%) were not aware of the availability of protective gear and very few (16%) requested for it.

**Conclusion** The parents considered in this study had appreciable knowledge and a positive attitude toward dental radiography. However, a significant lack of knowledge regarding protective gear used for dental radiography among these parents was identified from this study.

## Keywords

- ▶ radiography
- ▶ pediatric dentistry
- ▶ parents
- ▶ knowledge

## Introduction

Dentistry has experienced major advances over the past years in all its branches and consequently demanded for

advances in the field of radiology. Wilhelm Conrad Röntgen discovered X-rays on November 8<sup>th</sup>, 1895 and the first original dental radiograph was taken by Dr. Otto Walkhoff in January 1896. Since then, radiography has become

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indispensable in the field of dentistry.<sup>1</sup> Over the years as horizons of dental radiography increased, so did the concerns regarding its harmful effects as well as the need for radiation safety protocols.

Clinical dentistry is incomplete without radiographic examination as it is inevitable in majority of the patients. They are known to be a clinician's main diagnostic aid.<sup>2</sup> In Pediatric Dentistry, radiographs are valuable aids for providing quality oral health care to infants, children, adolescents, and individuals with special health care needs. They play a pivotal role in the diagnosis of oral diseases and evaluation of dentoalveolar trauma, alongside being an assessment tool in the dentofacial development and prognosis of treatment.<sup>3</sup>

There are various radiographic modalities at the disposal of clinicians ranging from intraoral radiographic techniques to extraoral techniques. Intraoral radiographic examination can be considered as the backbone of imaging for the oral health professional. It comprises of three categories: peri-apical, bitewing, and occlusal projections, whereas the extraoral radiographic examination includes panoramic radiographs, posteroanterior and lateral skull view, Water's view and posteroanterior and lateral cephalometric examinations. Disadvantages pertaining to manual handling and processing of radiographic images were overcome with the introduction of digital radiography. Many limitations of the two-dimensional imaging have been overcome with the advent of computed tomography and its modifications such as cone beam computed tomography.<sup>1</sup>

There are a range of damaging effects from ionizing radiation which can be broadly classified into stochastic and non-stochastic effects. Thus an adequate knowledge on dental radiography and radiology is essential for the patient and the dentist.<sup>2</sup> In comparison to inactive tissues, active tissues with high mitosis rates are more vulnerable to damage from radiation. Thus when an adult body is considered, only those tissues that are subjected to high levels of cell turnover throughout the individual's life are exposed to greater risk of radiation damage. Therefore the risk from radiation is highest in infancy and early childhood, in line with general growth patterns, and in adolescence it gradually approaches the risk to which adults are exposed to. Another concerning factor is that these young tissues have a considerably higher water content in comparison to adult tissues. This leads to more radiation being absorbed and dispersed, therefore a larger dose of radiation would be required so as to penetrate a layer of tissue of the same thickness in an adult.<sup>4</sup>

While radiation exposure in the dental setting is relatively low, being one of the most frequently undertaken radiographic procedures, it is often repeated several times during childhood and adolescence.<sup>5</sup> When the parents visit a dentist for their children they completely entrust the dentist not to cause any harm to their child but whether all the information regarding radiation and radiation safety is provided to the parents is unknown. Another issue to be addressed is that even if this information is being provided, it may not be well comprehended or retained by the

parents. The alarming need for an informed consent prior to a dental treatment is often completely underestimated in today's medicolegal minefield. The parents should be aware of their right to understand and question if needed, the need for treatment and every aspect of the treatment including the complex risks and benefits associated with dental radiographs.<sup>6</sup>

Radiographic guidelines are designed to avoid unnecessary exposure, as well as to identify individuals for whom radiographic examination will be beneficial.<sup>7</sup> However, the harmful effects of radiation cannot be neglected and the cumulative nature of radiation exposure over a patient's lifetime and increased radiosensitivity of children increase the importance of explaining radiation risks to parents.<sup>8</sup>

