



## Original Article

## Assessment of Knowledge Towards Radiation Hazards and Protection Protocols Among Medical and Dental Students

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## ABSTRACT

Recently the use of radiography is growing significantly due to technology advancements and overdependence for diagnosis that's the reason everyone is exposed to radiation and there is a linear relationship exists between radiation exposure and adverse effects on the body.

**Objectives:** To compare the radiation hazards and protection protocols knowledge among the final year medical and dental students of private university. **Methods:** It was an analytical cross-sectional study conducted on final year students of Medical and Dental College of private university at Karachi Pakistan. All students in final year MBBS and BDS irrespective of age and gender were the source population. The study populations (n=85) were those students who were randomly chosen to fill the questionnaire. The study tool in this research included a structured questionnaire. Each correct answer was scored as 1 point. Percentages and frequencies will be recorded for qualitative variables. The total knowledge scores between medical and dental students were compared using the independent t-test. **Results:** The data were analyzed on a total of (n=85) students. The mean ages were 22.91±0.71. From total sample 59 (69%) were girls and 26 (31) % were boys. There were (n=45) students from the final year MBBS and (n=40) students from BDS referred as group I and II respectively. There was significant difference (t(83) = -3.052, P=0.003) in the knowledge scores of group I (8.95±3.30) and group II (11.40±4.07).

**Conclusion:** Majority of Dental students have high knowledge scores as compare to medical students.

## INTRODUCTION

Radiological evaluation is essential for the diagnosis of many diseases in medicine and dentistry. In today's world with the advent of CT and CBCT which are giving much better results as compared to conventional radiographs, one tends to advise these even in situations where it is not justified [1]. In diagnostic radiography, the use of ionizing radiation (IR) has both helpful and undesirable effects on patients [2]. The biological effects of IR on the human body can be of two types of effect deterministic and stochastic effects. Deterministic effects are proportional to the dose whereas stochastic effects are produced by sub-lethal radiation-induced damage to DNA [3]. Sometimes adverse

effects appear instantly after exposure, on the other hand, they may not visible for several years [4, 5]. The protection of people and the environment from the harmful effects of exposure to ionizing radiation is defined as radiation protection [6]. Radiation protection has three main rules which are named distance, exposure time, and shielding for external irradiation. It also has three core principles namely dose limitation, justification, and optimization (ALARA, as low as reasonably achievable [7, 8]. This negative effect due to IR is on an increasing trend, it can be associated with insufficient knowledge and attitude towards radiation hazards, radiation doses of standard imaging, and

protection protocols among medical and dental practitioners [9, 10]. The lack of optimization criteria for referring doctors and radiological staff has aggravated the incidence of ionizing radiation, which can be harmful not only to radiological staff but also to patients [11-13]. The amount of radiation exposure from radiographs depends on multiple variables like the speed of film, exposure aspect, the technique used to take radiographs, collimators, and the use of a protective barrier. Physicians who advise radiological examinations tend to underestimate the actual doses involved and may have less knowledge about the risks to the health of people, and do not discuss them with their patients [1]. When high-dose scans like computed tomography and fluoroscopy are done without optimization, especially in a country like Pakistan where there is a limited number of health amenities that offer radiological services for a population of 243 million. Insufficient knowledge of radiation risk can be seriously detrimental. In many studies, it was indicated that the doctors were unaware of the radiation hazards and do not consider this when prescribing radiographic examination. It is observed from the literature search that the studies focused on assessing the knowledge of medical and dental practitioners regarding radiation protection concerns in India, Iran, and Saudi Arabia recorded the highest number of publications on this topic revealing the areas where they need to focus. On the other hand, Pakistan falls into a category where the least number of studies found on this important topic. This explains why we need to work on this important topic so we can improve our safety standards regarding radiation protection measures [14]. Dental and medical students acquire knowledge about the fundamentals of radiology in their final year, and they practice interpretation of clinical radio-diagnosis during their internship. Most of them usually underestimate the proper use of dental imaging tools, protective measures, and their associated radiation risks. The objective of the research is to compare the radiation hazards and protection protocols knowledge among the final year medical and dental students of private university.

