



RESEARCH ARTICLE

AWARENESS OF DENTAL GRADUATES ABOUT RADIATION PROTECTION: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Radiography in dentistry has got paramount importance in diagnosing oral diseases and conditions. However, this useful diagnostic aid carries dangerous risk of radiation exposure hazards. Though the radiation dosage of dental radiographs is relatively low, the cumulative effect caused by repeated exposures is of concern. Hence certain measures and protocols for radiation protection are to be followed.

Objective: The present study intends to know and analyze the knowledge and attitude of emerging dental practitioners i.e. the interns regarding radiation protection.

Materials and methods: A cross-sectional, structured questionnaire containing 16 questions regarding awareness of radiation protection was distributed among interns who attended a pre-dated, state-level Continuing Dental Education (CDE) Program, near Hyderabad, Andhra Pradesh. The results were further statistically analyzed using SPSS software.

Results: A total of 211 interns have participated in the study and were asked to fill the questionnaire. The results have shown that the participants' knowledge regarding radiation protection was relatively poor.

Conclusion: Though the knowledge and way of practice of the respondents was relatively poor, they showed a positive attitude towards the need for radiation protection and safety. They were willing to practice dental radiography with safety precautions. The results of study also show the need of continuing dental education programs regarding radiation protection and safety.

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INTRODUCTION

It is estimated that every year an approximate of 480 million dental radiographs were taken, which account for 15% of total diagnostic radiographs performed (Joan E Enabulele and Igbinedion, 2013). This is an issue of concern especially to the operators of x-ray machine, including the dental practitioners, training dentists and technicians. X-radiation causes both stochastic and deterministic effects. The most common concern about radiation exposure is skin cancer. The deterministic effects caused due to inappropriate radiation protection from ionizing radiation include skin burn, cataract infertility, cancer and death (Afaf Mohamed Taha Elamin, 2015). Various regulatory bodies like International Commission for Radiation

Protection (ICRP) and Atomic Energy Regulatory Board (AERB) are responsible for laying down the rules and regulations for radiation protection, at international and national levels respectively.³As Low As Reasonably Achievable (ALARA) principle has to be followed to minimize the dose. Knowledge and appropriate usage of collimators, filters, high speed films and lead aprons helps both the operator and patient. However studies have shown that the knowledge about radiation protection and safety is poor among medical and dental students, practitioners and radiographers. The present study aims to assess the knowledge of dental students in radiation protection and safety.

MATERIALS AND METHODS

A cross-sectional study was conducted among interns who attended a state-level, continuing dental education program near Hyderabad, where students from 8 dental colleges were present.

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These students had a prior training about radiation protection and safety as a part of the curriculum and were also routinely involved in performing radiographs. The investigators visited the program and handed over a cross-sectional, structured, pre-tested and self-administered questionnaire containing 16 questions in total. The purpose of the study and the questions were explained to the interns. The questionnaires were taken back after being filled by the interns. The questionnaire consisted of 16 questions pertaining to evaluate the knowledge of the dental students (interns) towards radiation protection and safety. They were focused on the type of radiation the x-rays produce, radiation safety principles, collimation, filtration, position of the operator, and personnel protection including intraoral stabilization of film, usage of lead barriers and performing radiographs in pregnancy. After receiving the questionnaire back, the data was extracted and entered into an excel sheet. Thus obtained data was subjected to statistical analysis using SPSS software (SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 211 dental studies doing internship participated in the study. The age group of the participants ranged from 22 to 25 years. All the participants had a formal training on radiation protection as a part of their curriculum. It was quite alarming that only 56.9% students agreed that x-rays are harmful while 39.3% said that they are not harmful. 51.7% said that x-rays reflect from walls. Only 46.4% of the respondents were aware of the recommendations from regulatory boards like National Council on Radiation Protection [NCRP], Atomic Energy Regulatory Board [AERB] and International Commission on Radiological Protection [ICRP] recommendations. A significant number of interns (81.5%) were aware of the usefulness of collimators and filters. 69.7% were aware of deterministic and stochastic effects of X-radiation. 75.4% of respondents were aware of ALARA principle. 72% agreed that digital radiography needs less radiation exposure than for conventional. 65.9% agreed that high speed films require less radiation exposure.

