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ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING RADIATION PROTECTION AMONG HEALTH CARE WORKERS AT TERTIARY CARE HOSPITAL PESHAWAR

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Abstract

Background: Radiation is the name for energy that is emitted into and carried through space. This research describes the knowledge, attitude, and practices surrounding radiation safety among healthcare workers. With the high use of medical radiological procedures nowadays, it should be required to use suitable radiation protection equipment should to limit occupational radiation exposure.

Objectives: to assess the radiation protection knowledge, attitude, and practice of healthcare professionals.

Material and Methods: This cross-sectional study was carried out in a tertiary care facility in Peshawar. The sample size 218 calculated people made up the sample, as determined by the WHO Calculator. The study was carried out between January and May of 2026. Data were gathered from radiation-exposed healthcare professionals and analyzed using SPSS version 26.

Result:

Of the 218 participants, 53.7% were radiologists and 46.3% were paramedics. Male respondents constituted 50.0% and females 48.6%. Most participants (49.1%) had 1–5 years of professional experience. Knowledge regarding radiation protection was generally satisfactory, with 83.0% aware of the ALARA principle, 78.4% familiar with TLD badges, 62.4% knowledgeable about ionizing radiation risks, and 58.7%

aware of radiation protection principles. Protective practices were moderate to high, particularly for lead glove (84.9%) and apron use (76.6%)

Discussion:

The findings indicate satisfactory knowledge and practices regarding radiation protection among radiologists and paramedics. Awareness of ALARA, TLD badges, and radiation risks was generally high. However, lower compliance with thyroid collar and eye goggle use highlights gaps in practice, emphasizing the need for continuous education and monitoring programs.

Conclusion: The study concludes that radiologists and paramedics possess good knowledge of radiation protection and demonstrate acceptable safety practices. Despite positive awareness levels, certain protective measures remain underutilized. Regular training, strict adherence to radiation safety guidelines, and institutional support are essential to improve compliance and minimize occupational radiation exposure.

Introduction

Ionizing radiation is defined as radiation that has the ability to remove an orbital Electron from the atom with which it interacts. The overall yearly dosage of natural ambient radiation is around 3msv, while the total annual dose of man-made radiation is 3.2msv (1).

It is well known that ionizing radiation is frequently employed for medicinal and diagnostic purposes. Ionizing radiation use has considerably expanded in recent decades as a result of medical science advancements and the use of new practical applications (2).

Healthcare professionals have regular workplace exposure to a range of diagnostic and therapeutic radiological procedures. Due to a disruption in the normal DNA functioning, the HCWs' exposure to various radiography waves causes both immediate effects (such as dermatitis, microsites, and hair loss) and long-term complications (such as cataracts, skin issues, genetic issues, and cancer). In particular, compared to patients and other groups, HCWs exposed to radiation experience an approximately 40% increased risk of developing cancer. The International Radiation Protection Association has created some rules to restrict the dose received by the HCWs in order to prevent the adverse effects of radiation, and it is regularly evaluated. Education is the key to properly implementing radiation safety principles. All healthcare professionals are now exposed to radiological dangers due to the rise in radiology operations. They ought to be aware of how these processes work so they may better protect themselves (3).

The three guiding principles for radioprotection care proposed by the International Commission on Radiological Protection are justification (the examination must have a clear medical indication), optimization (care related to the examination and control of the professionals exposed), and dose limitation (to the minimal amount required and sufficient to perform a quality examination, also known as the ALARA principle) (4). It is estimated that there are 2.3 million healthcare workers in the world who are working with radiation related modalities, and half of them are exposed to human-made artificial radiation and ionized radiation (5).

Radiation Doses:

Dose restrictions fall into one of two groups, according to the Radiation Protection Council: Public dose (1 mSv effective dose, 15 mSv for the eye's lens, 50 mSv for the skin, and 50 mSv for the hands and feet annually) Occupational dose (20 mSv/year for the effective dose, 150 mSv/year for the eye lens, 500 mSv/year for the skin, and 500 mSv/year for the hands and feet) (6).

This annual dose for ionizing radiation protection has been compiled by the International Commission on Radiological Protection. For both public and occupationally exposed workers, this dosage limit is quite helpful. (7).

