



## AWARENESS OF RADIATION RISKS AND PROTECTION AMONG MEDICAL STUDENTS: A CROSS SECTIONAL STUDY

### Pharmacology

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### ABSTRACT

Radio-diagnosis and imaging is one of the important specializations, used as a tool for the diagnostic and therapeutic examination but ionizing radiation used in the radiology examination also carries well-known potential risks. The knowledge of ionizing radiation exposure risks among the medical staff is essential for planning diagnostic procedures and therapy. Objective: The main objective of this study is to assess the knowledge of medical students on radiation dose, its hazards and radiation protection protocol. Materials and methods: A cross sectional questionnaire-based study was conducted among final year medical students, house surgeons and post graduate students in a rural medical institute in South India. 185 students participated in the study. Each correct answer was awarded one mark and no mark was given for wrong answer. Results: The highest rates of correct answers to questions related to the issue of radiation protection were provided by the post graduates followed by house surgeons and final year medical students. Few students incorrectly believed MRI and ultrasonography utilizes ionising radiation.

Conclusion: Medical students have limited awareness about radiation risks and protection. Periodic training of both undergraduate and postgraduate medical students on radiation risks and protection needs to be emphasized.

### KEYWORDS

MRI , Knowledge, Questionnaire.

### INTRODUCTION

Radiation has negative biological effects on living organisms, which may vary depending on the dose and the duration of exposure.<sup>1,2</sup> In recent years, studies have documented increasing patient radiation exposures, which can be attributed to increased utilisation of diagnostic imaging studies, particularly computed tomography (CT). A retrospective study of radiation doses in a cohort of patients with Crohn's disease conducted over a 15-year period demonstrated that increasing numbers of CT exams were performed with average cumulative effective doses rising from 7.9 to 25 mSv when the first 5 years of the study period were compared with the final 5 years.<sup>3</sup> The occurrence of the adverse effects of X rays had triggered research in radiation protection. As a result, personal radiation protective equipment was introduced and legislations were passed that defined the limit values and established regulations for radiological protection of the medical staff and the patient.<sup>4,5,6</sup>

The international authorities such as International Council of Radiation Protection (ICRP) and national authorities such as National Council of Radiation Protection (NCRP) in India issues guidelines about the limits of radiation doses and ways to minimize radiation exposure.<sup>7</sup> Eighty-five percent of the radiation dose was attributable to CT. CT has been shown to account for merely 6% of diagnostic procedures, yet represented 47% of the entire radiation dose received by patients.<sup>8</sup>

It has long been recognized that ionizing radiation is a human carcinogen. In general, the effects of radiation are thought to vary according to the dose and duration of exposure and a linear, dose-dependent model is commonly accepted; as a result, there does not seem to be a threshold dose below

which radiation exposure is safe.<sup>3,9,10</sup> Thus, methods relying on ionizing radiations should be rationally utilized, taking their risks and benefits into consideration, and whenever possible, preference should be given to methods that do not rely on

ionizing radiation, and to the utilization of the minimum dose required to solve the clinical doubt.

Medical students represent future physicians who commonly refer patients for diagnostic imaging studies that may involve ionizing radiation. The purpose of this study, thus, was to investigate students'

awareness of radiation exposures and risks.

### MATERIALS AND METHODS

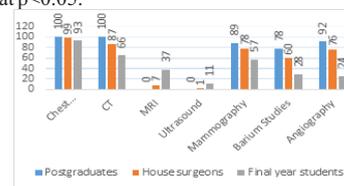
The cross-sectional study was conducted during the period of November 2018 through December 2018 among undergraduate final year medical students, house surgeons and post-graduate students at a rural teaching medical institute located in southern India. A total of 185 students participated in the study. A pre-designed pre-tested questionnaire was used for data collection. The questionnaire consisted of demographic details of the students and questions to assess the knowledge of participants on radiation awareness. A correct answer was given one mark and no mark was given for incorrect/do not know answers. Institutional ethics committee clearance and informed consent from participants were obtained before commencing the study. Data analysis: Frequency and percentages were provided for the demographic characteristics, i.e., gender. Descriptive statistics (mean, standard deviation and median) were provided for the radiation knowledge score. Mean scores among groups were analysed using unpaired t-test and significance was set at  $p < 0.05$ . All statistical analyses were carried out using the statistical package for the social sciences (SPSS), version 23.0.

