


Original Research Article

# Perception of dental undergraduates and interns on radiation protection safety protocol - A questionnaire based cross-sectional study

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## Abstract

**Background:** Radiographs are an important diagnostic tool for dental professionals. X-rays have the ability to penetrate human tissues. Nowadays, it is mandatory to follow ALARA principle “As Low As Reasonably Achievable” during dentist routine work to reduce the radiation dose, by which the exposure to dental radiation should be minimized where practicable.

**Objectives:** The present study was conducted to assess the knowledge of Third year, Final year dental students and interns regarding dental radiation protection safety protocol as well as their knowledge on dental radiography.

**Materials and methods:** The present cross sectional study was performed on 180 participants of BRS Dental College and Hospital, Sultanpur. The responders were divided into 61 3<sup>rd</sup> year dental students, 54 Final year students and 65 interns. Data was collected by using self designed questionnaire which consisted of 12 questions pertaining to knowledge and practices of undergraduates and interns regarding radiographic protection.

**Results:** It was observed that limited participants were aware of the radiation protection protocols and it was more so with the interns, followed by the fourth and third year students.

**Conclusion:** The radiographs can pose as a potential hazard to health of both dentists as well as the patients. Thus it is necessary to reduce the exposure to dental radiation.

## Key words

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Radiology, Radiation Safety, Radiation Guidelines, Radiation Protocol.

## Introduction

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Dental Imaging is an integral part of clinical dentistry. As a result, radiographs are often referred to as the clinician's main diagnostic aid. However it carries a potential harm and the exposure to dental radiation should be minimized where practicable [1]. X-rays are a form of high-energy electromagnetic radiation. They can penetrate the human tissues. When X-rays strike matter such as a patient's tissues, the photons can completely be scattered with no loss of energy or can be absorbed with total loss of energy or scattered with some absorption and loss of energy or can be transmitted unchanged.

The International Commission on Radiological Protection (ICRP) recommended that all patient exposure must be justified and kept as low as possible. So it is a mandatory to follow ALARA principle "As Low As Reasonably Achievable" during dentist routine work [2, 3]. This principle was adopted to minimize radiation dose. In general, ALARA principle takes into consideration the justification for the radiological study and taking the imaging examination with the least amount of radiation that can produce radiographs of reasonable diagnostic quality. As a result radiographs should only be taken at the minimum dosage with reasonable information yield in as much as a safer method is not available [4]. Consequently operators of radiographic equipment should be thoroughly familiar with radiation safety practices and radiation regulations to protect themselves, their colleagues and the patients.

The effects of x-rays are harmful to living tissues and it is sufficiently intense and detrimental to cause cancer, leukemia and genetic damage [5, 6]. These biological effects can be divided into Deterministic and stochastic effects [3]. Deterministic effects are those effects in which the severity of the response is proportional to the dose. These effects occur in all people when the

dose is large enough [7]. Stochastic effects are those for which the probability of occurrence of the change, rather than its severity, is dose dependent [3]. The stochastic effects thus lay the patient's and the operating personals in a high risk zone as it does not have dose thresholds [3]. Thus, dental radiographs should be only prescribed for patients when the benefit of disease detection outweighs the risk of damage from X-rays [8]. Thus reducing the radiation dose should be an important consideration for dental professionals [9]. In order to reduce patient's exposure to radiation, appropriate use of a lead apron, thyroid collar, right collimation and suitable technique are included in the practice of radiologic examination. Every radiographic exposure to the patient should be clinically justified and each exposure should be expected to give the benefit of a confirmed diagnosis.

Studies have shown that there was poor knowledge among dental students [10], dentists [11], and other health workers [12]. The radiation protection knowledge and practice of dental radiography by dentists is consequently crucial. Unfortunately, the proper radiation protection practice by dentists is inadequate [11]. As third year, final year dental students, interns and dentists are at risk from radiation hazards during their life, they should have a thorough knowledge towards the biological hazards of X-ray and different protection protocols. As compared to the radiation exposure of medical doses, the radiation doses used for dental imaging seems to be relatively low but the cumulative doses are high due to repeated examinations over time dental radiographs could lead to unnecessary radiation exposure [13, 14]. As such, this study was conducted to assess Third year, Final year dental students and intern's knowledge regarding dental radiation protection and practice as well as their knowledge on dental radiography.

## **Materials and methods**

The present cross sectional study was performed on 180 participants of BRS Dental College and Hospital, Sultanpur. The responders were classified to 115 undergraduate dental students, which included 61 3<sup>rd</sup> year students and 54 Final year students and 65 interns. The purpose of this classification was to determine whether the clinical experience years were more informed about radiation safety protocol.

