

Awareness and Knowledge of Risk in Radiation Exposure among Health Care Professionals: A Hospital Based Survey

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ABSTRACT

Introduction: The pioneers of radiology were exposed to high doses of radiation, leading to various dermatoses, hematological disorders, cataract or cancer diseases. The present study was conducted to assess the level of knowledge of radiation hazards among health care providers and professionals who are exposed to radiations during diagnostic and treatment procedures.

Materials and methods: The study consisted of a questionnaire survey evaluating knowledge, awareness and concern regarding radiological exposure among 40 health care providers and professionals i.e. nurses, doctors, medical technicians, assistant and other staff.

Result: 90% of study subjects reported that radiological diagnostic examinations can increase the risk of cancer development in patients in future, 2% was not agree with this statement and 8% subjects does not answer this question. 45% of subjects wear lead aprons, 15% shields as radiation protection measure and 10% maintain distance from source of radiation exposure and 15% subjects were not taking any protection measure. 70% study subjects never explained the possible risks of radiation to patients, 6% some time, 5% most of the time and 5% always explained.

Conclusion: There is a need to disseminate information regarding radiation dose and the possible risks to the non-radiology medical community. Staff should receive education, and the diagnostic imaging request process may need to include information on radiation doses and risks.

Keywords: Radiation exposure; Healthcare professionals; Awareness

INTRODUCTION

The term radiation includes a wide spectrum of different forms of energy,¹ which has been a boon for medical care as by generating detailed anatomical pictures, the technology can improve diagnoses, limit unneeded medical procedures and can thus, enhance treatment.² However radiation exposure has also been suspected to cause ill health to human-beings.¹ As the imaging modalities deploy ionizing radiation, hence as a consequence, the exposure of interventional radiologists and other working staff in the radiology department to radiation has increased as medical imaging has expanded. In the United Kingdom an estimated 100-250 deaths occur each year from cancers directly related to medical exposure to radiation. In March 2000, the UK secretary of state issued new regulations that emphasized the importance and dangers of radiation.³ Thus, due to potential harmful effects, it is the duty of a health care professionals to provide actual and basic knowledge to the patients undergoing all radiological procedures and processes.⁴ The physician should

answer to queries of patient regarding radiation hazards, which can be reliable provided their knowledge is adequate and up-to-date. The knowledge related to radiation is taught during undergraduate training in medical colleges. However, physicians grossly underestimate the proper risk regarding proper use of medical imaging tools and their associated radiation risks.^{3,5}

The largest group of individuals exposed occupationally to artificial radiation sources is that employed in health facilities. These individuals include: radiologists; radiation oncologists; other physicians who use X rays and radionuclides in their practices; other practitioners, such as dentists, pediatricians and chiropractors, who are licensed to use X rays; radiographers and radiological technologists who assist in the production of images and the management of patients; radiological physicists; installers; repairmen; and inspectors and regulators.⁶ In view of this, the present study was conducted to assess the level of knowledge of radiation hazards among health care professionals who are exposed to radiations during diagnostic and treatment procedures.

MATERIAL AND METHODS

The present study is a questionnaire based cross-sectional study conducted on 40 health care professionals in 2 major hospitals of the city. The method of sampling was convenience sampling. An informed consent was obtained and ethical clearance was taken from the ethical committee. The study was conducted from July and September 2015. The questionnaire survey consisting of closed-ended questions (table 1) regarding the profession and the knowledge of the basic principles of radiation protection in diagnostics and treatment carried out using radiation. Data was obtained regarding the clinical experience, position, frequency of contact with radiations. The obtained results were subjected to analysis using the appropriate statistical analysis.

