Original Article

Knowledge and Attitude of Medical Students Towards Radiation Exposure in Radiology Department

Dilshad Singh
Junior Resident ,Dayanand Medical College & Hospital, Ludhiana, Punjab.

Abstract

Background: Radiation exposure is harmful for health-care providers as well as patients. It may have deleterious effect on the somatic cells and genetic cells. For the protection of staff in radio diagnostic centre, patients, and the general public from the harmful effects of excessive radiation, doses received by the staff of department should be monitored regularly.The present studyaimed at assessment of knowledgeand attitude of medical studentstowards the radiation exposure in radiology department. **Material and Methods:**The study was conducted in the medical institute. The approval for conducting study was obtained from the ethical committee of the institute. The study population comprised of 1st to 5th year medical students (n=634) and to a control group, year 0 [1st year medical students (n = 142) on their first week at medical school]. A questionnaire was given to the study population and control group at the end of the academic year. **Results:** The target population (Years 1–5 and Year 0) included 776 medical students. Of this group, 690 medical students completed the questionnaire, giving a response rate of 89%. Two hundred and ninety eight students were female and three hundred and ninety two students were male, resulting in a 57%: 43% male to female ratio. The study population performed much better than the control group with mean scores of 57% and 37%, respectively ($p < 0.001$). Mean scores improved with the number of years completed successfully in medical school with each successive class outperforming the year below (e.g. Year 4 did better than Year 3, $p < 0.001$). **Conclusion:** The mean scores of the students from the multiple choice questionnaire framed to assess the students are increased with successive increase in each academic year of the student.

Keywords: Medical students, Radiation damage, Radiation protection

Corresponding author:Dilshad Singh Junior Resident ,Dayanand Medical College & Hospital, Ludhiana, Punjab.

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INTRODUCTION

Nowadays, increased number of cancer cases has been reported due to association of increased risk due to repeated exposure to radiations. Studies conducted in United Kingdom have reported that approximately 100-250 deaths occurred every year from cancer having direct link to medical exposure of radiations. International commission on Radiological Protection have proposed justification and optimisation as principles for radiation protection.[1, 2] Therefore, clinician who refers the patient for radiological diagnostic techniques must know the possible harmful effects of the exposed radiations in order to justify a medical imaging procedure based in radiations. As clinicians are skilled in diagnosing lesions radio graphically and it has a huge benefit in clinical practice but the idea of risk of radiations is absent nowadays.

The personnel such as radiologists, radiology and nuclear medicine technicians, and others performing x-ray and computed tomography (CT)-scan examinations are at high risk for damage due to radiation exposure, as compared to general hospital personnel's.[3]Radiation exposure is harmful for health-care providers as well as patients. It may have deleterious effect on the somatic cells and genetic cells. For the protection of staff in radiodiagnostic centre, patients, and the general public from the harmful effects of excessive radiation, doses received by the staff of department should be monitored regularly.[4]

For minimising the radiation risk, the as low as reasonably achievable (ALARA) principle should be followed. The focus of ALARA principle is to use such techniques and procedures which allows the technician to keep the exposure kevel as low as reasonably achievable preventing the risk of

radiation exposure to medical professionals. Other protective gears such as thyroid shields, lead apons, and eye protections can be used to effetcively attenuate the scattered x-ray levels.[5]

A number of studies conducted in past 10 years have investigated physicians from different specialities and backgrounds of their knowledge of radiation dose and associated risks, and most of them have concluded unsatisfactory results. [6,7] Radiation doses required for different radiographical techniques were significantly underestimated by most of the physicians.[8]

The present study aimed at assessment of knowledge and attitude of medical students towards radiatioin exposure in radiology department.