Prior to the study ethical approval was obtained from the Institutional Review Board of BRS Dental College and Hospital, Sultanpur. A list of study subjects was obtained from the Academic Section of BRS Dental College and Hospital, Sultanpur. The survey was scheduled for a period of 1 month from 1<sup>st</sup> August to 30<sup>th</sup> August, 2016 following a detailed weekly schedule which included two days in a week. Few adjustments were done due to logistic reasons.

Data was collected by using self designed questionnaire. The questionnaire was developed in English language. The questionnaire consisted of 12 questions pertaining to knowledge and practices of undergraduates and interns regarding radiographic protection. Prior to the study, the questionnaire was pre-tested and validated on 10 subjects to check the feasibility of the study. Content and construct validity showed no significant changes. Questionnaire showed high degree (0.89) of agreement during test-retest of the questionnaire. Those individuals who participated in the pilot study were not considered for the main study to prevent possible bias.

The questionnaire in the form of multiple choice questions were distributed among participants and it was collected at the same time after completion. The data was collected by a single investigator (principal investigator). Collected data was coded, compiled and tabulated. The data collected was entered in Microsoft Excel sheet and analyzed for simple statistics as mean and percentage.

## **Results**

The results are comprehensively presented in **Table - 1**. It was observed that that limited participants were aware of the radiation protection protocols and it was more so with the interns, followed by the fourth and third year students.

## **Discussion**

This study is first of its kind and very few similar studies were available for comparison, to assess knowledge on radiation protection it is pertinent to establish the level of awareness on radiobiology. Evaluation of results of the present study showed that 76.92% of the intern participants, 59.01% of 3<sup>rd</sup> year students and 64.81% of Final year students were aware that dental x-rays are harmful. The results were contradictory with findings of MPV Prabhat, et al. which noted that majority of the participants were aware about the harmful nature of dental X-rays. An increased occurrence of cancer, birth defects, cataracts and shortening of life span were reported as a result of prolonged radiation exposure [10]. An association between radiation exposure and increase the chances of abortion, mutagenic changes in the fetus, cataracts and shortening of life span have also been documented. Although these findings may not be seen with diagnostic dental radiography, even then some stochastic biological hazards effect may be observed [15].

Radiological investigations should only be prescribed by medical personnel for specific purposes when the benefit outweighs the risk. The dentists should be aware about radiation protection methods in order to protect themselves, their patients and others around them. Their knowledge of ionizing radiation from medical devices makes explanation of the benefit and risk to the patients easy. Professional negligence on part of medical practitioners can lead to prolonged radiation exposures which are hazardous and harmful to the living tissues. [9] For the same reason dentists should follow the ALARA principle concept of keeping the

radiation exposure “As Low As Reasonably Achievable” [2, 3, 16].

Evaluation of the results of the current study showed that majority of participants were aware of the fact that X-rays used in diagnostic dental radiology are harmful and certain levels of precautions should be taken while in use. Among

all the groups evaluated, a subtle variation was noted in regard to the knowledge and understanding of the basic physics of radiation in an ascending order from third year, final year to interns. This stresses the fact that awareness about the harmful nature of the x-rays increases with increase in qualification of the participants.

**Table – 1:** Frequency of responses of participants.

Sr. No.	Questions	Responses	3 <sup>rd</sup> year BDS		Final year BDS		Interns	
			N (61)	%	N (54)	%	N (65)	Total %
1	Are dental X-rays harmful?	YES	36	59.01	35	64.81	50	76.92
		NO	25	40.98	19	35.18	15	23.07
2	Can X-rays be reflected from the walls of the room?	YES	24	39.34	25	46.29	38	58.46
		NO	37	60.65	29	53.70	27	41.53
3	Are you aware of National council on radiation protection (NCRP) and ICRP- International commission on radiological Protection (ICRP) recommendations?	YES	20	32.78	18	33.33	40	61.53
		NO	41	67.21	36	66.66	25	38.46
4	Are you aware of ALARA principle?	YES	24	39.34	37	68.51	50	76.92
		NO	37	60.65	17	31.48	15	23.07
5	Do you know which speed film you use?	YES	23	37.70	32	59.25	48	73.84
		NO	38	62.29	22	40.74	17	26.15
6	Does increase in speed reduce exposure?	YES	22	36.06	30	55.55	46	70.76
		NO	39	63.93	24	44.44	19	29.23
7	Are you aware of usefulness of collimators and filters in dental radiography?	YES	24	39.34	31	57.40	47	72.30
		NO	37	60.65	23	42.59	18	27.69
8	Are Dental radiographs absolutely contraindicated for pregnant patients?	YES	28	45.90	21	38.88	25	38.46
		NO	33	54.09	33	61.11	40	61.53
9	Does digital radiograph require less exposure than conventional?	YES	32	52.45	37	68.51	55	84.61
		NO	29	47.54	17	31.48	10	15.38
10	Will you adhere to radiation protection protocol at the time of your future private clinical practice?	YES	39	63.93	40	74.07	56	86.15
		NO	22	36.06	14	25.92	9	13.84
11	Do you regularly prefer using lead aprons?	YES	36	59.01	44	81.48	55	84.61
		NO	25	40.98	10	18.51	10	15.38
12	Are you aware of the radiation hazard symbol?	YES	22	36.06	39	72.22	51	78.46
		NO	39	63.93	15	27.77	14	21.53