### RESULTS

**Table 1: Mean score of students' awareness on radiation.**

Group	n	Mean Score	Mean percentage	SD
Postgraduate	36	14.53*	76.47	1.98
House Surgeons	67	9.13	48.05	1.27
Final Year Students	82	7.34*	38.63	1.71

\* Significant at  $p < 0.05$ .



**Figure 1: Knowledge of students in associating various imaging techniques with risk of cancer.**

**Table 2: Percentage of students associating ionising radiation with various imaging techniques. The figure in parentheses represent the student numbers.**

Imaging study	Postgraduates % (36)	House surgeons % (67)	Final year students % (82)
Chest radiographs	94.44(34)	97.01(65)	93.90(77)
CT	91.67(33)	94.02(63)	68.29(56)
MRI	5.56(2)	47.76(32)	62.19(51)
Ultrasound	2.7(1)	34.32(23)	52.43(43)
Mammography	58.33(21)	50.74(34)	28.04(23)
Barium Studies	63.89(23)	35.82(24)	18.29(15)
Angiography	80.56(29)	85.07(57)	41.46(34)

The study was conducted among 185 participants of which there were 36 post graduate students, 67 house surgeons and 82 final year medical students. 103 participants were female and 82 were male participants. The questionnaire assessed the knowledge on radiation risks and radiation protection protocol and also the cancer risk with the use of such diagnostic techniques. 63% of the study participants were exposed to lectures or teaching in diagnostic radiology. Overall correct answers for the questions was given by a mean percentage of 76.47 of the post graduates. Final year medical students had a mean percentage of 38.63 and house surgeons had a mean percentage of 48.05. Only 74% of PG students and 52% of interns correctly answered the question regarding the unit of measurement of radiation. All participants had a moderate understanding of issues surrounding radiation dose associated with CT. 82.16% of the study population knew that CT involved the use of x-rays. The assessment of final year medical students' knowledge of principles of MRI and ultrasound yielded disappointing results. 62.19% and 52.43% of the final year students answered that MRI and ultrasonography exposes patients to ionising radiation (Table 2). Similarly, 45.95% of the study population answered that MRI used x rays (Table 2) Regarding cancer risks, 80% of the study population were aware that CT potentially increased the lifetime cancer risk. There was a significant difference about radiation knowledge among post graduates when compared to final year medical students. (Table 1)

## DISCUSSION

Radiation diagnostic and therapeutic techniques mainly comprised of x-ray, CT scan, USG, MRI and Nuclear medicine. Use of ionising radiation in medical field has increased along with radiation hazard in patients and health workers. Medical and dental x-rays now constituents the major man-made sources of radiation exposures.<sup>11,12,13</sup>

The European council's Eurotom directive issued in 1997 was an effort to address radiation protection awareness.<sup>14</sup> This directive states that the radiation exposure for medical purposes should yield a net benefit to the patient and the society. Medical students are expected to be aware of which imaging techniques uses ionising radiations and the approximate quantity of radiation involved without which they are unable to make appropriate clinical decisions. This study was aimed at assessing the knowledge of the medical students on radiation doses and the key finding was that the participants had low levels of knowledge. The findings of this study are consistent with previous studies which reported poor knowledge of ionizing radiation procedures among medical students.<sup>15</sup>

The highest mean score for the questionnaire was observed in postgraduates and house surgeons because of their extensive involvement in hospital and patient care. The study demonstrated incremental increase in knowledge of radiation risk and protection from final year through internship and postgraduation. Few students incorrectly believed that MRI, USG used ionizing radiation. Also, few students in our study population associated MRI and USG with increased cancer risk. This misconception was higher in final year medical students compared to house surgeons and post graduates. A previous study done on medical students demonstrated similar trend wherein a proportion of medical students believed MRI used ionizing radiation and increased the risk of cancer. Imaging studies encountered less frequently by students such as mammography, angiography and barium studies were less well understood.

Limitations of this study include the small sample size and single centre study.

## CONCLUSION

Overall medical students' awareness on radiation dose and the risks

associated with ionising imaging techniques was reported to be low. While most of the students are familiar with radiation-free modalities, many are not familiar with the relative doses and risks of common imaging studies. This may expose patients to increasing imaging investigations and exposure to radiation hazards. The study indicates a need to introduce training programme for awareness about radiation protection and emphasize on radiation protection protocols as a part of undergraduate medical curriculum.

**CONFLICT OF INTEREST:** None

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