MATERIALS AND METHODS

The study was conducted in the medical institute. The approval for conducting study was obtained from the ethical comiitee of the institute. The study population comprised of 1st to 5th year medical students (n=634) and to a control group, year 0 [1st year medical students (n = 142) on their first week at medical school].A questionnaire was given to the study population and control group at the end of the academic year. The questionnaire consisted of multiple choice questions diveded into two sections. Section 1 included demographics of students, and self-assessment of of knowledge of radiology compared with other medical subjects, as well as previous exposure to instruction and lectures/teaching in radiology. The second section (section 2) assessed awareness and general knowledge of radiation exposures associated with diagnostic imaging studies. One mark was awarded to each correct answer and 0 mark was awarded to each incorrect answer or omission.Results were divided into different groups based on gender differnce, earlier experience of lectures in diagnostic radiology, radiation protection, and apparent knowledge of radiology.Statistical analysis of the data was done using SPSS software for windows. For analysis of individul questions chi-square tests of independence were used. Firstly, the data was analysed using Student's t-tests, followed by Mann-Whitney U tests and Kruskall-Wallis tests. P-value less than 0.05 was defined as the statistical significance.

RESULTS

The target population (Years 1–5 and Year 0) included 776 medical students. Of this group, 690 medical students completed the questionnaire, giving a response rate of 89%. Two hundred and ninety eight students were female and three hundred and ninety two students were male, resulting in a 57% : 43% male to female ratio. Eighty-two percent of the study population compared with 4.1% of controls had been exposed to lectures or teaching in diagnostic radiology prior to completing the questionnaire. Despite this, 87% of the study population and 89% of controls considered that they had never been exposed to lectures or teaching focussed on radiation protection.The study population performed much better than the control group with mean scores of 57% and 37%, respectively ($p < 0.001$). Mean scores improved with the number of years completed successfully in medical school with each successive class outperforming the year below (e.g. Year 4 did better than Year 3, $p < 0.001$) (Table 1, Figure 1). The greatest difference in mean scores was between 2nd and 3rd years (58% versus 71% respectively, $p < 0.001$). In addition, it was observed that students who received teaching in diagnostic radiology and radiation protection performed better than their counterparts who did not ($p < 0.001$) (Table 2, Figure 2).

Table 1: Mean scores for each year (from a total of 17 questions). Mean scores increased when each year was compared with the one below. Fifth year students achieved a mean score of 87%.

Year	n	Mean Score	Mean %	SD
0	142	6.23	36.6	3.68
1	108	8.56	50.35	3.29
2	96	9.89	58.17	3.662
3	107	12.09	71.11	3.95
4	124	12.96	76.23	3.08
5	113	14.88	87.52	2.061

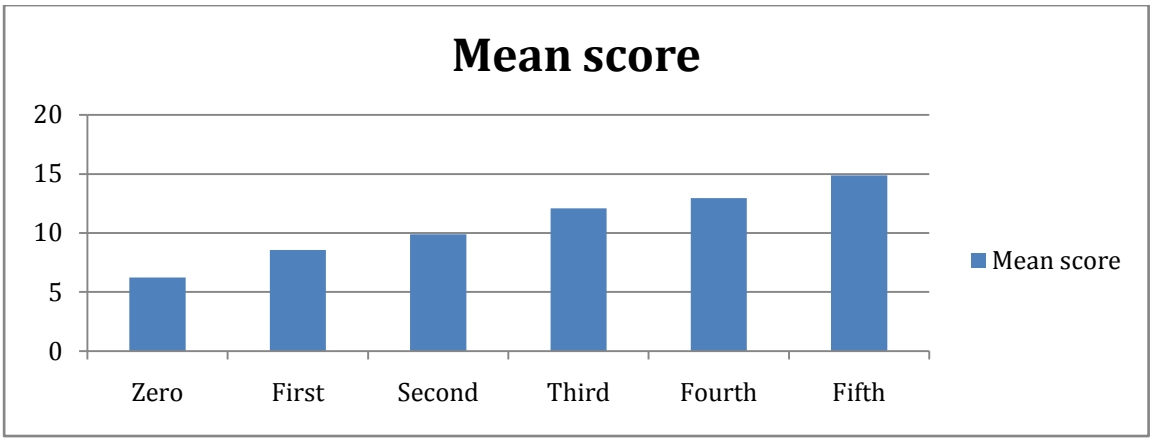

Figure 1: Mean scores for each year (from a total of 17 questions).