## METHODS

This research was a cross-sectional analytical study. It was conducted on final-year students of the medical and dental College of a private university in Karachi Pakistan. All medical and dental students in their final year MBBS and BDS irrespective of age and gender considered as source population. The research populations comprised of those students who were randomly chosen to fill out the questionnaire. The students for research were selected using a computer-generated simple random sampling technique using their enrollment numbers. However, when

any of them refused to participate, the next number from the list was taken as well. Questionnaires with missing page and incomplete in which all 15 questions were not answered were excluded from the study. The total number of medical and dental students was 150 among them the study was performed on a total of 85 students. In this research, the study tool included a structured questionnaire comprising two parts: A and B. Part A covered the questions about the demographic data of the students, and Part B comprised Fifteen questions in which ten questions consist of dichotomous responses (yes/no) and five questions are of multiple-choice type. In the fabrication of the questionnaire help from previous studies was taken with the permission of the authors [1, 15]. Questionnaires will be distributed among the students after taking their written consent and self-administered. Each correct response was scored as 1 point and each wrong response was scored as 0 points. The higher score shows the better knowledge of participants. All the responses were analyzed and recorded. Participants that responded with 4, 5 to 7 and >7 up to 15 correct responses were considered as having "low competence"; "moderate competence" and "high competence" in IR knowledge. This scale was developed with the help of a previous study based on a study by Koole et al., in which the competence levels of undergraduate dental students were assessed [16]. Data were assessed through Statistical Package for the Social Sciences SPSS software (version 20.0); for qualitative variables, percentages and frequencies were recorded. The total scores of correct responses between medical and dental students were compared using the independent t- test. The significance level was kept at  $p \leq 0.05$ .

## RESULTS

The data were analyzed on a total of (n=85) students. The mean ages of the students were  $22.91 \pm 0.71$ . Out of the total 59 (69%) were girls and 26 (31) % were boys. There were (n=45) students from the final year MBBS and (n=40) students from BDS. In the current study, medical students who were studying in their final year of MBBS at the time of the research were referred to here as group I, and students who were studying in their final year of BDS were referred to as group II. An independent sample t-test was conducted to compare the knowledge scores of both groups. There was a significant difference ( $t(83) = -3.052, P=0.003$ ) in the knowledge scores with the mean score for group I being  $8.95 \pm 3.30$  lower than group II with a mean score of  $11.40 \pm 4.07$ . The magnitude of differences in the means (mean difference =  $-0.244$ , 95% CI) was significant. In the comparison of both groups majority of participants in group II have high knowledge scores as compared to group I participants who have low to moderate scores as shown in table 1.

S. NO	Groups	Level of competence (max scores =15)	Mean ± SD	p-Value
1-	Group I (n=45)	Low 15 (1-7)	8.95±3.30	0.0038*
		Moderate 19 (8-10)		
		High 11 (11 to 15)		
2-	Group II (n=40)	Low 9 (1-7)	11.40±2.07	
		Moderate --9 (8-10)		
		High --22 (11 to 15)		

\*Statistically significant

**Table 1:** Comparison of total Knowledge scores among students in both groups

Regarding the knowledge about the harmful nature of X-rays, high-speed films, and the position of the radiographer with regard to protective screen respondents of both groups had the same level of knowledge. Group I had better knowledge about the Function of the Dosimeter, adverse effects of high radiation dose, and an indication of X-Ray in a pregnant woman in comparison to group II. Group II had better knowledge about the Principle of ALARA (as low as reasonably Achievable), National Council on Radiation Protection (NCRP), and International Commission on Radiological Protection (ICRP) recommendations, as well as they, showed better results regarding the knowledge of Digital radiography, Protocol for the management of radiographic waste, use of protective barrier, screen material, radiosensitive and radio resistant organ of the human body as shown in Table 2.