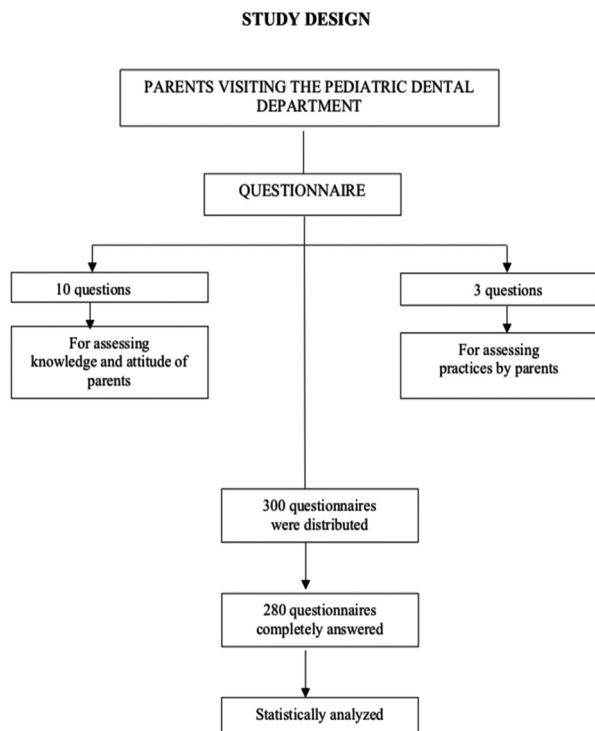
There are several studies that have assessed the knowledge and attitudes of the clinician, and other allied health professionals toward radiation risks. There is not enough concrete information regarding the knowledge and attitude that the parents have regarding dental radiographs for their children, particularly in the Dakshina Kannada district of Karnataka. It is unknown if the fears regarding dental radiography is exaggerated or whether the parents are aware of the effects of dental radiography and they accept them. There is also a need to identify the knowledge the parents have regarding protective gears that are available for dental radiography. Thus, this questionnaire survey was conducted with the aim of assessing the knowledge, attitude, and practices of parents toward Pediatric Dental Radiography.

## Materials and Methods

The ethical clearance for the study was obtained (Reference No. -ETHICS/ABSMIDS/138/2021).

In total, 300 questionnaires were given out to parents who visited the Department of Pediatric and Preventive Dentistry, A.B. Shetty Memorial Institute Of Dental Science, NITTE Deemed to be University for various dental treatments. Convenience sampling technique was adopted. A consent form was signed by each parent before having them filled. All the questionnaires were anonymous and consisted of 13 questions pertaining to pediatric dental radiography. The first 10 questions served to evaluate the knowledge and attitude of parents toward pediatric dental radiography. The last three questions were designed to assess the practices of parents in relation to dental radiography and protective gear.

The questionnaire was compiled from previous studies<sup>5,6</sup> and validated by two experts in the field of Oral Radiology and Pediatric Dentistry (A.B. Shetty Memorial Institute of Dental Sciences) from 10 samples provided. After the validation of the questionnaire, Cronbach's  $\alpha$  score of 0.87 was obtained. The questionnaires were then translated into local languages of Kannada and Malayalam. Parents of all children seeking dental treatment at the dental clinic who gave their consent to be a part of this survey were included in the study. The data obtained was compiled on a MS Office Excel Sheet (v



**Fig. 1** Study design.

2019, Microsoft Redmond Campus, Redmond, Washington, United States). The study design is depicted in ►**Fig. 1**.

### Statistical Analysis

Data was subjected to statistical analysis using Statistical package for social sciences (SPSS v 26.0, IBM). Descriptive statistics like frequencies and percentage for categorical data has been depicted.

### Results

From the 300 questionnaires that were distributed, 280 were completely answered and taken into consideration for the study. The data was collected and then analyzed from these questionnaires. The results obtained from the questionnaires have been divided into two groups:

1. Knowledge and attitude of parents toward pediatric dental radiography.
2. Practices of parents in relation to pediatric dental radiography.