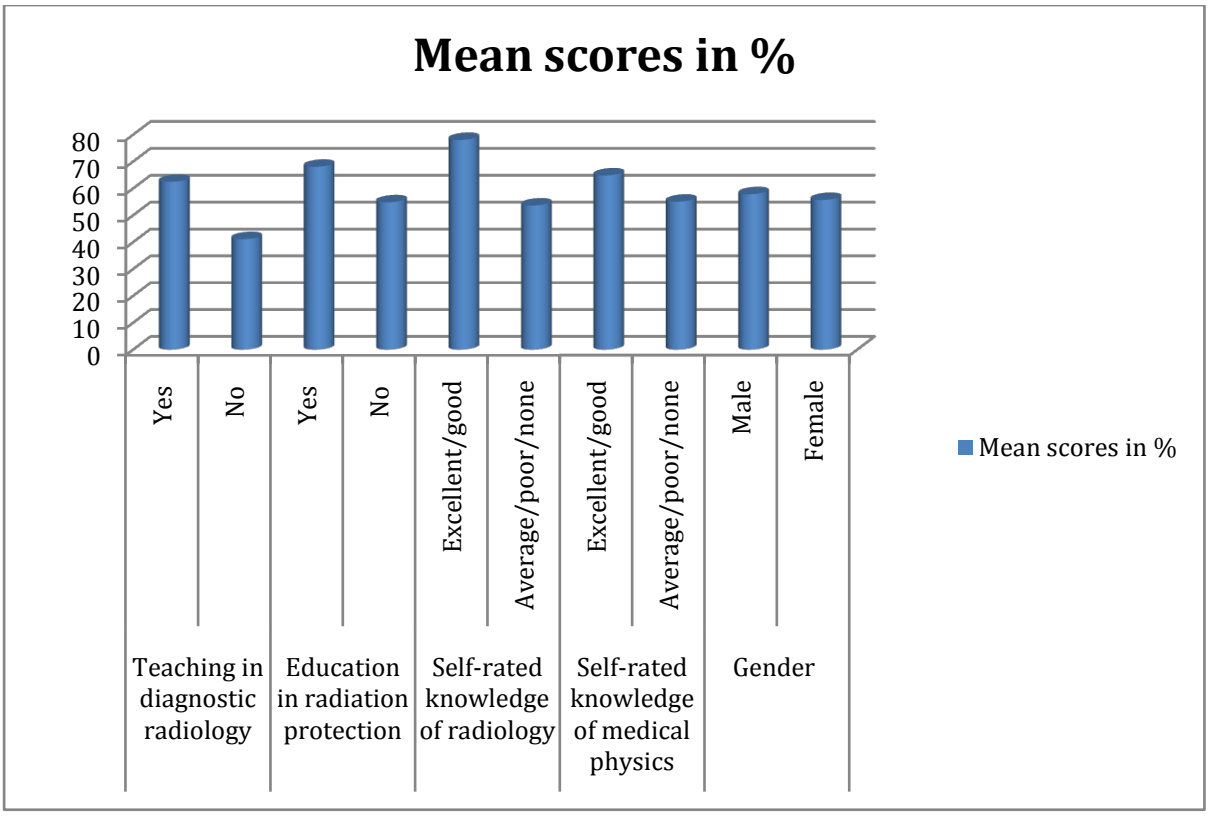

Figure 2: Factors influencing students' overall scores.

Table 2:Factors influencing students' overall scores.

Factors affecting mean scores of students		Mean scores in %	P-value
Teaching in diagnostic radiology	Yes No	62.43 41.08	<0.001
Education in radiation protection	Yes No	68 54.8	<0.001
Self-rated knowledge of radiology	Excellent/good Average/poor/none	78 53.6	<0.001
Self-rated knowledge of medical physics	Excellent/good Average/poor/none	64.8 55.02	0.003
Gender	Male Female	57.8 55.67	0.316

DISCUSSION

In the present study it was observed that there are a lot of shortcomings in the knowledge of students on the topic of radiation protection and these shortcomings should be fulfilled in the undergraduate curriculum of the students for further challenges in the future.