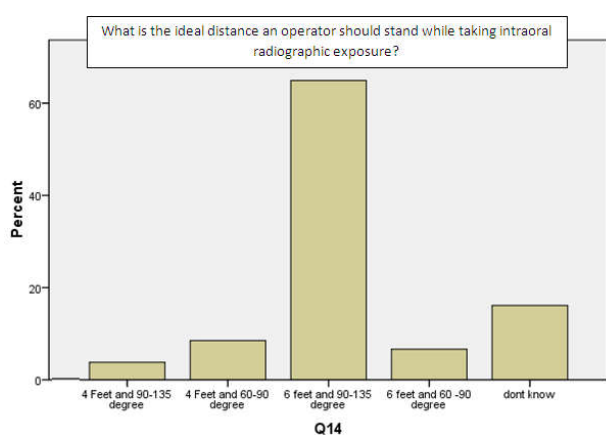


Figure 1. 54.9% of the respondents were aware of distance position rule

When it comes to intraoral film positioning, 61.1% said that they will ask the patient to hold the film with finger themselves, during exposure while 59.2% said that they will not prefer holding the film for the patients. Radiation exposure and pregnancy is always a topic of discussion. 59.7% interns felt that dental radiography is absolutely contraindicated in pregnant patients. 84.4% respondents agreed that personal monitoring badges have to be worn by the operator.

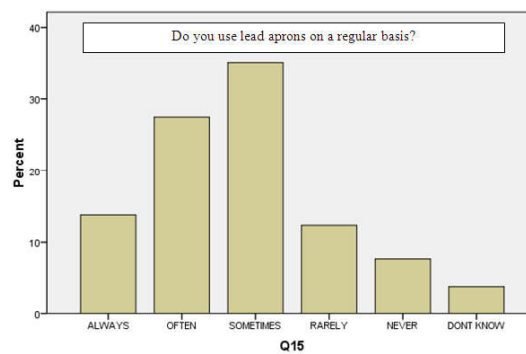


Figure 2

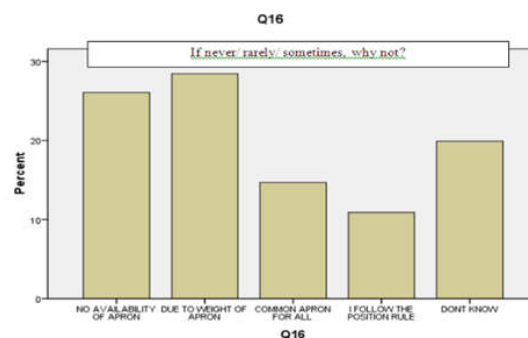


Figure 3

Figure 2 and 3: 13.7% of respondents said that they use lead aprons on regular basis and majority said that they do not regularly use them because of non-availability of lead aprons and their heavy weight

It is welcoming that 88.2% of the respondents said that they will adhere to radiation protection protocol in the future. (Table 1) 54.9% of the respondents were aware of distance position rule (Fig 1). However only 13.7% of respondents said that they use lead aprons on regular basis and majority said that they do not regularly use them because of non-availability of lead aprons and their heavy weight (Fig 2 & 3).

DISCUSSION

Since the first usage of x-rays in dentistry, dental radiography has become a vital diagnostic tool in diagnosis of oral diseases. These x-rays are ionizing radiation and are extensively used in dentistry. Dental radiographs help dentists to evaluate the patient, diagnose, and plan treatment and aid in the follow up of oro-maxillofacial conditions. Despite its commendable benefits in diagnosis and health care, radiographs carry the risk of radiation exposure and the consequent hazards due to ionization. Though the radiation dosages of dental radiographs are considered to be relatively low, the cumulative radiation exposure might be detrimental. Hence there is an utmost need to follow radiation protection protocols. The present study was thus conducted to know the knowledge and awareness of the interns, who will be practitioners in near future. Though few similar studies were done in the past, they focused on multitude of factors and have done between various grades of dental practitioners and studies. This study aimed to check the awareness solely in interns, who already had a formal training in radiation protection and those already practicing performing radiographs in the institutions and hospitals.

