

# Awareness level of radiation protection among dental students

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## Abstract-

**Introduction:** Dental radiographs are the important tools in diagnosis of oral diseases. The radiation hazard posed by the dental radiographs is low but still accumulation of such radiation in human body can pose a threat to the overall health of individual. The aim of the study is to assess the awareness of radiation protection and hazards among dental students.

**Methods:** The study was questionnaire based which contained a set of 17 multiple choice of questions. The questions were mainly based on Principle of radiation protection, organs which are susceptible to measures radiation exposure of radiation protection, necessity of informing patients against hazards of radiation exposure.

**Results:** The total of 350 potential participants were emailed & invited to respond to the questionnaire, and the response rate was 85.7%. Most of the participants were 3rd year, 4th year & Interns. A majority of the participants considered medical radiation to be very hazardous to human beings.

**Conclusion:** The present study suggested that majority students still come under the average knowledge category. The lectures should impart more knowledge as well as training about the protection measures to train the budding dentists about all the aspects of radiation.

**Key Words:** Awareness, hazards, radiation, students.

## INTRODUCTION

The transmission of energy through space and matter is called radiation. In our day today life radiation has become a very important part of modern living & reaching every sector of science. Basically there are two types of radiation namely ionizing and nonionizing radiations & we are constantly exposed to these radiations through our medical & dental procedures.

These radiations play important roles in both diagnostic and therapeutic modalities & it is widely used in the field of dentistry ranging from diagnosis of caries to more complex procedures such as precision implant planning.

Even small dosage of radiation exposure causes hazardous effects so awareness and knowledge about radiation hazards and protective measures play an important role in reducing radiation exposure among healthcare workers. Dentists as well as radiographers should inform patients about the possible hazards involved with the use of X-rays.

A stochastic effect doesn't depend upon threshold dose that could lead to biological injury, so the probability of occurrence of the change, rather than its severity, is dose dependent. Deterministic effects are dose dependent, above which the biological damage appears in the body. Both deterministic and stochastic effects are caused by high dose of ionising radiation. Whereas low dose of radiation leads to mainly stochastic effects. Both dentists and patients are at high risk of stochastic effects. Many studies have demonstrated that exposure to radiation increases the risk of bone marrow suppression, birth deformities, infertility, cataract and several types of cancer & specially thyroid carcinoma<sup>1</sup>.

National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection have globally issued usable guidelines to control the amount of radiation received by both the patient and practitioners. Which lead to a limited exposure of radiation which have been introduced to ensure there are no deterministic effects towards any individual & also to reduce the stochastic effects as low as reasonably and economically feasible.<sup>8</sup>

ICRP (International Commission on Radiological Protection) proposed a general principle of radiation protection, which is based on three principles: Justification, optimization (as low as reasonably achievable (ALARA)) and dose limitation.<sup>17</sup>

These three principles form the foundation of radiation protection strategies. Several study data shows that collective doses from dental radiography have a significant share in the average annual dose from medical sources. Average dose from intraoral radiography is lower or comparable with the daily background radiation dose.<sup>4</sup>

As radiograph plays an essential role in daily dental practice, because the practitioner has to evaluate a diseased tooth through radiographic examination. Certain amount of radiation cannot be omitted from delivering to the patients; therefore it should be as low as reasonably achievable.<sup>16</sup>

In dentistry the radiation exposure has to be done to full-fill their diagnosis sheet. The dentist differs from medical colleagues as he exposes, processes, and interprets the radiograph. Even if the radiation exposure is minimal, the importance of awareing the patient about radiation exposure or to avoid the radiation dosage is the responsibility of the dentist because the hazardous effects of radiation exposure going to affect the patients throughout their entire lifetime.<sup>17</sup>

## MATERIALS AND METHODS

The study was questionnaire based and had a cross sectional observational design and the study data is collected from several references which contains set of 17 questions. The questions are mainly based on: Principle of radiation protection (ALARA), organs that are susceptible to radiation exposure, measures of radiation protection, necessity of informing patients against hazards of radiation exposure.<sup>4</sup>