Those students who had just entered the medical school (year 0) were used as control group because they did not receive any teaching in radiology or radiation protection. The students in the study group (years 1-0) were exposed to different lectures and practical experiences for 5 years under and thus, their understanding and knowledge of the basic concepts for radiation protection were much improved as compared to control group. The authors observed that there is a significant difference in the knowledge and attitude of students from study group as compared to control group students. The most significant difference was observed in between the students of 2nd and 4th year students. The highest mean score for the questionnaire was observed in the 5th year students because of the contribution of the intensive clinical radiology teaching delivered to final-year medical students by clinical radiologists in preparation for their final exams. This teaching involved small group tutorials, case review sessions and formal lectures.The study conducted by Branstetter BF et al. assessed the changes in attitude that persist through the clinical years of training and whether preclinical exposure to radiology has a long-term effect on medical students' opinions about radiology and radiologists. An initial survey was administered in the preclinical years of training to assess first-year medical students' attitudes toward radiology before and after the changes to the curriculum. A follow-up survey was administered before graduation to determine whether the changes in attitude revealed in the first survey persisted throughout the remaining years of training, and to assess students' opinions about negative radiologist stereotypes. Students who had undergone the revised curriculum were compared to students who had undergone the traditional curriculum. There were statistically significant differences between the two graduating classes in terms of interest in, and perceptions of, the field of radiology. At graduation, students exposed to the revised preclinical curriculum with a greater exposure to radiology had a greater interest in radiology as a discipline and were more likely to have taken senior electives in radiology. These graduating students were also less likely to agree with negative stereotypes about radiologists. It was concluded that dedicated medical student teaching from an academic radiologist during the first year of medical school has a positive, long-lasting effect on medical students' attitudes toward radiology. The prevalence of negative stereotypes about radiologists among graduating medical students can be reduced by appropriate teaching of radiology in the preclinical years of medical school.[9]The present study demonstrated an incremental increase in students' knowledge of radiation protection with each year of medical teaching. Knowledge levels were highest among 5th year students, just prior to graduation and taking up positions as hospital interns. An important component of interns daily workload would be the ordering and organisation of diagnostic imaging studies under the supervision of senior attending physicians. This highlights the importance of radiation protection instruction to

medical undergraduates. While the majority of students were exposed to instruction in clinical radiology, over 80% of medical students considered that they had no teaching in radiation protection, and this deficiency in the curriculum was associated with poorer performance in the questionnaire. Exposure to formal teaching in clinical radiology, however, was associated with better performance in the questionnaire. Faggioni L et al. conducted a study to evaluate the awareness of radiation protection issues and the knowledge of dose levels of imaging procedures among medical students, radiology residents, and radiography students at an academic hospital. A total of 159 young doctors and students (including 60 radiology residents, 56 medical students, and 43 radiography students) were issued a questionnaire consisting of 16 multiple choice questions divided into three separated sections (i.e., demographic data, awareness about radiation protection issues, and knowledge about radiation dose levels of common radiological examinations). Medical students claimed to have at least a good knowledge of radiation protection issues more frequently than radiology residents and radiography students (94.4% vs 55% and 35.7%, respectively; $P<0.05$), with no cases of perceived excellent knowledge among radiography students. However, the actual knowledge of essential radiation protection topics such as regulations, patient and tissue susceptibility to radiation damage, professional radiation risk and dose optimisation, as well as of radiation doses delivered by common radiological procedures was significantly worse among medical students than radiology residents and radiography students ($P<0.05$). Those latter significantly outperformed radiology residents as to knowledge of radiation protection issues ($P<0.01$). Overall, less than 50% of survey respondents correctly answered all questions of the survey. It was concluded by the authors that the radiology residents, radiography students and medical students have a limited awareness about radiation protection, with a specific gap of knowledge concerning real radiation doses of daily radiological examinations. Both undergraduate and postgraduate teaching needs to be effectively implemented with radiation safety courses.[10]