The International Commission on Radiation Safety offers global recommendations and guidance on all aspects of radiation protection from ionizing radiation. The National Dose Registry of South Korea complies with the Rules for Risk Control of Diagnostic Radiation. And records each person's specific radiation exposure dosages, which shouldn't be more than 50 mSv per year and 100 mSv every five years. (98.4%) of the radiation workers tracked by the National Dose Registry of Korea in 2014 had diagnostic radiation doses of no more than 5 mSv, and only 0.1% of workers received doses of 20 mSv or more. The annual decrease in the average radiation exposure dose during the past five years was 0.41 mSv on average. (8).

Radiation Protection:

The first option for using ionizing radiation safely was radiation shielding. The science and art of radiation protection involves protecting people and the environment from ionizing radiation's adverse effects. Additionally, it is said

that all efforts are coordinated to reduce x-ray exposure to patients and medical personnel. (9).

It is crucial for healthcare workers to understand the risks connected to ionizing radiation exposure and how to use radiation protective techniques (10)(8). Three principles—justification, limitation, and optimization—are used by the International Commission on Radiological Protection to apply radiation protection methods based on a conceptual framework. ALARA is a radiation protection idea that calls for teamwork to minimize both individual and shared radiation exposure. A adequate level of protection for individuals and the environment against the negative consequences of ionizing radiation exposure should be the first step in radiation protection (11).

Ten orders of radiation protection:

Do not approach the main beam. Always wear an apron for protection. Wear an Occupational Dosimeter at all times. One must always wear an apron when carrying a patient. Employ gonad shields, pregnant women should avoid exposure to radiation. It is best to choose the smallest field,

Do not let familiarity lead to complacency. Never hold the patient still for a radiological test; always utilize mechanical equipment. Apply the guiding principles Time, space, and protection Hospital employees that work in radiology modalities are affected by radiation due to the overuse of radiation in the medical industry today. As radiological workers have more knowledge and safety equipment about radiation threats, healthcare staff may not have as

much of either. By performing this study, we will be able to guarantee that health care staff are aware of the risks and take appropriate precautions.

(12) The use of ionizing radiation is a double-edged sword because it has significant benefits for patients but also poses health risks for both radiation workers and patients globally, where roughly 7 million (HCW) are exposed to radiation doses annually as a result of their activity. (13).

Rational: Radiation exposure is a significant occupational hazard for healthcare workers, especially those working in radiology and other imaging departments. Adequate knowledge, positive attitudes, and proper practices regarding radiation protection are essential to minimize radiation-related risks. Therefore, this study aims to assess the knowledge, attitude, and practices regarding radiation protection among healthcare workers at a tertiary care hospital in Peshawar.

AIMS AND OBJECTIVES

Aims:

The aim of this study is to assess the knowledge, attitude, and practices regarding radiation protection among healthcare workers at a tertiary care hospital in Peshawar.

Objectives:

1. To evaluate the knowledge of healthcare workers regarding radiation protection.
2. To assess the attitudes of healthcare workers toward radiation safety.
3. To examine the radiation protection practices among healthcare workers.

MATERIALS AND METHODS

Study Design:

Descriptive Cross-sectional study.

Study Settings:

Khyber Teaching Hospital (KTH) and Lady reading hospital (LRH) Peshawar

Study Duration:

The duration of this study was 04 months.

Sample Size:

The total sample size 218. (Calculated by WHO calculator)

Sampling Technique:

Using convenience sampling technique.

Inclusion Criteria:

All healthcare workers working in departments where ionizing radiation is used.

Exclusion Criteria:

Those who did not provide consent.

Data Collection Procedure:

It is declared that the subsequent approval and NOC has granted from director academics after the formal request of the students of Department of Medical Imaging, Ahmad Medical Institute Peshawar. After that the letter is submitted to the concerned department of Khyber Teaching Hospital (KTH), Lady reading hospital (LRH) in Peshawar for the approval and after the permission, data was collected through self-administration questionnaire.