RESULT

The results of present study (table 1) found that among the

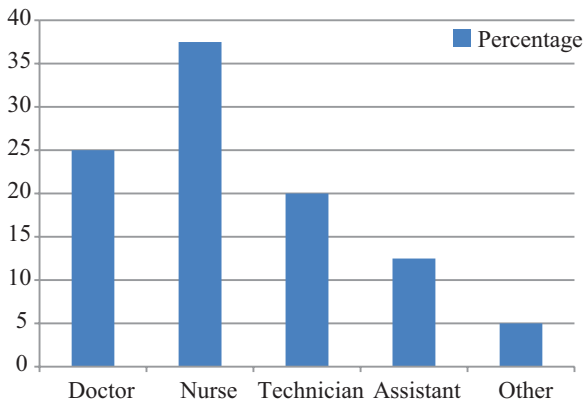
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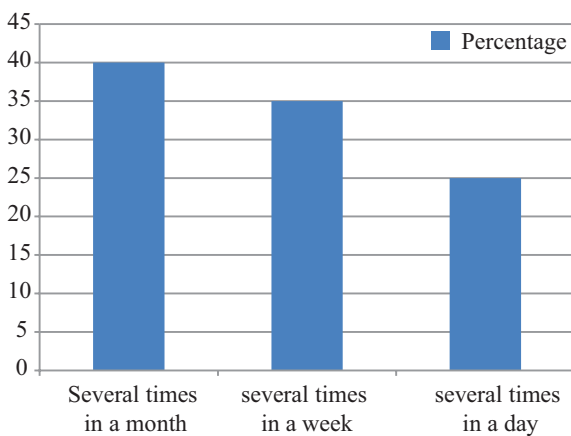
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health providers and professionals who were being exposed to radiation, 25% were doctors, 37.5% were nurses, 20% were technicians and 2% other (attendants, helpers, sweepers) (graph 1). Among 40 subjects included in the study 12.5% were working in radiological department since less than 1 year, 37.5% were working for a period between 1-5 years, 40% for 6-10 years, 5% for 11-15 years and 5% were working from more than 16 years (graph 2).

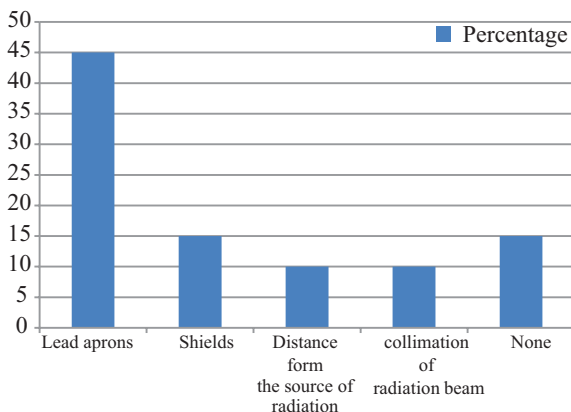
The present study reported that among the subjects 40% assist or carry out radiological procedures several times in a month, 35% several times in a week and 25% several times



Graph-1: Position of Health care providers and professionals included in study.



Graph-2: Frequency of radiological examinations of patients by Health care providers and professionals

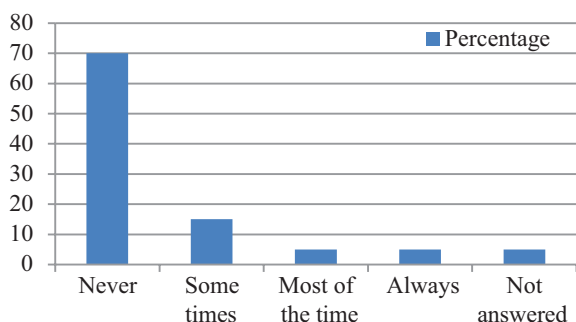


Graph-3: Radiation protection measures used by study group

in a day, thus exposing themselves to radiation during radiological examination (graph 3). 90% of study subjects reported that radiological diagnostic examinations can increase the risk of cancer development in patients in future, 2% was not agree with this statement and 8% subjects does not answer this question. 45% of subjects wear lead aprons, 15% shields

Question	No. and Percentage	
	Response	Percentage
1 What is your Position as health care professional?	Doctor	10 (25%)
	Nurse	15 (37.5%)
	Technician	8 (20%)
	Assistant	5 (12.5%)
	Other	2 (5%)
2 Duration of work in radiological department?	less than 1 year	5 (12.5%)
	1-5 years	15 (37.5%)
	6-10 years	16 (40%)
	11-15 years	2 (5%)
	more than 16 years	2 (5%)
3 How many times you assist or carry out radiological examinations of patients?	several times a month	16 (40%)
	several times a week	14 (35%)
	several times a day	10 (25%)
4 Do you think that radiological diagnostic examinations can increase the risk of cancer development in patients in future?	yes	36 (90%)
	no	1 (2.5%)
	Not answered	3 (7.5%)
5 Which radiation protection measures you are aware of?	none	8 (15%)
	lead apron	18 (45%)
	shields	6 (15%)
	distance from the source of radiation	4 (10%)
	time of exposure	4 (10%)
6 Attitude regarding the statement that patients referred for radiological investigations involving ionizing radiation should be informed of the possible risks?	Strongly disagree	4 (10.5%)
	Disagree	5 (12.5%)
	Unsure	15 (37.5%)
	Agree	6 (15%)
	Strongly agree	10 (25%)
	Not answered	-
7 Do you explaining possible risks of radiation to patients?	Never	28 (70%)
	Sometimes	6 (15%)
	Most of the time	2 (5%)
	Always	2 (5%)
	Not answered	2 (5%)

Table-1: Questionnaire and response of health care professionals.



