

# An assessment of male dental students' knowledge and attitude towards radiation protection for pediatric patients in King Khalid University

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## SUMMARY

**Background:** Radiographs are an essential part of most clinical dental examinations and diagnoses. However, it should be clinically justified to obtain maximum benefit and with reduced harmful effects for pediatric patients. The present cross-sectional study was conducted among male dental undergraduate students to assess the knowledge and awareness levels regarding radiation exposure protection for pediatric patients.

**Materials and Methods:** A cross-sectional study was carried out on the sample size of 206 male dental students. A written informed consent was obtained from the participants after explaining them the purpose of the study. Sampling method included in the study is simple random sampling method. Questionnaire was formulated which comprised of two parts: First portion included the questions related to the demographic information of participants, such as age and educational qualification. The other part of the questionnaire comprised 10 questions with 'yes' and 'no' pattern and multiple-choice question was prepared. The survey data was collected and organized into Microsoft Excel spreadsheets (Microsoft Inc., USA), and was statistically analyzed utilizing the Statistical Package for the Social Sciences version 20.0 software (IBM Inc., USA). The statistical test used here was the chi-square test and *p* values less than 0.05 were considered to be statistically significant (*p*<0.05).

**Results:** A total of 206 persons responded to the questionnaire. 179 (73%) were males and 67 (27%) were females. 82% of study subjects were of 20-25 years, 10% were of 26-30 years, 8% were of 31-35 years. Majority of participants 124 (60%), were agreed that they were aware of pediatric dental radiography. Regarding the radiation protection option available for children, more than half of participants (56%) were not aware of this. 120 (58%) participants believed that performing dental radiological examination in children below 5 years is forbidden. According to 126 (61%) participants agreed that most important organ that must be protected during dental radiography was thyroid and least organ was skin (10%). Majority of participants 187 (91%), said that they would stand behind a protective barrier during exposure of radiation to the patient.

**Conclusion:** Dental students' knowledge and awareness regarding radiation protection for pediatric patients was not uniformly good. Therefore, more emphasis should be placed on radiation hazards and radiation protection techniques in undergraduate curriculum mainly emphasis on the pediatric patients.

**Key words:** knowledge, radiography, protection, dental undergraduate, pediatric, Saudi Arabia

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## INTRODUCTION

Radiography in dentistry is commonly used in modern dental health care. It acts as a diagnostic tool in identifying the physical condition of the patients. However, the use of dental radiography should be carefully managed since it can cause some side effects toward normal cells and tissues especially in growing children. High radiation exposure towards pediatric patients can lead to biological effects that can last for a long period of time [1]. It is also believed that pediatric patients are more prone to develop cancer for the same dose received for the adults. Biological effects can be divided into two sub classes which are non-stochastic (deterministic effects) and stochastic effects [2]. The severity of the response is directly proportional to the amount or dose of radiation. It is a dose dependent which cause biological damage in human body. On the other hand, stochastic effect is non dose dependent. The effect of radiation on living organisms is very negative and range of these effects may vary depending on the dose and the duration of exposure [3]. Many medical or dental procedures are totally dependent on radiological tools such as radiography, fluoroscopy and Computed Tomography (CT). All these procedures utilize ionizing radiation. Therefore, it is better to use the minimum possible dose to achieve the optimum quality image of radiological imaging [4]. Therefore, it is extremely important to consider the safety of patients as well as the medical professionals performing the procedure by balancing the risk to radiation exposure. It is generally considered that risk from diagnostic procedure using X-rays are small and therefore; health risks to individuals are also small. However, the growing number of people exposed to X-ray radiation makes low-level of X-ray radiation also a major cause of concern [5]. However, the use of dental radiography should be carefully managed since it can cause some side effects toward normal cells and tissues especially in growing children. Radiology plays a significant role in the oral health care of infants, children, adolescent and elder patients. Most of the cases in dental clinic require dental radiograph examination for better and clear diagnosis of the disease. During clinical rotation, all of the undergraduate and postgraduate training dentists are trained to carry out the dental radiograph examination by themselves under supervision. Commonly, undergraduate dental students training will be

divided into preclinical level and clinical level. Preclinical level students comprise of first- and second-year students whereas clinical students comprise of third, fourth and interns. Hence, aim of this study was to evaluate the attitude of male dental undergraduate students towards exposure protection for pediatric patients in College of Dentistry, King Khalid University.