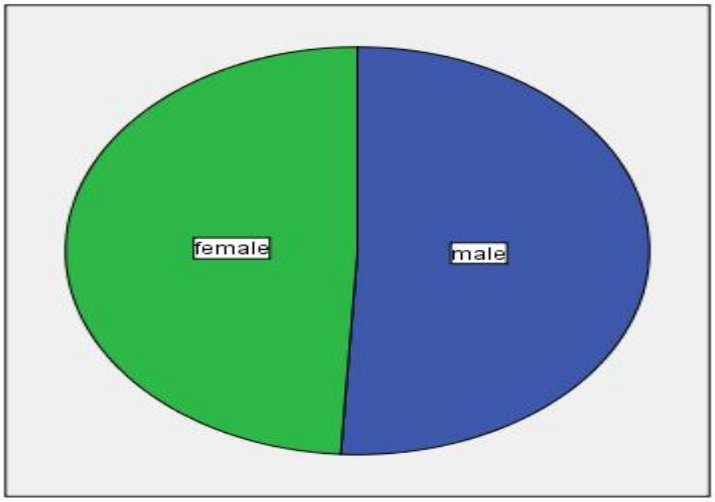
Data Analysis Procedure:

Data was tabulated and analyzed by SPSS version 26. The quantitative data (Number and Percentage) were presented in form of mean and for qualitative data (cause) was also be analyzed and bar charts or pie charts was drawn.

RESULTS

The demographic analysis of the study participants discovered that out of the total 218 respondents, the majority were male, including 109 participants (50.0% of valid responses, 49.5% of total responses). Female members totaled 106, accounting for 48.6% of valid responses and 48.2% of the total sample. The total valid replies accounted for 99.1% of the overall sample (n=218). The gender distribution proves a relatively balanced image between male and female participants, with a slight prevalence of male respondents.

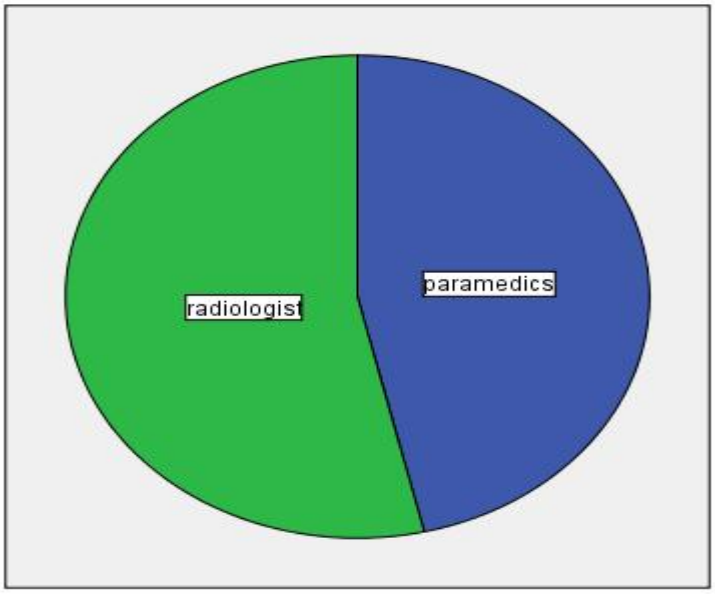
what is your gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	109	49.5	50.0	50.0
	Female	106	48.2	48.6	98.6
	2.10E+001	2	.9	.9	99.5
	2.30E+001	1	.5	.5	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



Graph 3.1 Determines a nearly balanced demonstration of male and female participants, with males slightly outnumbering females.

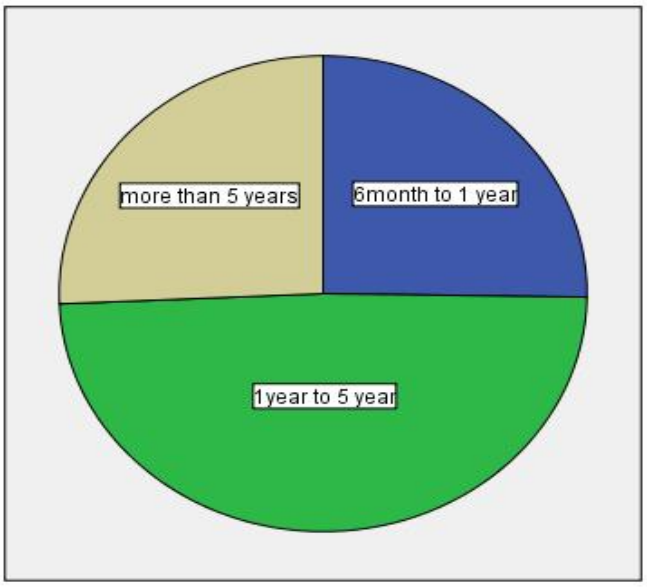
Amongst the respondents, 117 (53.7%) were radiologists and 101 (46.3%) were paramedics. Radiologists recognized the larger proportion of the study population