1. Knowledge and attitude of parents toward pediatric dental radiography

Knowledge and attitude regarding several aspects were measured namely the safety, harmful effects, and efficacy of radiographs. These were assessed from the first 10 questions in the questionnaire and the data obtained from these questions is tabulated in ►**Table 1** and represented in ►**Graph 1**.

From the data obtained from ►**Table 1** and ►**Graph 1** following inferences can be made:

Parents had a fairly appreciable knowledge regarding dental radiography and more so had a positive outlook toward it. Most parents were aware that the harmful effects from dental radiography was minimal (51%) and that it played an essential role in treatment planning (72%). Sixty-three percent of the parents lacked the knowledge regarding the harmful effects of dental radiography in children in comparison to adults (63%), be it in comparison to the harmful effects from cell phones (66%) or in comparison to harmful effects of medical radiography (42%). In total, 47% of the parents seemed to be aware of the detrimental cumulative nature of radiation. Interestingly, for most of the knowledge-based questions a large number of parents have chosen the option of “Don’t know.” So it can be inferred that there is a lack of an in depth knowledge regarding pediatric dental radiography among parents.

### 2. Practices of parents in relation to pediatric dental radiography

To assess the practices followed by parents during dental radiography they were asked seeking an explanation for the need for radiographs and the protective gear for dental radiography. These questions were included in the latter three questions of the questionnaire and the data obtained from these questions is tabulated in ►**Table 2** and ►**Graph 2**.

From the data obtained from ►**Table 2** and ►**Graph 2** following inferences can be made:

There was a large knowledge gap among parents when it came to protective gear in dental radiography. Fifty percent of the parents did not enquire for an explanation regarding the need for the dental radiograph for their children before the dental treatment. Sixty-four percent of the parents were not aware of the availability of protective gear and only a mere 16% requested for it.

### Discussion

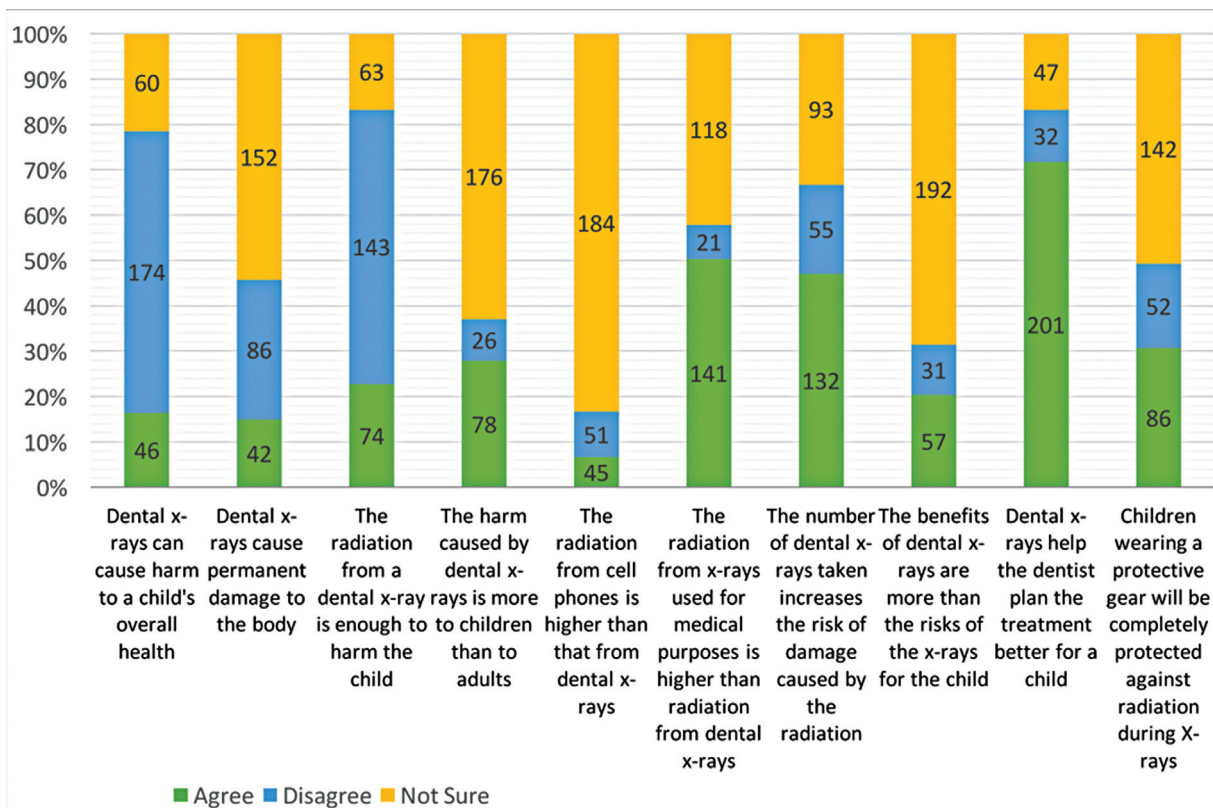
Pediatric dental radiography is an indispensable part in providing quality oral health care in children as they have a wide range of applications from diagnosis to treatment planning in dentistry.<sup>9</sup>