## MATERIALS AND METHODS

A cross-sectional study was carried out on the sample size of 206 male dental students in College of Dentistry, King Khalid University, Abha, Saudi Arabia, to know the knowledge, attitude and practice of radiation protection in children among male dental students. A written informed consent was obtained from the participants after explaining them the purpose of the study. Sampling method included in the study is simple random sampling method. Ethical approval for performing the survey was obtained from the Scientific Research Committee (SRC/ETC/2018-19/139) of King Khalid University, College of Dentistry.

The questions were designed and was circulated among dental students in the dental college. Questionnaires were translated into local language (Arabic) and then back to English in order to ensure that the translated version gives the proper meaning. Questionnaire was formulated which comprised of two parts: First portion included the questions related to the demographic information of participants, such as age and educational qualification. The other part of the questionnaire comprised 10 questions with 'yes' and 'no' pattern and multiple-choice question was prepared and piloting was done to obtain information about knowledge, attitude and practice of radiation protection in children.

The sample size was calculated by G\*power version 3.1.9.2. It was revealed from pilot study the correlation coefficient was 0.226 and power 95% ,  $\alpha$  error probability 5%; the sample size was 206. A self-administered structured questionnaire was developed and tested among a convenience sample of 20 dental students, who were interviewed to gain feedback on the overall acceptability of the questionnaire in terms of length and language clarity, according to their feedback the questions were corrected. Face validity was also assessed before the start of the study. Both descriptive and analytical statistical measurements were used to describe the main variables by SPSS 18 (IBM Corporation, Armonk, New York, USA) software. Chi-square, ANOVA was used to compare the qualitative and quantitative variables. The statistical significance of the coefficients in the statistical analyses will be tested at 0.05 ( $\leq 0.05$ ) level.

## RESULTS

A total of 206 persons responded to the questionnaire. 82% of study subjects were of 20-25 years, 10% were of 26-30 years, 8% were of 31-35 years (Table 1).

Age	n	%	p-value
20-25 years	169	82%	0.984
26-30 years	21	10%	
31-35 years	16	8%	

p<0.05; n=Number; %=Percentage

Tab. 2. Knowledge and attitude about Pediatric radiation protection among male dental students

Questions	Males (n)-206	Percent-age
Q1. Are you aware of pediatric dental radiography?		
Yes	124	60
No	82	40
Q2. Are you aware of radiation protection options available for children?		
Yes	91	44
No	115	56
Q3. Performing dental radiological examination in children below 5 years is forbidden		
Yes	86	42
No	120	58
Q4. Would you perform Radiographic screening for the purpose of detecting dental diseases before clinical examination in all new pediatric patients?		
Yes	74	36
No	132	64
Q5. Are you aware about the distance for both operator and children during dental radiographic examination?		
Yes	52	25
No	154	75
Q6. What is the most important organ that must be protected during dental radiography?		
Gonads	27	13
Thyroid	126	61
Skin	20	10
Bone Marrow	33	16
Q7. Mark the various options to reduce radiation exposure to patient that you are aware of?		
Lead aprons	53	26
Shields	32	16
Time of Exposure	29	14
None	13	6
All of the above	79	38
Q8. Would you stand behind a protective barrier during exposure of radiation to the patient?		
Yes	187	91
No	19	9
Q9. Children are at a higher risk of harm from x-rays than adults.		
Yes	170	83
No	36	17
Q10. Every radiation exposure in children will brings possibility of occurrence of the harmful effects, e.g. Leukaemia		
Yes	109	53
No	97	47

p<0.05; n=Number; %=Percentage

Knowledge and awareness among dental students regarding radiation protection for pediatric patients was shown in (Table 2).

Majority of participants 124 (60%), were agreed that they were aware of pediatric dental radiography. Regarding the radiation protection option available for children, more than half of participants (56%) were not aware of this. 120 (58%) participants believed that performing dental radiological examination in children below 5 years is forbidden. According to 126 (61%) participants agreed that most important organ that must be protected during dental radiography was thyroid and least organ was skin (10%). Majority of participants 187 (91%), said that they would stand behind a protective barrier during exposure of radiation to the patient. 170 (83%) students agreed that children are at a higher risk of harm for radiation than adults. When the participants were asked regarding the various options to reduce radiation exposure to patient that they were aware and response are giving in the (Figure 1).