The questionnaire was distributed to all the dental students including 3rd year, 4th year and interns and students pursuing dentistry in various dental colleges are also included. Those students who do not undergo clinical posting in Department of Oral Radiology and Medicine in their 1st and 2nd academic year and students who were not willing to participate in the study were excluded.<sup>5</sup>

## METHODOLOGY

The questionnaire based cross-sectional observational study design was conducted among a convenient sample size of 350 dental students. The study questionnaire was prepared by four interns of MIDSR dental college and validated by two experts. The study was conducted by involving the 3rd, 4th and interns of the dental college those who were willing and present at the time of stud.<sup>17</sup>

The specially prepared questionnaire using Google forms was distributed randomly among students of MIDSR dental college in Latur district of Maharashtra total of 17 questions were included. The questionnaire was mainly categorized into four sections as principle of radiation protection [ALARA] organs that are susceptible to radiation protection, measures of radiation protection and necessity of informing patients against hazards of radiation exposure. As the questionnaire was prepared using Google form it conveniently allowed participants to submit and collect data without biasing the data collection process. Students were informed that the questionnaire was processed anonymously. The questions were framed in the form of affirmative sentences with answers like YES, NO and DONT KNOW. The study was initiated in the month of August 2022 and completed in December 2022. At one week first email had been sent to the participants, another email was sent to motivate more participants to respond to the study.<sup>17</sup>

## RESULTS

The total of 350 potential participants were emailed & invited to respond to the questionnaire, and the response rate was 85.7 % (N = 300). The average age of the participants was 21-24 years. Most of the participants were 3rd year, 4th year & Interns.

A majority of the participants considered medical radiation to be very hazardous to human beings. Half of the participants believed that it was not very hazardous, and a small (54%) percentage of them considered it to be hazardous [figure 1]. Furthermore, 3% of the participants don't know anything about radiation hazards.

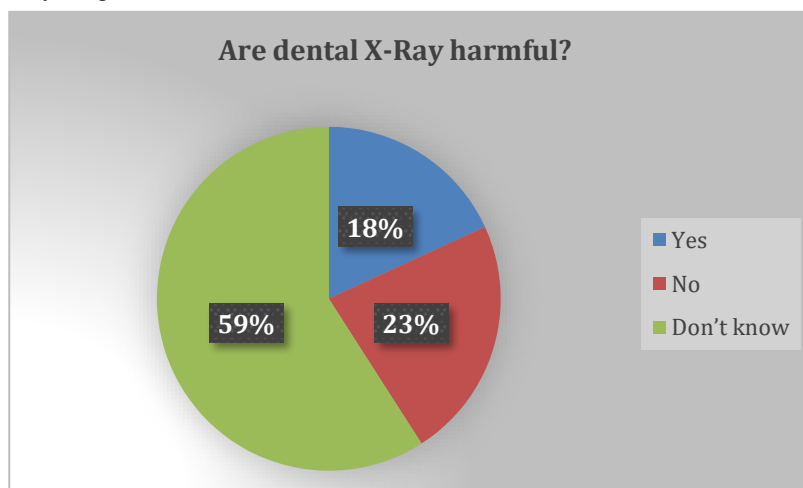


Figure 1: pie chart representing knowledge of participants on harmfulness of dental x-rays.

Almost half (51%) of the participants are aware of ALARA principle [figure 2]. 40% of the participants had never received any training about radiation hazards & protection measures.

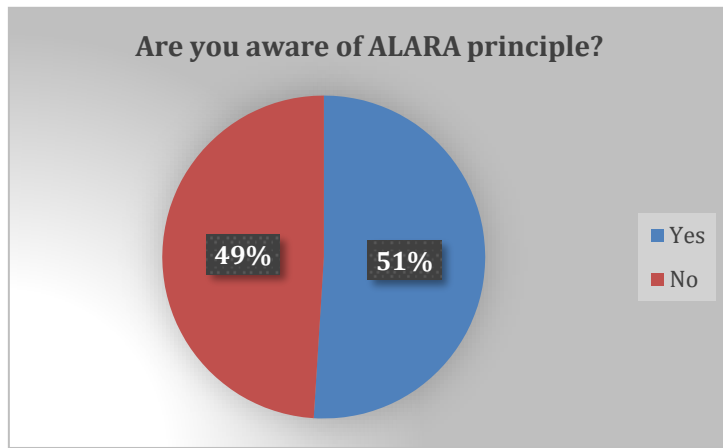


Figure 2: pie chart representing awareness about principles of radiation protection

