

Assessment of Physician Knowledge, Attitude and Safety Practice Towards Radiation Safety

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ABSTRACT

Background: Radiations plays an important role in various diagnostic and therapeutic procedures within health facilities, but its use poses inherent risks to both healthcare professionals and patients. Understanding the knowledge, attitude, and safety practices of physicians in relation to radiation safety is paramount for ensuring the well-being of all stakeholders involved. Physicians, as key decision-makers in medical procedures involving radiation, need to be well-informed about the associated risks and safety measures. **Objective:** To determine the physician knowledge, attitude and safety practice towards radiation safety. **Study Design:** Cross-sectional study. **Settings:** Pakistan Institute of Medical Sciences, Islamabad Pakistan. **Duration:** March 2020 to February 2021. **Methods:** All the physician relevant to exposure to ionizing radiation, such as radiology, nuclear medicine, interventional cardiology, and oncology, having minimum one year or more experience in radiological field of either age and gender were included. Data collection was carried out through a structured questionnaire, specifically designed to evaluate participants' understanding of radiation safety principles, their attitudes towards adherence to safety protocols, and their day-to-day practices in radiological procedures. The collected data was analyzed using appropriate statistical methods SPSS version 26. **Results:** Majority of participants experience medical radiation exposure less than once per week (42.1%), with a significant portion having exposure more than three times per week (40.8%). 90.8% of participants have never undergone a radiation protection course, despite 73.7% expressing willingness to participate in such a course if provided by their institution. 52.7% strongly disagreed that radiation significantly affects childbearing, while 39.5% believe they are safe within 1 meter of radiation exposure. On a positive note, 86.8% of participants correctly identified the ALARA principle for radiation protection. Regarding the implementation of safety protocols, only 28.9% were more likely to wear a lead apron, and 22.4% never wore it. **Conclusion:** Health care professionals lacks adequate knowledge, training and attitude regarding radiation safety protocols. Lack of adequate knowledge and training leads to poor utilization of radiation safety equipment and it is a source of health hazard for both medical professionals and the patients.

Keywords: Radiations, Physicians, Knowledge, Safety measure, Training.

INTRODUCTION

In this modern era of medical practice many diagnostic and therapeutic interventions require radiological imaging. Health workers working in different departments such as Anesthesia, Cardiology, Radiology,

Neurosurgery, Orthopedics, Gastroenterology and many more are exposed to radiations in a number of ways. Much of the radiation exposure occurs during fluoroscopic procedures, CT scan, Mammography and Nuclear imaging studies¹. Radiation is a form of energy which can be ionizing or non-ionizing in nature.

Radiation is known to be a teratogenic factor². Radiation poses a number of health problems to the individuals being exposed to it. Apart from medical radiation exposure; in this modern industrialized world we are all exposed to background radiation. Therefore, health care professionals are somewhat exposed to radiation at greater dose and rate than normal population; being exposed to both background radiation and medical radiations. Hence, they are more likely to suffer from radiation associated adverse effects. One of the serious most adverse effects of radiation is DNA damage to body cells leading to malignancy later in life³. This depends upon the amount of radiation to which the person is exposed. The exposure is best described in terms of effective dose.² In a number of studies, it was found that an exposure greater than 20mSv/ year averaged over five years was associated with 1 in 1000 lifetime risk of fatal malignancy.^{4,5}

Individuals physiological status will greatly affect how his body will respond to radiation. Elderly with a number of comorbidities will likely to suffer from more adverse effects. Furthermore, pregnancy presents a unique challenge as in this state radiation is both harmful to mother and fetus. Maternal radiation exposure could result in pregnancy loss, fetal malformations or carcinogenesis.⁶ Health care professionals being exposed to radiation can have different physiological status; therefore, radiation could affect them in a wide variety of ways. The extent of radiation exposure risk is closely tied to the knowledge and awareness levels of healthcare providers.^{7,8} Findings from a systematic literature review encompassing over 20 articles indicate insufficient understanding among physicians and patients regarding the correlated cancer risk and radiation dosage associated with CT scans.^{7,9}