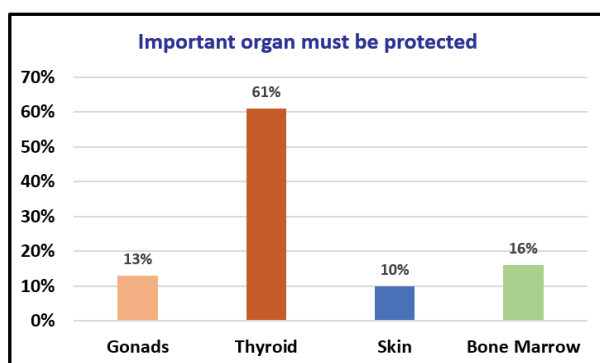


Fig. 1. Most important organ that must be protected during dental radiography

Figure 2 shows description of awareness of dental students' regarding various options of reduction in radiation exposure in pediatric patients.

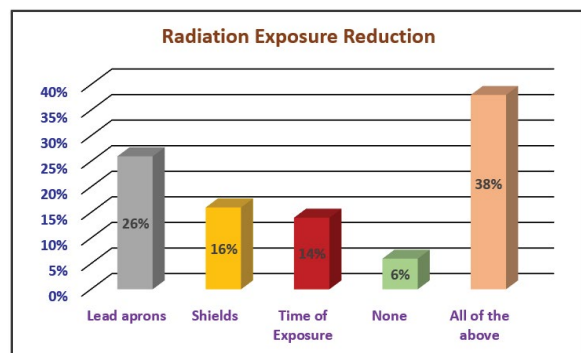


Fig. 2. Awareness of dental students' regarding various options of reduction in radiation exposure in pediatric patients

## DISCUSSION

Radiology plays a significant role in the oral health care of infants, children, adolescent and elderly patients. In dentistry, radiographs are mainly used to diagnose and evaluate problem-related to oral diseases and for better treatment planning. High radiation exposure towards pediatric patients can lead to biological effects that can last for an extended period. By evidence, pediatric patients are more prone to develop cancer for the same dose received for the adults [6]. Similarly, in our study, 83% of participants agreed that children are at a higher risk of harm from radiation than adults. The health hazards of x-rays to human beings which include genetic mutations, blood

cancers and oncogenesis are prevalent due to the unawareness of these effects from radiation. Along with these sources of radiation, human beings were exposed to radiation from natural sources, and these radiations cause the death of 100-250 individuals in the United Kingdom over one year [7]. These deaths attributed to the poor knowledge about radiation safety and hazards among dental students, medical students, dentists, health care workers and radiographers. The results of the study suggest that 109 (53%) of the participants are well aware of the harmful effect of radiation exposure in the children, which causes leukemia. Even though the dose of radiation used during dental radiographic examination is in a low dose, but still it is paramount to reduce radiation exposure toward our body as the accumulated dose may happen. Shahab et al. reported a study about radiation safety to assess the knowledge of dentists about essential information about radiation protection and methods of reducing the radiation dose to the patient. The majority of dentists did not employ appropriate procedures to decrease exposure to unwanted radiation [8]. Lee and Ludlow assessed the attitude of dentists regarding radiation safety. The dentists asked about primary knowledge of radiation safety and the method of reducing radiation dose. Results of the study confirmed that there is a demand to reinforce the dentist's working knowledge about the issue of radiation safety [9].

Radiation exposure risk can be reduced in pediatric patients by utilizing additional efforts like the use of lead apron, thyroid collar, high-speed film and proper angulation during taking radiograph [10]. The principle of radiation protection is not only to reduce exposure of radiation towards pediatric patients, but it should also provide positive outcome from the use of dental radiograph [11]. In our study, the percentage of dental students that always uses lead apron as protection to reduce radiation exposure to children during dental radiography is 26%. The reason for not wearing a lead apron might be attributed to non-availability of the lead apron and increased weight of apron. From our current study, it is undeniable that the participants were aware of the radiation exposure protection available for pediatric patients. It's a low figure when compared to a study done in Uganda, where 77% of the practitioners mentioned that they did use a lead apron [12]. This low use of thyroid shields and lead aprons is of concern. It is therefore essential for lead aprons and thyroid shields to be available in the government dental clinics. Clear guidelines must be provided to the dentist on the use of thyroid collars. This study also shows that a majority of students (75%) do not follow the position distance rule and these results are similar to those obtained from a survey conducted by S Shahab, where only 36% of dentists followed the position distance rule for their protection [8].