Table 1. Tables and Graph/figures

		YES (in %)	NO (in %)	Don't Know (in %)
1	Is dental X-ray harmful?	55.9	39.3	3.8
2	Do X-ray beams reflect from room walls?	51.7	35.5	12.8
3	Are you aware of National council on radiation protection [NCRP], Atomic energy regulatory board [AERB] and International commission on radiological Protection [ICRP] recommendations?	46.4	29.4	24.2
4	Are you aware of the usefulness of collimators and filters in dental radiography?	81.5	15.6	2.8
5	Are you aware of deterministic and stochastic effects?	69.7	27.0	3.3
6	Are you aware of ALARA principle?	75.4	22.3	2.4
7	Does digital radiography require less exposure than conventional?	72.0	19.4	8.5
8	Does the high speed film require a reduced exposure?	65.9	24.6	9.5
9	Do you prefer to hold the films during exposure?	37.9	59.2	2.8
10	Do you ask the patient to hold the film with their hand during exposure?	61.1	36.0	2.8
11	Does dental radiograph absolutely contra-indicated in pregnant patients?	59.7	37.9	2.4
12	Should personal monitoring badges be worn by the operator?	84.4	12.8	2.8
13	Will you adhere to the radiation protection protocol in the future?	88.2	10.9	0.9

It is to be noted that only 56.9% of respondents felt that dental x-rays are harmful. This might be because either the students were not aware of the harmful effects of radiation or might be because they were in agreement that dental radiography uses less radiation when compared to other medical radiographs and hence its harm is less conclusive. In the present study about 53.6% respondents either didn't know or had no idea regarding the recommendations from regulatory boards like NCRP, AERB and ICRP etc., In reality, these regulatory boards formulate rules for radiation protection and also lay down norms regarding dose limits for general public and radiation workers. ICRP is an international regulatory board with a national counterpart in every country. NCRP is its American Counterpart while AERB is its Indian counterpart. In 1991, ICRP has stated that "the overall objective of radiation protection is to provide an appropriate standard of protection for man without unduly limiting the beneficial practices giving rise to radiation exposure". In India, radiation protection is governed by section 17, Atomic Energy act, 1962 (Grover, 2002).

In the present study significant number agreed that collimators and filters are useful in dental radiography. This was in accordance to the fact that rectangular collimators aid in reducing the dimension of x-ray beam when compared to circular collimators. However greater accuracy is required when using rectangular collimators to reduce cone cuts (Stuart Grange, 2009). In the present study 72% of participants said that digital radiography poses less radiation risk than conventional radiographs. This was in accordance to Markus Korner *et al.*, in 2007, who suggested that flat panel detector digital radiography can result in reduction in exposure (Markus Korner *et al.*, 2007). In the present study 65.9% were aware that high speed films reduce radiation exposure. This was in accordance to Tomohiro Okano *et al* in 2010, who stated that fastest radiographic films available have to be used. It should be made sure that the diagnostic ability of these high speed films is satisfactory. They also stated that ISO E and F speed films are recommended as they reduce radiation exposure by greater than 50% when compared to D speed films (Tomohiro Okano and Jaideep Sur, 2010). However, respondents showed poor knowledge regarding intraoral film placement when majority said that they will ask the patient to hold the film by themselves. This shows their limited knowledge regarding various film holding devices and their usage in dentistry. This was in contrast to the ADA 2006 recommendation that film holders aid in aligning the film precisely with collimated beam and reduces image distortion and thus reduction in unnecessary

patient exposure in redoing the films (White and Pharoah, 2014). About 59.7% participants said that dental radiography is absolutely contraindicated in dentistry. However this was in contrast to the literature by Razi T *et al*, 2011, which stated that response to radiation during pregnancy requires a very high dose. Doses less than 250 mGy (25 rads) are not enough to elicit any response (Rahmineh Razi *et al.*, 2011). A significant number of participants were aware of ALARA principle and position and distance rule. This was in accordance to a study conducted by Prabhat *et al*, where significant number of students was aware of the same (Prabhat *et al.*, 2011). In contrary to the above knowledge, only 13.7 respondents said that they use lead aprons on regular basis, while significant number said they donot use on regular basis due to lack of compliance due to its unavailability and heavy weight. This was in accordance to a study done by Math *et al*, 2013, where 50% of dental practitioners were not aware that thyroid is more sensitive to dental x-rays. By using thyroid shield about, 63-92% and 33-84% of radiation exposure can be reduced in children and adults respectively (Math *et al.*, 2013). Nevertheless, 88.2% of participants were promising in adhering to radiation protection protocol in future, which is quite welcoming.

Conclusion

The present revealed relatively poor knowledge and attitude regarding radiation protection in dentistry, in total. However they showed significantly fair knowledge in use of collimators and filters in dentistry, ALARA principle and distance-position rule. On the whole, the present study emphasizes the need of reinforcing radiation protection protocols and rules in the curriculum and during practical sessions. This calls for the need of continuing dental education programs in radiation protection.

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