Different human tissues have different radio sensitivity towards radiation exposure. As per the responses only 25% of the participants have knowledge about radio sensitivity of different tissues. [Figure3]

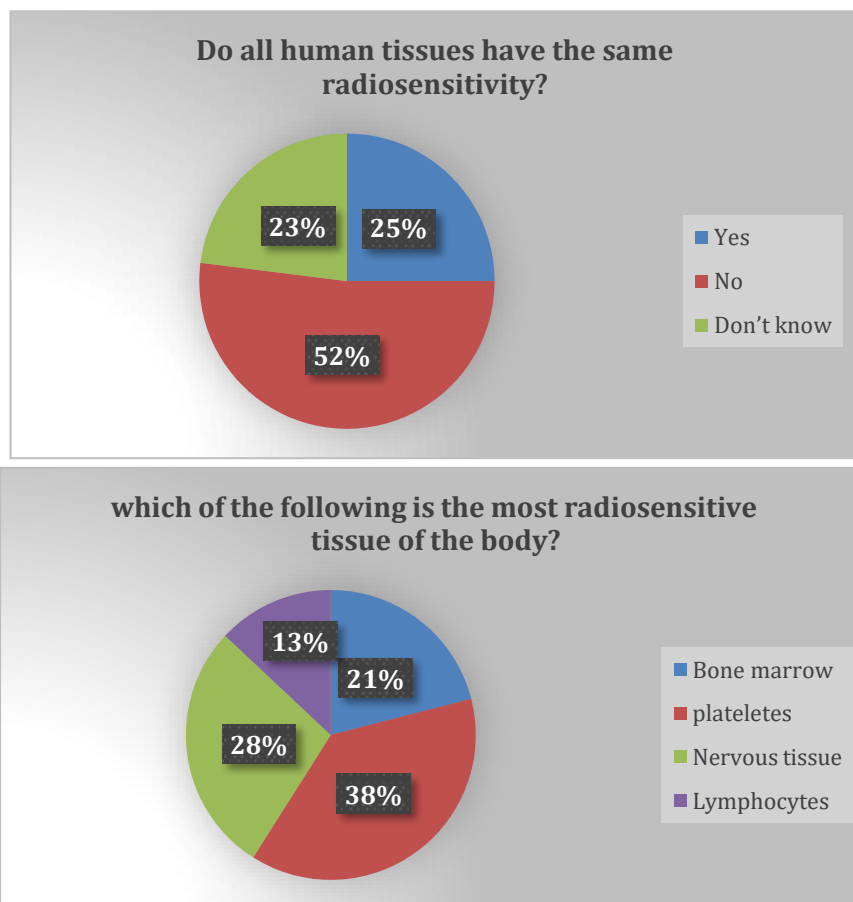


Figure 3: pie chart representing knowledge of participants about radio sensitivity of human tissues.

There are various radiation exposure effects on human tissues which are broadly categorized into deterministic and stochastic effects. 28% of the total participants consider Leukemia as the major stochastic effect.

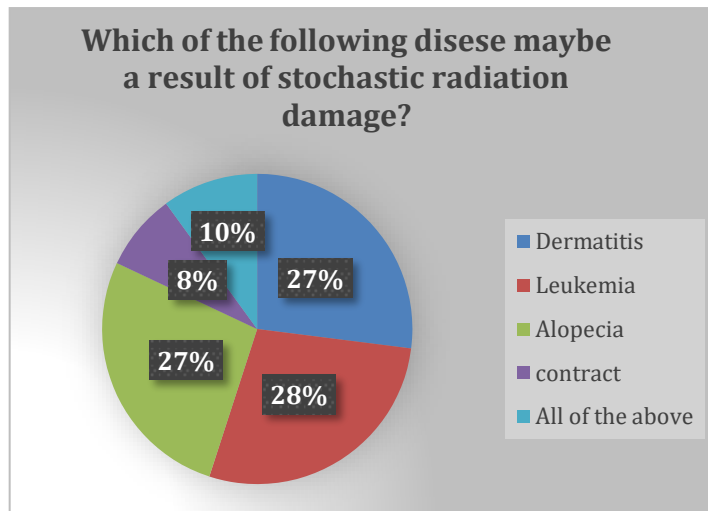


Figure 4: pie chart representing stochastic damages on humans.