Owing to the diversity of its usage, it is one of the most frequently undertaken procedures as a part of diagnosis, treatment planning as well as treatment purposes.<sup>5</sup> Even though the diagnostic benefits of radiographs have been well established, it is of utmost importance that dental practitioners reduce patient exposure without compromising the quality of patient care.<sup>10</sup> There is an increased concern in case of children largely because of the greater radiosensitivity of children to radiation in comparison to adults. Another concerning factor when it comes to children is that they have their entire reproductive life span ahead of them, which in turn can lead to concerns regarding genetic consequences of exposure. Therefore a reduced radiation exposure is a crucial safety aspect of dental treatment.

From the 1970s the acronym ALARA (As Low As Reasonably Achievable) has been in use for optimization of X-ray doses. Oral health professionals are obligated to minimize

**Table 1** Knowledge and attitude of parents toward dental radiography

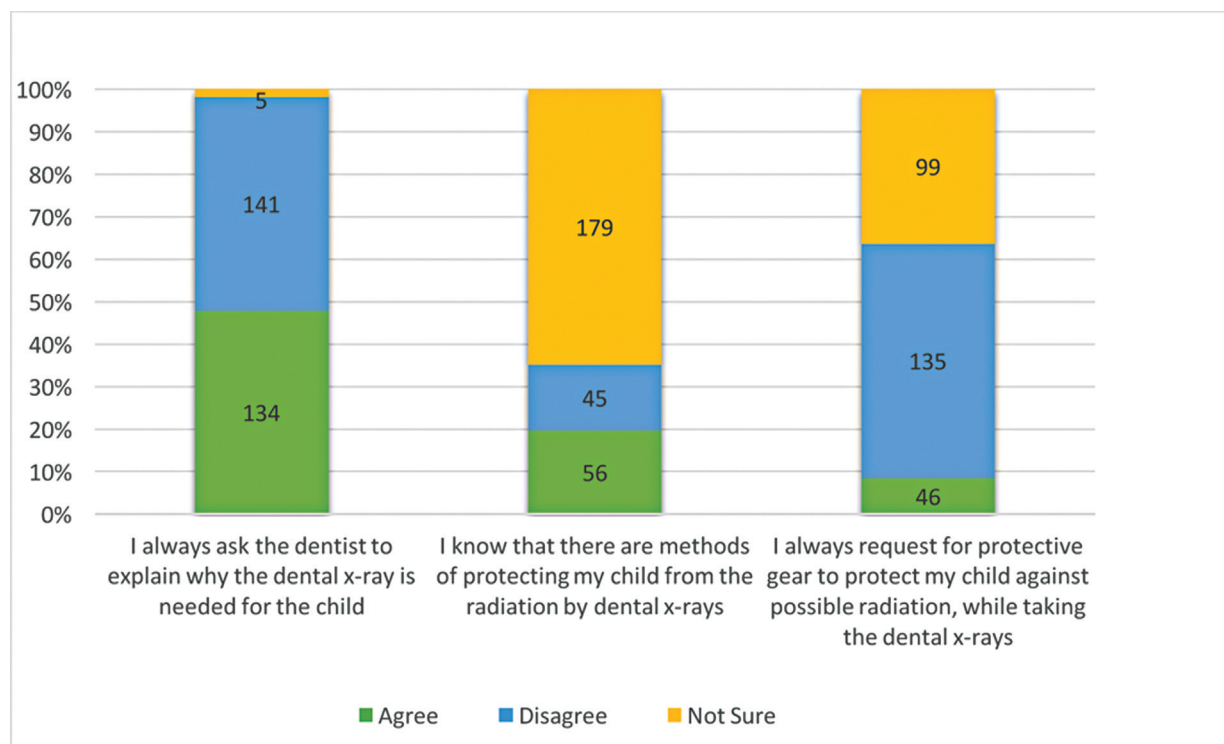
Questions	Agree (number)	Agree (%)	Disagree (number)	Disagree (%)	Don't know (number)	Don't know %
Dental X-rays can cause harm to a child's overall health	46	16.43%	174	62.14%	60	21.43%
Dental X-rays cause permanent damage to the body	42	15.00%	86	30.71%	152	54.29%
The radiation from a dental X-ray is enough to harm the child	74	26.4%	143	51%	63	22.5%
The harm caused by dental X-rays is more to children than to adults	78	27.86%	26	9.29%	176	62.86%
The radiation from cell phones is higher than that from dental X-rays	45	16.07%	51	18.2%	184	65.7%
The radiation from X-rays used for medical purposes is higher than radiation from dental X-rays	141	50.36%	21	7.50%	118	42.14%
The number of dental X-rays taken increases the risk of damage caused by the radiation	132	47.14%	55	19.64%	93	33.21%