Radiological investigations should only be prescribed by dental personnel for specific purposes when the benefit outweighs the risk. Thus, the dentist must ensure that adequate justification for the dental radiograph is met and that minimal permissible exposure is given. These dentists should be knowledgeable about radiation protection to protect the patients adequately. Majority of the dental students (64%), agreed that they would not perform any radiographic screening to detect dental diseases before clinical examination in all new pediatric patients. Speaking in detail that every radiograph should only be done if it increases the ability of a dentist to diagnose a condition and treat it by

comparing them with the side effects it is going to have on the patient. If there is a net benefit to the patient, only then the radiograph should be done. The undergraduate dental students should have proper knowledge of this concept so that they can provide the maximum benefit to the pediatric patient along with taking care of the healthcare staff. The respondents in this survey when questioned about awareness of radiation protection option available for children, the results obtained, were less than half of the participants, i.e., 44%. This may be due to lack of learning knowledge related to radiographic examinations and radiation hazards with safety measures in the undergraduate level of education. Due to this, after their graduation, they should attend dental education programs continue to increase and keep their knowledge up to date.

When the respondents were questioned about the vital organ to be protected during dental radiography, a total of 61% answered as thyroid. These results are synonymous with the result of the Ukrainian study, where 66% of the respondents were aware that thyroid should be protected [13]. Dental students correctly opted to protect the thyroid gland rather than the brain or nostril during head and neck radiography. In the head and neck region, the thyroid gland is one of the most sensitive organs. Sikorski et al. documented that radiation exposure reduction by thyroid shield varied from 5% to 56% for a complete-mouth survey. Also, their study showed that thyroid skin exposures measured on children were 63% to 92% lower. As a result, it's highly recommended that leaded thyroid shields should be employed in children [14].

Dental undergraduate students will be a future dentist who will be at risk of biological radiation hazards during their life. They should be aware of different protection methods against x-ray. The dentist should be aware of different radiation protective methods as well as the daily received radiation dosage. Various methods to protect the imaging health personnel include education, implementation of radiation protection program and usage of barrier shielding. The radiation protection program should also limit the lifetime and annual radiation exposure within the allowable threshold. Training in radiation protection should be a continuous process even after graduation from dental school to achieve long-term knowledge retention, early or repeated reinforcement may be necessary [15]. In our

study, 91% of respondents said that they would stand behind a protective barrier during exposure of radiation to the patient. Similar studies were conducted in India, where 43.8% of dentists stood behind lead shield [16]. Another study was carried out in Turkey, where only 8% and 11.2% of the dentists, respectively, stood behind lead shield contradicting the findings of our study [17].

Application of dental radiography for efficient diagnosis and treatment planning has been significantly increasing over the years. However, due to this, there is an increased risk for unwanted exposure of both the patient and the operator. Proper technique, positioning, equipment used all play a pivotal role in the radiographic protection of both the patient and the operator [18]. Further studies with a larger sample size are needed to validate our hypotheses. Moreover, the current study was a single institutional-based one, hence a cross-sectional study comprising of similar samples utilizing multiple institutional participants are essential for authentication. There are many ways or management options available for radiation exposure protection for both paediatric patients and operator. These factors include proper angulation, proper distance between the x-ray machine and operator, an adequate technique used, appropriate equipment used for patients, suitable speed and type of film.

## CONCLUSION

Study concludes that although the majority of students had good knowledge about radiation physics, hazards and protection, still most of the majority fell into the average knowledge category. More and more efforts should be incorporated in providing adequate knowledge and training both theoretically as well as clinically so that these budding dentists can do justice with the humanity by weighing the benefits of doing x-rays over the hazards of it. Seminars and workshops are the best way for graduates to share and increase their knowledge.

## CONFLICT OF INTEREST

No funds were provided by any outside agency for this study, and neither author has any conflict of interest.

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