what is your education					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paramedics	101	45.9	46.3	46.3
	Radiologist	117	53.2	53.7	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



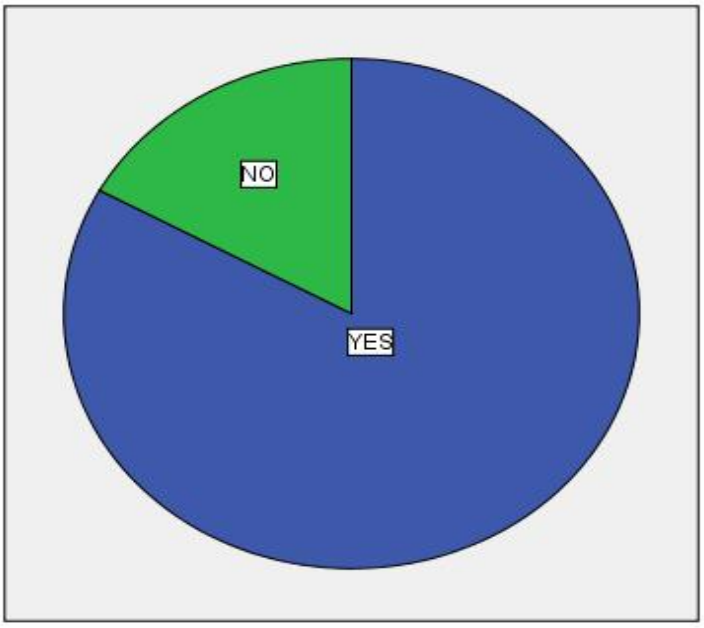
Graph 3.2 shows that radiologists shaped a slightly higher proportion of members compared to paramedics.Most members (49.1%, n=107) had 1–5 years of experience, while 25.7% (n=56) had more than 5 years and 25.2% (n=55) had 6 months to 1 year of experience.

job experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6month to 1 year	55	25.0	25.2	25.2
	1year to 5 year	107	48.6	49.1	74.3
	more than 5 years	56	25.5	25.7	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



The graph 3.3 shows that members with 1–5 years of experience signified the largest professional group.A majority of participants (83.0%, n=181) stated knowing about the ALARA principle, whereas 17.0% (n=37) were unaware of it.

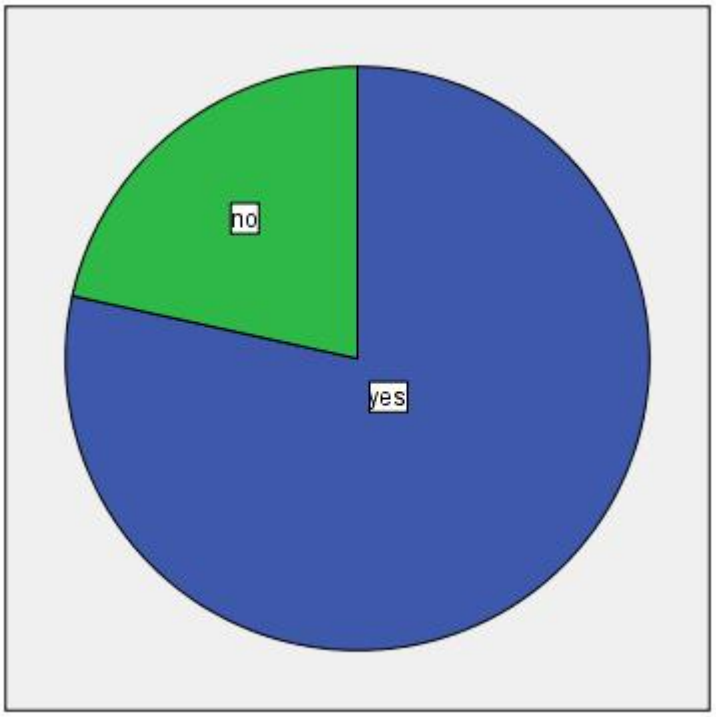
do you know about ALARA					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	181	82.3	83.0	83.0
	NO	37	16.8	17.0	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



The graph3.4 highlights a high level of awareness about the ALARA principle among respondents.