Graph-4: Health care providers and professionals explaining possible risks of radiation to patients

as radiation protection measure and 10% maintain distance from source of radiation exposure and 15% subjects were not taking any protection measure. 70% study subjects never explained the possible risks of radiation to patients, 6% some time, 5% most of the time and 5% always explained.

DISCUSSION

Everyone alive in this world is being exposed to ionizing radiations and about 18% exposure is due to man-made source. There is likely to be a risk in investigations that involves ionizing radiation to patient's health as the US National Council on Radiation Protection and Measurements had reported that medical X-rays and nuclear medicine accounts for only 15% of all exposures to radiation.¹

Our study found that subjects working in the radiology department lack proper knowledge of radiation exposure from medical imaging. The safety of patients and staff is a priority of every diagnostic or therapeutic procedure involving ionizing radiation. Radiation exposure should always operate under the As Low As Reasonably Achievable (ALARA) principle and as opportunities do exist in the radiation field for collective dose reduction, both by reducing the numbers of scans and by reducing the doses per scan.⁷ ALARA denotes making every reasonable effort to keep patient exposures to ionising radiation as far below dose limits as practical, while maintaining diagnostic yield.⁸

90% of study subjects were aware that radiological diagnostic examinations can increase the risk of cancer development in persons exposed to radiations. However, data regarding radiation protection found that 45% of subjects wear lead aprons, 15% shields as radiation protection measure and 10% maintain distance from source of radiation exposure and 15% subjects were not taking any protection measure. Thus, the present study found that health care professionals underestimate radiation exposure of frequently used diagnostic imaging and the associated risks.

Study group in the present study comprised of doctors posted in the radiology department along with non-physicians (i.e. nurses, medical technicians and auxiliary staff members as due to the frequent contact of these medical professionals with patients before and during procedures involving ionizing radiation. Similarly, Szarmach A et al⁵ conducted a survey among the medical staff and concluded that education in the field of radiological protection should be a subject of

periodic training of medical personnel regardless of position and length of service. Kew TY et al⁸ assessed knowledge regarding medical radiation exposure and its associated risks among non-radiology doctors and reported that there was a lack of awareness of radiation doses and risk of carcinogenesis and there is a need to disseminate information regarding radiation dose and the possible risks to the nonradiology-medical community. Keijzers GB et al⁹ assessed emergency department doctors knowledge of radiation doses associated with diagnostic procedures and reported that over three-quarters of doctors underestimated the lifetime risk of fatal cancer attributable to a single computed tomography scan of the abdomen and most doctors reported never attended any formal training on risks to patients from radiation exposure.

A study conducted on medical students by Mubeen SM et al¹ showed nearly 40% of the students accepted that objects in the X-ray room emit radiation after an X-ray procedure and nearly the same percentage agreed that protective measures should be taken while performing an ultrasound and that dangerous radiation is emitted from good quality microwave equipment. Slightly more than one-third students viewed that gamma rays are more hazardous than X-rays while the same percentage agreed that intravenous contrast material used in angiogram is radioactive. Sixty-seven percent students agreed that nuclear material used in medicine is potentially explosive while 18% of students were in the opinion that MRI emits ionizing radiation.

70% study subjects never explained the possible risks of radiation to patients, 6% some time, 5% most of the time and 5% always explained. Patient safety is a priority in any medical investigation or intervention. There are a number of measures that radiation personnel may utilise to reduce cumulative radiation risks to patients. These include technical aspects (automated tube current modulation, beam filtration, adaptive collimation), imaging parameter selection (decreasing tube potential and current), and protocol modifications (multiple pass scanning and reduction of duplicate coverage).⁸ It is important that doctors who request imaging are well trained in deciding whether diagnostic imaging is indicated, but also have an accurate knowledge of the associated risks. This is particularly important in the emergency department, where many radiological imaging tests are requested each day, often in a time-pressured environment.⁹

CONCLUSION

It is well known to both the lay public and to medical professionals that although radiological investigations are valuable, they represent a small but definite potential risk to health through exposure to ionising radiation. There is a lack of awareness of radiation doses and risk of carcinogenesis, among patients and health care professional. Thus, there is a need to disseminate information regarding radiation dose and the possible risks to the non-radiology medical community. Staff should receive education, and the diagnostic imaging request process may need to include information on radiation doses and risks. It is important that medical personnel working in radiology, nuclear medicine and radiation on-

cology that may contain radiation exposure should use ring badges, whole body film badges and/or TLD badges to avoid excessive radiation dose.

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