S. NO	Knowledge Items	Response	Medical students (n=45)	Dental Students (n=40)	Total correct responses (n=85)
1-	X-Rays are Harmful	Yes	45	39	84
		No	—	01	
2-	While taking X-rays ALARA principles should be applied.	Yes	31	31	62
		No	14	09	
3-	Are you aware of NCRP/ICRP?	Yes	30	31	61
		No	15	09	
4-	Do high-speed films reduce patients' exposure	Yes	45	39	84
		No	—	01	
5-	While taking radiographs one must stand behind a protective screen.	Yes	43	39	84
		No	02	01	
6-	A dosimeter is used to measure the radiation dose	Yes	42	36	78
		No	03	04	
7-	Digital radiography requires less exposure than Conventional	Yes	30	31	61
		No	15	09	
8-	Radiographs are absolutely contraindicated for pregnant patients	Yes	25	38	63
		No	20	02	

9-	High radiation doses lead to cancer	Yes	43	20	63
		No	02	20	
10-	Are you aware of the protocol for radiographic waste management?	Yes	08	23	31
		No	37	17	
11-	Which material does the screen consist of	Lead	08	25	23
		Glass	37	15	
		Steel	0	0	
		Plastic	0	0	
12-	What do you use as a protective barrier?	Lead apron	11	26	37
		Thyroid collar	34	14	
		Shielding gloves	0	0	
		Protective devices	0	0	
13-	Which among the following is the most radiosensitive organ/tissue?	Skin	13	28	41
		Kidney	32	01	
		Neuron	0	0	
		Liver	0	0	
14-	Which among the following is the most radio-resistant organ/tissue?	Bone	25	12	37
		Muscle cells	16	28	
		Lungs	02	0	
		Mammary gland	02	0	
15-	Which among the following do you think will be the most appropriate way of awareness of radiation protection and hazards?	Lectures	35	18	53
		Tutorials	01	0	
		workshop	04	01	
		Departmental rotations	05	21	

**Table 2:** Knowledge of radiation hazards and protection among medical and dental students

## DISCUSSION

Our study results provide current evidence of knowledge, awareness, and practice about radiation protection among medical and dental students in Karachi Pakistan and the majority of dental participants have high knowledge scores as compared to medical participants which could be attributed to the inclusion of the subject of Oral Radiology in the curriculum of dental students whereas, the medical students are not exposed to the subjects until they enter their internship. Among all medical and dental professionals' knowledge conveyed during student life decide attitude, practice, and clinical behavior in their professional life. The current study reported, 99% of participants knew the harmful nature of x-ray, radiation exposure with high-speed films, and the position of the radiographer with regard to protective screen these results are in accordance with Motwani Mukta *et al.*, and Rahul *et al.*, it might be due to fact that participants in these studies are at the same level of education (final year) and study setting are same [1, 17]. In accordance with ADA guidelines, during pregnancy taking dental radiographs is not absolutely contraindicated but if a radiographic investigation is compulsory, it can be carried out with

appropriate safety measures [18]. Our study discloses that the majority of medical students in comparison to dental students are aware of the criteria for ordering radiographs for pregnant women and the adverse effects of high radiation doses these results are in disagreement with Motwani Mukta *et al.*, results of the possible reason for this disagreement is the difference in the curriculum of both countries [1]. According to current study results majority of dental students are aware of the ALARA principle as well as NCRP/ICRP recommendations as compared to medical students so it can be inferred that those who were unfamiliar with the term cannot apply ALARA in practice and consequently patient receive unnecessary radiation exposure these results are in agreement to the results of Prabhat *et al.*, and Asha *et al.*, where the majority of dental students have awareness about it [3, 19]. In accordance with other studies, the present study reported about 77% of dental participants and 66% of medical participants knows that digital radiography requires less exposure than the conventional technique. It can be inferred that dental students are more aware of digital radiography and its advantages than medical students [3, 17]. It might be because almost all radiographs taken during dental procedures are digital in nature. Dental students were more aware than medical students of radiographic waste management. These results are in disagreement with Asha *et al.*, where the majority of medical students were aware of radiographic waste management this implies that special efforts need to be taken to improve the knowledge of medical students in this field in our country [19]. Properly selected lead apron reduces the effective radiation dose by 75%–90% [20]. Recent study reported in comparison to medical student's majority of dental students mentioned that they are using lead aprons on regularly in corroboration with previous study [21]. This reveals that knowledge related to the usage of the lead apron is not even among the students of both fraternities and they have to be closely taught and examined.

## CONCLUSIONS

In comparison to both groups majority of dental participants have high knowledge scores as compared to medical participants who have low to moderate scores.

## Conflicts of Interest

The authors declare no conflict of interest

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