Below shown chart is the summary of all the responses collected by the participants for each question.

Distribution of student responses					
Questions	N(%)	N(%)	N(%)	N(%)	N(%)
(1) Are dental X - Ray harmful?	Yes-164 (54.3%)	No-114(37.7%)	Don't know- 24 (8%)		
(2) Are you aware of the radiation hazard?	Yes-225 (74.5%)	No-77 (25.5%)			
(3) Have you ever attended training's on radiation protection?	Yes- 170 (56.3%)	No-132(43.7%)			
(4) How do you consider your knowledge level about ionising radiation related risk?	Excellent- 84 (27.8%)	Good-120 (39.7%)	Sufficient-76 (25.2%)	Insufficient- 22 (7.3%)	
(5) Do you explain the radiation measure & their limitations to the patients before taking X-Rays?	Yes-191 (63.2%)	No-111(36.8%)			

(6) Are you interested in joining & promoting awareness program in your college?	Yes-223 (73.8%)	No-79 (26.2%)			
(7) Do you use lead barriers?	Yes-163 (54%)	No-139(46%)			
(8) Do high speed films reduce patient exposure?	Yes-142 (47%)	No-97 (32.1%)	Don't know-63 (20.9%)		
(9) Are you aware of ALARA principle?	Yes-177 (58.6%)	No-125(41.4%)			
(10) Are you aware of position, distance rule while shooting X rays?	Yes-179 (59.3%)	No-123(40.7%)			
(11) At what distance you should stand if no barriers are present?	3 feet- 70 (23.2%)	5feet-141 (46.7%)	6 feet- 91 (30.1%)		
(12) Does digital radiography requires less radiographic exposure than conventional type?	Yes-128 (42.4%)	No-99 (32.8%)	Don't know 75 (24.8%)		
(13) Do all human tissues have the same radio sensitivity?	Yes-89 (29.5%)	No-142(47%)	Don't know-71 (23.5%)		
(14) Which of the following is more sensitive to radiation?	Unborn child-133 (44%)	Child-119 (39.4%)	Adult-50 (16.6%)		
(15) Are dental radiographs absolutely contraindicated in pregnant patients?	Yes-110 (36.4%)	No-96 (31.8%)	Don't know-96 (31.8%)		
(16) Which of the following is the most radio sensitive tissue of the body?	Bone marrow-98(32.5%)	Platelets-88 (29.1%)	Nervous tissue-72 (23.8%)	Lymphocytes-44 (14.6%)	
(17) Which of the following disease may be a result of stochastic radiation damage?	Dermatitis-69 (22.8%)	Leukemia-76 (25.2%)	Alopecia-53 (17.5%)	Contract-22 (7.3%)	All of the above- 82 (27.2%)

**DISCUSSION:**

As per our knowledge, this study was the attempt to examine knowledge and awareness about radiation hazards among dental students. The main outcomes of this study are that most participants considered radiation exposure that they get to exposed during daily practice very hazardous. Most of the participants reported that they always wore a lead apron when working under radiation exposure.

**CONCLUSION:**

The study concluded that majority of students had good and enough knowledge about the radiation exposure hazards, and protection measures; but most of the majority students still come under the average knowledge category. So, the lectures should impart more and more knowledge as well as training about the protection measures to train the budding dentists about all the aspects of radiation.

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**DECLARATION OF CONFLICTING INTERESTS:**

The researchers declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**ETHICAL APPROVAL:**

Ethical approval for this study was obtained from MIDSr ethical committee, Latur.

**INFORMED CONSENT:**

The participants were informed that their participation in the study's questionnaire was entirely on a voluntary basis before they responded. The formal informed consent was waived by the Institutional Ethics Committee.

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