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Assessment of Knowledge and Perception of UG, Interns & PG medical students towards Radiation Protection Protocols: A Survey Study

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Abstract:

Introduction: *Though, radiography has made the diagnosis of diseases easier and less time consuming, the hazards of radiation to humans cannot be ignored. It is of vital importance that radiation protection protocols are adhered to for the safety of the patient, the environment as well as for self-safety.*

Objective: *To assess the knowledge and perception of undergraduate (UG), Interns & postgraduate (PG) medical students towards Radiation Protection Protocols.*

Material & Methods: *A cross-sectional questionnaire survey was conducted on 182 UG, intern and PG medical students to estimate their knowledge and perception towards Radiation Protection Protocols. A survey questionnaire was created using Google forms and links to the survey were sent to the study participants via email and social media platforms.*

Results: *68.97% of UG medical students, 73.61% of medical interns and 90.38% of PG medical students were aware of the ALARA principle. Only 34.48% of UG medical students, 41.67% of medical interns and 73.08% of PG medical students were familiar with NCRP and ICRP Recommendations. Only 51.72% of UG medical students, 66.67% of medical interns and 69.23% of PG medical students reported that they provided thyroid collars to patients during radiation exposure.*

Conclusion: *Postgraduate medical students had the highest knowledge and perception towards Radiation Protection Protocols. A large number of UG, intern and PG medical students did not adhere to safe radiological practices.*

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I. Introduction:

X-ray imaging is of paramount importance in medical science. Diagnostic x-rays and scans can save the patient from unnecessary invasive procedures and help the doctor a great deal in disease diagnosis. Even so, ionizing radiation has the potential to cause DNA damage which may lead to development of different kinds of cancers.[1] Needless and excessive radiation exposure may prove to be detrimental to the patient and doctor alike. Therefore, comprehensive knowledge of radiation protection protocols is indispensable to medical practitioners. For this purpose, comprehensive guidelines have been formulated by the National Council on Radiation Protection and Measurements (NCRP) in the USA and the International Commission on Radiological Protection (ICRP), worldwide have issued essential guidelines for radiation safety. These guidelines have been adopted around the world by respective regulatory authorities. Even though, NCRP recommends an exposure level of 5 rem per year as comparatively safe; it is recommended that doses of radiation should be kept **'as low as reasonably achievable'**, which is referred to as the **ALARA principle** in radiology.[2]

Although, guidelines and protocols regarding radiation safety have been set, radiologists do not always adhere to these protocols. Abuzaid MM et al.[3] in their study have reported that only 60.4% and 45.7% of radiologists adhere to patient- protection and self- protection practices, respectively. The foundation of knowledge and practices is laid down during medical school. Hence, our study assesses and compares the knowledge and perception of radiation protection protocols amongst UGs, intern and PG medical students.

II. Material and Methods:

This cross-sectional self-administered questionnaire survey was conducted from 15-04-2020 to 15-06-2020. The questionnaire for the survey was formulated from a previous study conducted by Almohaimede AA et al. (2020)[4] with minor modifications. The questionnaire consisted of ten questions. The survey questionnaire was created using Google forms and links to the questionnaire were sent to 300 UG, interns and PG medical students (100 each) via email and social media platforms. Attempting all questions was necessary for submission of the questionnaire by the participants. 182 replies were received, i.e. the response rate for the study was 60.66%. Responses were recorded, data was tabulated and descriptive statistics was used for data analysis.

III. Results:

Table 1 shows the distribution of the study participants according to their level of professional education. Table 2 shows the distribution of responses of the study participants to questions related to knowledge and awareness towards Radiation Protection Protocol. 68.97% of UG medical students, 73.61% of medical interns and

90.38% of PG medical students were aware of the ALARA principle. Only 34.48% of UG medical students, 41.67% of medical interns and 73.08% of PG medical students were familiar with NCRP and ICRP Recommendations. 79.31% of UG medical students, 94.44% of medical interns and 100% of PG medical students recognized the radiation hazard symbol. 62.07% of UG medical students, 75% of medical interns and 86.54% of PG medical students knew that digital radiography requires less exposure than conventional. 58.62% of UG medical students, 83.33% of medical interns and 100% of PG medical students had knowledge that high-speed films reduce exposure. 62.07% of UG medical students, 75% of medical interns and 86.54% of PG medical students claimed that they provided lead aprons to patients during radiation exposure. 51.72% of UG medical students, 66.67% of medical interns and 69.23% of PG medical students reported that they provided thyroid collars to patients during radiation exposure. 67.24% of UG medical students, 72.22% of medical interns and 88.46% of PG medical students said that they stood behind a lead barrier during radiation exposure. 62.07% of UG medical students, 68.06% of medical interns and 80.77% of PG medical students reported that they stood 6 feet away from primary X-ray beam during exposure. 75.86% of UG medical students, 88.89% of medical interns and 96.15% of PG medical students did not allow people to come inside the room during exposure to X-ray.