In the present study, it was observed that 38.46% of the intern participants, 45.90% of 3<sup>rd</sup> year students and 38.88% of Final year students supported the fact that dental radiographs are absolutely contra-indicated for the pregnant patients. This result varied from the study carried out by MPV Prabhat, et al. [10], where only 6.4% of interns supported this fact. Thus, about 30- 50 % of the students were not ready to treat pregnant patients regardless of their pregnancy semester, the level of emergency and regardless the different precautions available. In support of our study, a previous study conducted amongst 250 general dentists, it was concluded that the studied population of dentists does not seem to have the sufficient knowledge regarding the diagnostic dental radiation risk during pregnancy [17].

In our study, 61.53% of the intern participants, 32.78% of 3<sup>rd</sup> year students and 33.33% of Final year students were aware of the NCRP/ICRP recommendations, which are conflicting to the results of the study carried out by MPV Prabhat [10]. One of the striking finding of our study was the reduced number of 3<sup>rd</sup> year students wearing lead apron while operating an x-ray unit, considering the beneficial effect of lead apron. In our present study, the percentage of intern participants that always wore lead apron was 84.61% which was comparatively better as compared to the study carried out by R. Jacobs and his associates amongst the Belgian dentists where only 12% of the dentists wore lead apron while operating an x-ray units [18]. The reasons for not wearing a lead apron among undergraduates might be attributed to the non availability of lead apron and increased weight of the apron. Knowledge among the participants about speed of x-ray film was encouraging. Most of the intern participants in our study were aware about which speed of x-ray film they used and whether increase in the speed reduced the exposure. Also most of the interns (72.30%) were aware of the usefulness of collimators and filters in dental radiography. These findings coincide with the results of the study carried out by R. Jacobs and MPV Prabhat [10, 18].

In the present study, it was noted that 78.46% of the interns, 36.06% of 3<sup>rd</sup> year students and 72.22% of Final year students were aware of the radiation hazard symbol and this knowledge was comparatively low in the graduates compared to interns. From the current study, it is arguable that the participants were aware of the radiation protection protocols and it is more so with the interns, followed by the fourth and third year students. Although this study is first of its kind and not many studies were available for comparison, the results fits well with our hypotheses that the KAP of undergraduates and interns towards radiation protection was limited and this can be applicable to this community as well. However, further studies with a larger sample size are required to validate our hypotheses. More over the current study was a single institutional based one, hence a cross-sectional study comprising of similar samples utilizing multiple institutional participants are required for authentication.

Methods to protect the personnel include education, implementation of radiation protection program and usage of barrier techniques. Training of personnel in radiation protection should be a continuous process even after graduation from dental school to achieve long-term knowledge retention and repeated reinforcements [19]. It is also recommended that radiographic examinations at the undergraduate level should be taken intricately so as to inculcate knowledge about radiation hazards as early as possible. After graduation, the practitioners must attend continuing dental education programs to keep their knowledge up to date. This can help in keeping the dentist updated with any new information beneficial for his practice. Also awareness regarding radiation exposure hazards should be circulated on social media to reach a larger audience. The periodic check-up of X-ray units should be made mandatory by the authorities. Also, film badges for personal dosimetry should be made compulsory to be worn by the dentist and the para-medical staff to keep an eye on the amount of radiation exposure.

## Conclusion

The radiographs can pose as a potential hazard to health of both dentists as well as the patients. Thus it is necessary to reduce the exposure to dental radiation.

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