To implement protective measures, physicians should minimize their exposure time, maintain maximum distance from the radiation source, and utilize protective equipment.¹⁰ Therefore, health care professionals should be adequately protected against radiation. For effective protection, one must have adequate knowledge and attitude so that he can employ effective radiation protection techniques. Relevant literature showed controversial findings regarding physician knowledge and safety practice towards the radiations. According to a study observed that there was adequate awareness regarding radiations among healthcare workers who were exposed.^{11,12} While other reported inadequate knowledge and safety practice regarding radiations.^{7,10,13} Due to relevant literature controversies and limited local literature information, this study has been carried out to determine the physician knowledge, attitude and safety practice towards radiation safety.

METHODS

This cross-sectional study based on simple random sampling was carried out Pakistan Institute of Medical Sciences from March 2020 to February 2021. The sample size was calculated according to WHO calculator. The total sample size was 76. All the physician relevant to exposure to ionizing radiation, such as radiology, nuclear medicine, interventional cardiology, and oncology, having minimum one year or more experience in radiological field of either age and gender were included. Physicians not actively involved in clinical practice to maintain relevance to current radiation safety practices and those who were not agreeing to participate in the study were excluded.

The population included both junior and senior physicians practicing in diverse healthcare settings. Data collection was carried out through a structured questionnaire, specifically designed to evaluate participants' understanding of radiation safety principles, their attitudes towards adherence to safety protocols, and their day-to-day practices in radiological procedures. The questionnaire was divided into three sections, each corresponding to knowledge, attitude, and practice domains. Knowledge assessment was including multiple-choice questions, while attitude evaluation was employing Likert scale items. Practice-related queries will focus on routine radiation safety measures implemented during diagnostic and interventional procedures. The data collection tool was undergoing pre-testing to ensure clarity, relevance, and reliability. Ethical considerations, including informed consent and confidentiality, were strictly adhered to throughout the research process. The collected data was analyzed using appropriate statistical methods SPSS version 26, to draw meaningful insights into the current state of physician awareness and adherence to radiation safety protocols.

RESULTS

Regarding medical radiation exposure per week majority were exposed less than 1 time per week (42.1%) closely followed by more than 3 times exposure per week i.e. 40.8%. 90.8% of the study participants have never received radiation protection course while 73.7% were willing to participate in such course if it was provided by their institution. 52.7% of the participants strongly disagreed that radiation had significant on child bearing. 39.5% of the participants believe that they are safe with in 1m of radiation exposure. 86.8% of the participants accurately identified ALARA principle for radiation protection and majority (40.8%) believe that 5mSv is the safe permissible dose closely followed by 30 mSv which was supported by 36.8% of the participants. None of the participants carried a dosimeter to determine the safe level of exposure. Regarding implementation of radiation

safety protocols only 28.9% of the individuals were more likely to wear lead apron while 22.4% of the participants never wear it. 68.4% of the participants never wear protection goggles while 65.8% of the participants never wear thyroid protection shield. However demographic information provided in table 1.

Table 1: Demographic characteristics of the study subjects n=76

Factor	Sub-group	Frequency	Percentage
Gender	Male	42	55.3%
	Female	34	44.7%
Department	Anesthesia	17	22.4%
	General surgery	24	31.6%
	Neurosurgery	7	9.2%
	Orthopedics	10	13.2%
	Urology	2	2.6%
	Cardiology	5	6.6%
	Radiology	11	14.5%
Position	Resident	71	93.4%
	Fellow	3	3.9%
	Staff	2	2.6%