Among the participants, 171 (78.4%) were alert of TLD badges, while 47 (21.6%) described no knowledge about them.

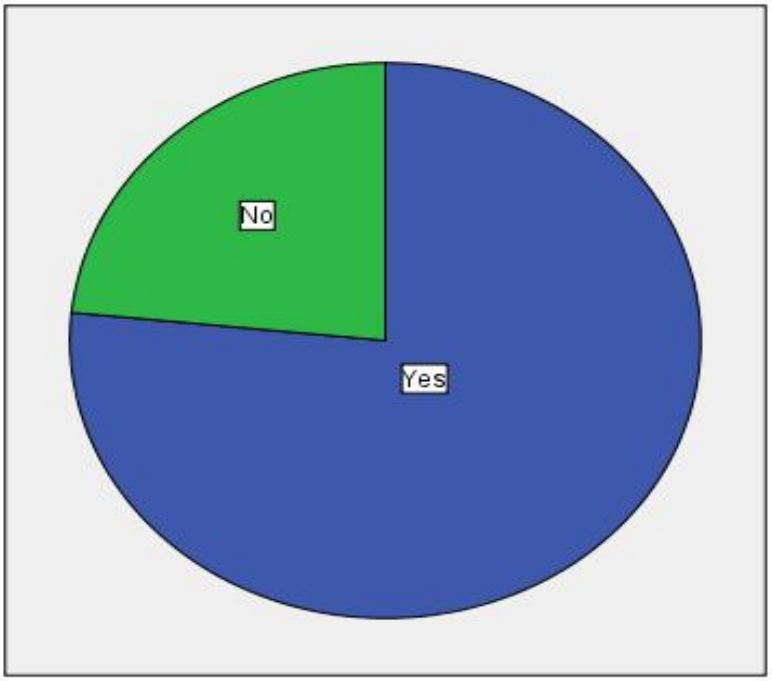
do you know what is TLD badge					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	171	77.7	78.4	78.4
	No	47	21.4	21.6	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



The graph 3.5 demonstrations that awareness of TLD badges was high amongst the study participants.

Most participants (167; 76.6%) reported using lead aprons during practice, whereas 51 (23.4%) did not use them.

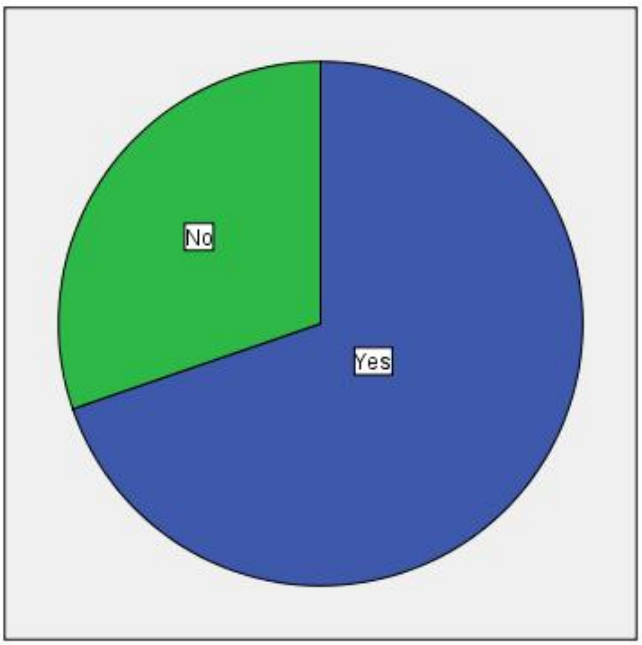
Do you use lead Apron?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	167	75.9	76.6	76.6
	No	51	23.2	23.4	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



The graph 3.6 shows that lead apron usage was common among the respondents.