The benefits of dental X-rays are more than the risks of the X-rays for the child	57	20.36%	31	11.07%	192	68.57%
Dental X-rays help the dentist plan the treatment better for a child	201	71.79%	32	11.43%	47	16.79%
I always ask the dentist to explain why the dental X-ray is needed for the child	86	47.86%	52	50.36%	142	1.79%



**Graph 1** Knowledge and attitude of parents toward dental radiography.

**Table 2** Practices of parents during dental radiography

Question	Agree (number)	Agree (%)	Disagree (number)	Disagree (%)	Don't know (number)	Don't know (%)
I always ask the dentist to explain why the dental X-ray is needed for the child	134	47.8%	141	50.3%	5	1.78%
I know that there are methods of protecting my child from the radiation by dental X-rays	56	20%	45	16%	179	63.9%
I always request for protective gear (for e.g., lead apron), to protect my child against possible radiation, while taking the dental X-rays	46	16.42%	135	48.2%	99	35.3%

**Graph 2** Practices of parents during dental radiography.

the radiation dose to patient and surroundings to a level as low as reasonably achievable. Recently the acronym ALADA is also in use which refers to “As Low As Diagnostically Acceptable.”<sup>11</sup>

Pointers to be followed for good radiologic practices are appropriate selection criteria for the use of radiography, optimized radiation protection, and utilization of the total amount of information in each radiograph.<sup>7</sup> Various radiological practices aid in minimizing or eliminating unnecessary radiation in diagnostic dental imaging. Some of these practices include use of F-speed film or digital films, collimation, proper film exposure and processing techniques, use of protective gear and reducing the number of radiographs to the minimum necessary (ALARA).<sup>3</sup>