DISCUSSION

Health hazards associated with radiation has become a topic of great interest. These hazards are preventable by employing effective public health techniques which utilizes education, training and implement of safety protocols. Current study has been done to evaluate the physician knowledge regarding rations and the study possess majority of the participants were residents, male and belonged to general surgery and anesthesia department. Comparatively another study also found majority of the participants were male and belonged to general surgery department followed by radiology.¹⁴ Similarly, a study revealed that majority of the participants belonged to Orthopedics and Radiology department.¹⁵ In another study conducted majority of the participants were male and residents.¹⁶ I

n our study majority of the participants (42.1%) were exposed to radiation more than 3 times a week. In a study conducted by Abdellah et al 37.5% of the participants were exposed to radiation more than 3 times a week.¹⁴ Similar results were obtained in a study conducted on urology residents showing that the participants were frequently exposed to ionizing radiation with frequency being greater than 3 times a week.¹⁷ Moreover, in our study majority of the participants belonged to general surgery and anesthesia department while in the two of above- mentioned studies majority of the participants belonged to radiology, general surgery and urology department. This indicates that radiation exposure shows geographic variation which might be due to greater

number of doctors opting for a particular field in different areas of the world. This further indicates that all medical specialties should be targeted for radiation safety education and training. Interestingly 90.8% participants in our study had never received radiation protection training while 73.7% were willing to participate among such training programmed if they were offered by their working institute. Our findings are consistent with a number of studies. In a study conducted; only 11.2% of the participants had received radiation safety training.¹⁴ Similar results were obtained by Erkan et al¹⁸ which showed that 77.2% of the study participants had never received any radiation safety training.¹⁸ Regarding radiation health hazards; 86.8% of the participants correctly identified ALARA principle for better outcomes.

Alsiddiky A et al¹⁰ observed that there was a significant lack of knowledge in the realm of radiation safety. Consequently, it is imperative to conduct departmental education sessions that address specific knowledge gaps, aiming to enhance both knowledge and practice, as these two aspects are positively correlated. Around 23% of the respondents have received training in radiation safety.¹⁰ Consistently study by Hobbs JB et al¹⁹ revealed a relatively low level of knowledge concerning radiation exposure and associated risks, especially in the comprehension of various imaging modalities. Notably, 26% of participants were unable to accurately identify which modalities expose patients to ionizing radiation. Thus, despite of the fact that majority of the participants knew ALARA principle for radiation protection; many of them did not know the safe limit of exposure. This lack of knowledge jeopardizes the health of both medical professionals as well as patients. As a result of lack of knowledge mentioned above; very few individuals were likely to effectively utilize radiation safety protocols.

In our study only 28.9% of the individuals were more likely to wear lead apron. While 68.4% of the participants never wore protection goggles and 65.8% had never utilized thyroid protection shield. This indicates that there is high level of radiation safety negligence. Our study indicates that there is poor radiation safety knowledge, attitude and poor utilization of radiation protection techniques among health care professionals. This is supported by a number of studies which were carried out different centers; all over the world.^{14-18,21} A recent systemic review has further highlighted that health care professionals lack adequate knowledge and training regarding radiation hazards and protection techniques.²²

CONCLUSION

Our health care professionals lack adequate knowledge, training and attitude regarding radiation safety protocols. Lack of adequate knowledge and training leads to poor

utilization of radiation safety equipment and it is a source of health hazard for both medical professionals and the patients.

LIMITATIONS

The study has a few limitations, particularly a limited sample size, and it primarily focuses on healthcare professionals. The findings may not be fully generalizable to other healthcare settings or regions. Additionally, the research does not explore contextual factors or organizational barriers that may contribute to the identified knowledge gaps and training deficiencies.

SUGGESTIONS / RECOMMENDATIONS

There is a crucial need for targeted and comprehensive training programs aimed at improving the knowledge and attitudes of healthcare professionals regarding radiation safety protocols. Regular refresher courses and updates should be implemented to ensure that healthcare professionals remain abreast of the latest developments in this field.

CONFLICT OF INTEREST / DISCLOSURE

None.

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