A total of 152 participants (69.7%) reported using personal dosimeters, whereas 66 (30.3%) did not use them.

Do you use Personal Dosimeter or not?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	152	69.1	69.7	69.7
	No	66	30.0	30.3	100.0
	Total	218	99.1	100.0	
Total		218	100.0		



The graph 3.7 indicates that personal dosimeter use was common among participants, although nearly one-third were non-users.

DISCUSSION

The present study assessed the knowledge and practices linked to radiation protection among radiologists and paramedics. The demographic findings displayed a closely equal distribution of male (50.0%) and female (48.6%) participants, with radiologists establishing a slightly larger proportion (53.7%) than paramedics (46.3%). Moreover, almost half of the participants (49.1%) had 1–5 years of skilled experience, indicating that the study population was collected mainly of early- to mid-career healthcare professionals. Such a distribution

provides an appropriate basis for assessing current knowledge and practices regarding radiation safety.

The findings confirmed a relatively high level of awareness regarding radiation protection principles. A large majority of respondents (83.0%) stated knowledge of the ALARA (As Low as Practically Achievable) principle, while 78.4% were familiar with thermoluminescent dosimeter (TLD) badges. These findings are reliable with the study showed by Goula et al. (2021) (1), which described positive attitudes and satisfactory awareness of radiation protection actions among healthcare professionals. Similarly, Sharma et al. (2022) observed that healthcare workers generally controlled adequate knowledge regarding radiation risks and safety precautions (7). The high awareness of ALARA among participants may replicate the increasing emphasis on radiation safety education within radiology departments and healthcare institutions.

Knowledge about ionizing radiation and its associated risks was reported by 62.4% of participants, while 58.7% were conscious of the cardinal principles of radiation protection. Although these proportions specify acceptable levels of knowledge, a significant percentage of participants still required awareness of essential radiation safety concepts. These conclusions support the observations of Vassileva et al. (2022), who highlighted that continuous professional education and training programs are necessary to support radiation protection capabilities among healthcare workers (12). Bushong (2016) similarly highlighted that understanding radiation biology, radiation risks, and protection principles forms the foundation of safe radiologic practice and patient care (6).

CONCLUSION

This study looked at what radiologists and paramedics know about radiation protection and how they practice it. The results showed that most people in the study had an understanding of how to stay safe from radiation and what precautions to take. A lot of the people in the study knew about the ALARA principle TLD badges, the risks of ionizing radiation and the main rules of radiation protection. This means that radiologists and paramedics generally understand the basics of radiation protection because they work with radiation all the time.

The study also found that a lot of people are doing a job of following radiation protection rules. Most of the people in the study said they wear lead gloves, aprons, thyroid collars and personal dosimeters when they are working. However not as many people wear eye goggles, which shows that some safety rules are not always followed. Also even though most people said they follow the rules of radiation protection some of them do not always do what they are supposed to do to stay safe.

Overall the study found that while radiologists and paramedics know a lot about radiation protection there are still some problems with putting safety rules into practice. To get better at following safety rules radiologists and paramedics need to keep learning and practicing. Hospitals need to make sure everyone is following the rules. If we can get better at radiation protection we can reduce the amount of radiation that healthcare workers are exposed to make hospitals safer and take care of patients. The study shows how important it is for hospitals to make sure everyone knows about radiation safety. Follows the rules. Radiation protection is very important, for radiologists and paramedics because they work with radiation all the time.

RECOMMENDATION

The study suggested to have training programs about radiation protection and should have workshops and classes to learn more about radiation protection. This will help people know more about safety rules. Follow them. Healthcare places should make sure people have access to gear like lead aprons, thyroid collars, eye goggles and personal dosimeters. Also make sure people always wear this gear .Check on radiation safety rules from time, to time. Remind people to follow them. Radiation protection training programs are very important. Radiation protection is something need to take limitations:

1. The study was limited by its cross-sectional design, which prevented the assessment of changes over time.
2. Data were collected through self-reported responses, which may be subject to recall and reporting bias.
3. The findings may not be generalizable beyond the study setting.

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