Table 1: Distribution of study participants according to level of professional education:

Level of professional education	**Undergraduate**	**Intern**	**Postgraduate**	Total
No. of participants	58	72	52	182
Percentage distribution	31.87	39.56	28.57%	100%

Table 2: Distribution of responses to questions related to knowledge and awareness towards Radiation Protection Protocol:

S.No.	Question	Response	No. according to level of professional education			% according to level of professional education		
			UG	Intern	PG	UG	Intern	PG
1	Are you aware of ALARA principle?	Yes	40	53	47	68.97%	73.61%	90.38%
		No	18	19	5	31.08%	26.39	9.62%
2	Are you familiar with	Yes	20	30	38	34.48%	41.67%	73.08%

	NCRP and ICRP Recommendations?	No	38	42	14	65.52%	58.33%	26.92%
3	Do you recognize the radiation hazard symbol?	Yes	46	68	52	79.31%	94.44%	100%
		No	12	4	0	20.69%	5.56%	100%
4	Does digital radiography require less exposure than conventional?	Yes	39	63	51	67.24%	87.50%	98.08%
		No	19	9	1	32.76%	12.50%	1.92%
5	Do high-speed films reduce exposure?	Yes	34	60	52	58.62%	83.33%	100%
		No	24	12	52	41.38%	16.67%	100%
6	Do you provide lead aprons to patients during radiation exposure?	Yes	36	54	45	62.07%	75.00%	86.54%
		No	22	18	7	37.93%	25.00%	13.46%
7	Do you provide thyroid collars to patients during radiation exposure?	Yes	30	48	36	51.72%	66.67%	69.23%
		No	28	24	16	48.28%	33.33%	30.78%
8	Do you stand behind a lead barrier during radiation exposure?	Yes	39	52	46	67.24%	72.22%	88.46%
		No	19	20	6	32.76%	38.46%	11.54%
9	Do you stand 6 feet away from primary X-ray beam during exposure?	Yes	36	49	42	62.07%	68.06%	80.77%
		No	22	23	10	37.93%	31.94%	19.23%
10	Do you allow people to come inside the room during exposure to X-ray?	Yes	44	64	50	75.86%	88.89%	96.15%
		No	14	8	2	24.14%	11.11%	3.85%
		Total	58	72	52	100%	100%	100%

IV. Discussion:

Many studies have been done to assess the knowledge and perception of dental students towards radiation protection protocols, but hardly any such studies have been done in the medical field. The ALARA principle dictates that radiation exposure to an individual should be 'as low as reasonably achievable', hence the acronym 'ALARA'. In the current study it was found that 68.97% of undergraduate medical students were aware of the ALARA principle of radiography whereas this percentage was 73.61% for medical interns and a vast 90.38% in medical post-graduate students. Similar results were found in studies conducted on dental students by Almohaimede et al.[4] but our percentage was higher than that of Swapna et al.[5] Arnout EA et al. in a similar study conducted on Saudi dental undergraduates in their preclinical and clinical years reported that when asked about their awareness of the ALARA principle, only 21.4% of the former replied 'yes' whereas 40% of the latter gave the same reply.[6] In our study, only 34.48% of UG students were aware of the guidelines issued by NCRP and ICRP for radiation safety, whereas this percentage was 41.67% in interns and a high 73.08% in case of PG students. This could be due to limited education regarding radiological principals during the initial years of medical school. Sharma et al.[7] in their study have also revealed poor knowledge and awareness regarding radiotherapy in undergraduate medical students. Our results are in agreement with previous studies.[4,5] 79.31% of UG students, 94.44% of interns and all the PG students were familiar with the radiation hazard symbol. These findings indicate that medical students in their graduation and internship have only introductory understanding of radiation hazards but lack the comprehensive knowledge vital for safe radiology practice. Vinod S et al. [8] and Agarwal et al.[9] in their study also reported that medical students had poor knowledge of radiological principles. Our results are consistent with that of previous studies.[4] 67.24% of UG students, 87.50% of interns and 98.08% of PG students were aware that digital radiography requires less exposure than conventional radiography. 58.62% of UG students, 83.33% of interns all the PG students knew that high-speed films reduce exposure to radiation. These results are in agreement with studies by Almohaimede AA et al.[4] and Swapna LA et al.[5] Behal S[10] in her study has also revealed that 84.61% of dental interns believe that digital radiography requires less exposure than conventional radiographs. Our values are higher than that reported by Arnout et al.[6] Nagaraj T et al.[9] in their study to assess the perception of dental students towards radiation protection protocols have reported that 55% of dental interns and 71% of dental PG students preferred the use of F-films over E-films on their patients.[9] Only 62.07% of UG students, 75% of interns and 86.54% of PG students provided lead aprons to their patients and these percentage was even lower in case of thyroid collars. Only 51.72% of UG students, 66.67% of interns and 69.23% of PG students provided thyroid collars to their patients. Our values were lower than that reported by Almohaimede AA et al.[4] Assiri et al.[d6] in their study revealed that 66.4% and only 35.3% of dental practitioners make their patients wear lead aprons and thyroid collars respectively. 67.24% of UG medical studnts, 72.22% of interns and 88.46% of PG medical students replied that they stood behind a lead barrier while taking radiographs. Our results are in agreement with that of Nagaraj et al.[9] 62.07% of UG students, 68.06% of interns and 80.77% of PG students replied that they stood 6 feet away from the radiation source while taking a radiograph. Also, 75.86% of UG students, 88.89% of interns and 96.15% of PG students stated that they did not allow people to come inside the room during exposure to X-ray. Our results are in agreement with previous studies.[4]

V. Conclusion:

Postgraduate medical students had the highest knowledge and perception towards Radiation Protection Protocols. UG medical students were found to only possess elementary knowledge regarding radiation protection like identifying the radiation hazard symbol. They lacked knowledge of fundamental principles and guidelines of radiology. Another important finding was that even though most PG students had knowledge and awareness of radiation protocols all of them did not follow safe radiological practices. There is a need to educate medical students regarding radiation protection protocols and safe radiological practices right from the initial years of medical school.

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