As children are more vulnerable to radiation exposure, it is the responsibility of the treating pediatric dentist to inform the parent or caregiver regarding the hazardous

nature of the radiation. The cumulative nature of this exposure further increases the risk and thereby the need to inform parents regarding the same.<sup>12</sup>

This questionnaire study was undertaken to assess the knowledge, attitude, and practices of parents regarding dental radiographs for children. Parents were asked to choose the option that best reflected their thoughts. Mainly three parameters were assessed namely their knowledge, attitude, and practices. They were to choose among the following groups: agree, disagree, and don't know.

The respondents had a fairly appreciable knowledge regarding the hazardous nature of radiation. There was a general positive attitude toward dental radiography. Moreover they were aware that the risk from the dental radiation exposure was minimal. Largely the parents also had the knowledge that the radiographs aided in planning the treatment for their children.

These findings were in accordance with those obtained by Chiri et al in 2013 and Babu et al in 2017 in their respective studies.<sup>5,6</sup>

A significant number of parents lacked the knowledge pertaining to differences in the risk of exposure between children and adults. They were also not aware of the risk versus benefit ratio when it comes to radiographs. There was a complete lack of knowledge in the area of protective gear for radiation exposure. A fairly significant number of parents lacked the knowledge regarding the harmful effects of dental radiography in children compared with adults, harmful effects from cell phones and from medical radiographic purposes. A significant number of parents seemed to be unaware of the detrimental cumulative nature of radiation. For most of the knowledge-based questions a large number of parents have chosen the option of "Don't know," which can essentially mean that there is a lack of an in-depth knowledge regarding Pediatric dental radiography among parents.

Most parents were unaware of the availability of protective gear and its uses for dental procedures and an even smaller number of parents (16%) requested for it before taking radiographs. All of the above data leads to the inference that there is a large lacunae regarding awareness of the effects of dental radiography amongst parents. Babu et al<sup>5</sup> also found similar lack of knowledge in the parent population in their study.

Hartwig in his study to understand the awareness regarding ionizing radiation and its effects among parents and legal guardians of a pediatric medical emergency department found that parents and legal guardians are majorly unacquainted with the inherent risks to their child from radiation. To improve their knowledge regarding medical radiography the participants of his study suggested their preferred modes of learning to be an Internet-based resource, informational pamphlet, or the treating physician (in the order of preference).<sup>12</sup>

Therefore, a multitiered approach can be adopted involving these methods along with other additional sources to educate and grow awareness among parents and guardians regarding pediatric dental radiography and its effects, stressing upon the minimal harmful effects of dental radiography. There is also an alarming need that was recognized from this study to educate the parents regarding radiation safety and the use of radiation protective gears that are available. There is a need for these practices to be standardized and made mandatory before undertaking dental procedures requiring radiographs that were identified from this study. Following these protocols will help the parents to make informed decisions regarding dental procedures that require radiographs for their children and also request for protective gears for their child before undertaking these procedures.

Our study does have weaknesses limiting its ability to be generalized, as seen with most surveys. This study was performed at one Pediatric Dental Department in the Dakshina Kannada District, and the knowledge bias pertain-

ing to dental radiographic imaging could be ascribed to this particular region and patient demographics. Future studies including a larger population of parents and measuring association to any variables can further throw light on the pediatric dental radiography, its harmful effects, and radiation safety.

## Conclusion

The parents considered in this study had appreciable knowledge regarding dental radiography and generally had a positive attitude toward dental radiography and understood the importance of it. However, a significant lack of knowledge regarding protective gear used for dental radiography among these parents was identified from this study. Thus the need for educating parents and legal guardians regarding the importance of radiation safety for their children should be made a mandatory protocol to be followed by oral health professionals before undertaking dental procedures was also recognized from this study.

### Conflict of Interest

None declared.

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