Jennifer O'Sullivan et al. conducted study to assess students' awareness of radiation exposures and determined the impact a curriculum in clinical radiology (CICR) had on awareness. Six hundred seventy medical students at one medical school were studied. CICR was delivered in yearly modules over the 5-year programme. Five hundred twenty-three students (years 1–5), exposed to increasing numbers of CICR modules and 147 students beginning medical school (year 0), represented the study and control groups, respectively. Students completed a multiple choice questionnaire assessing radiation knowledge and radiology teaching. Most students in the study population received CICR but 87% considered they had not received radiation protection instruction. The percentage of correctly answered questions was significantly higher in the study population than the control group (59.7% versus 38%, $p < 0.001$). Students who received CICR achieved higher scores than those who did not (61.3% compared with 42.8%, $p < 0.001$). Increasing exposure to CICR with each year of medical education was associated with improved performance. It was concluded by the authors that assessment of students' awareness of radiation exposures in diagnostic imaging demonstrates improved performance with increasing years in medical school and/or increasing exposure to CICR. Findings support the Euroatom 97 directive position, advocating implementation of radiation protection instruction into the undergraduate medical curriculum.[11]

CONCLUSION

So, this can be concluded that the mean scores of the students from the multiple choice questionnaire framed to assess the students is increased with successive increase in each academic year of the student. The findings likely support the Eurotom 97 directive stating that medical schools should implement radiation protection instruction as part of the undergraduate medical curriculum.

REFERENCES:

1. Schauer DA, Linton OW. NCRP Report No. 160, ionizing radiation exposure of the population of the United States, medical exposure—are we doing less with more, and is there a role for health physicists? Health Phys. 2009;97(1):1–5. doi: 10.1097/01.HP.0000356672.44380.b7.
2. Berrington de Gonzalez A, Mahesh M, Kim KP, et al. Projected cancer risks from computed tomographic scans performed in the United States in 2007. Arch Intern Med. 2009;169(22):2071–2077. doi: 10.1001/archinternmed.2009.440.
3. Mathews JD, Forsythe AV, Brady Z et al (2013) Cancer risk in 680,000 people exposed to computed tomography scans in

childhood or adolescence: data linkage study of 11 million Australians. BMJ 346:f2360.
4. Puri S, Hu R, Quazi RR, Voci S, Veazie P, Block R. Physicians' and midlevel providers' awareness of lifetime radiation-attributable cancer risk associated with commonly performed CT studies: relationship to practice behavior. AJR Am J Roentgenol. 2012;199(6):1328–1336. doi: 10.2214/AJR.12.8581.
5. Arslanoglu A, Bilgin S, Kubal Z, Ceyhan MN, Ilhan MN, Maral I. Doctors' and intern doctors' knowledge about patients' ionizing radiation exposure doses during common radiological examinations. Diagn Interv Radiol. 2007;13(2):53–55.
6. Soye JA, Paterson A. A survey of awareness of radiation dose among health professionals in Northern Ireland. Br J Radiol. 2008;81:725–9.
7. Shiralkar S, Rennie A, Snow M, Galland RB, Lewis MH, Gower-Thomas K. Doctors' knowledge of radiation exposure: Questionnaire study. BMJ. 2003;327:371–2.
8. Rice HE, Frush DP, Harker MJ, Farmer D, Waldhausen JH. APSA Education Committee. Peer assessment of pediatric surgeons for potential risks of radiation exposure from computed tomography scans. J Pediatr Surg. 2007;42:1157–64.
9. Branstetter BF, Humphrey AL, Schumann JB. The long-term impact of preclinical education on medical students' opinions about radiology.Acad Radiol. 2008 Oct;15(10):1331-9.
10. Faggioni L, Paolicchi F et al. Awareness of radiation protection and dose levels of imaging procedures among medical students, radiography students, and radiology residents at an academic hospital: Results of a comprehensive survey. Eur J Radiol. 2017 Jan;86:135-142.
11. O'Sullivan J, O'Connor J et al. An assessment of medical students' awareness of radiation exposures associated with diagnostic imaging investigations. Insights Imaging. 2010 May; 1(2): 86–92.

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