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Evaluating Student Level of Awareness of Radiation Safety in the Context of Ionizing Radiation Facilities

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A R T I C L E I N F O

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A B S T R A C T

Clinical training for Radiologic Technology students introduces the fundamentals of radiation safety as part of their academic foundation. However, gaps between knowledge and practical application still exist, especially in environments with ionizing radiation. Therefore, the researcher aimed to assess the awareness levels and practices of Radiologic Technology students regarding radiation safety within ionizing radiation facilities. The study examined respondents' demographics and their relationship to radiation safety knowledge and practices, which guided the survey design. The results showed a generally high level of awareness among students, but practical application varied depending on clinical exposure and academic level. These findings highlight the need to include more hands-on safety training earlier in the curriculum. Based on these results, the researcher proposed targeted recommendations to improve students' readiness and adherence to safety procedures, ensuring they are well-prepared to work safely and effectively in radiation-related healthcare environments.

INTRODUCTION

With the steady advancement of technology in the medical field, diagnostic radiology has proven invaluable in helping both medical professionals and patients, but even though medical technology is modern, radiation is still involved. This raises concern about how aware people are of radiation safety in the context of ionizing radiation.

In Zekioğlu's (2021) study, the advancement and progression of medical technology has led to the increased usage of ionizing radiation for both treatment and diagnosis. Using statistics from the US, the total radiation dose received by the American population between the years 2006 and 2016 has lessened by 15-20%, but the number of procedures using computed tomography and X-rays has increased by 13% (NRCP,2019). Although all procedures involving ionizing radiation result in patients and society being exposed to more radiation than they were three decades ago, this also leads to a rise in the radiation dose received by healthcare professionals performing these procedures (Cornacchia et al.,2019). Due to this rise, radiation safety has gained importance relative to past years to safeguard the health and well-being of healthcare workers, patients, and society. Recent research has sought to highlight the possible dangers and the awareness of medical professionals regarding occupational radiation exposure (Wakeford, 2018). Nonetheless, even with the beneficial health impacts of applications, the detrimental effects of ionizing radiation on human health must not be ignored. Hence, imaging, interventional techniques, and therapeutic methods should be performed according to specific guidelines that reduce the potential dangers for patients, healthcare providers, and the community.

With this in mind, greater attention should be brought to the knowledge and awareness of those students who will eventually deal with these concepts' day-to- day as part of their future careers as radiologic technologists. Exposure to ionizing radiation is inevitable in the medical world so the issue of radiation safety is an ever-present concern. To deal with this there have always been radiation protection protocols and standards regarding interaction with radiation in the workplace, these safety protocols usually come from organizations and agencies such as the; International Atomic Energy Agency, International Commission on Radiological Protection, American College of Radiology, Philippine Nuclear Research Institute, Center for Device Regulation, Radiation Health, and Research to name some.

Radiation is primarily used for diagnosis and treatment in healthcare facilities, but it poses risks if not handled properly. Therefore, it is crucial for students, especially those studying radiologic technology and related fields, to understand radiation safety. Proper knowledge helps prevent harmful exposures and promotes safe practices in environments with ionizing radiation, such as hospitals and laboratories. However, many studies have focused on professional knowledge and practices, with fewer examining the awareness levels of students in training. This creates a gap in understanding how prepared students are before entering clinical settings. Addressing this gap is the goal of this study, which evaluates student awareness. The results will benefit students, educators, and healthcare institutions by ensuring future professionals are well-informed and prepared to follow proper radiation safety procedures.

Significance of the Study

This study helps to identify how well students understand radiation safety, especially in places where ionizing radiation is used, such as hospitals and laboratories. The findings can benefit students by showing which areas they need to improve on to stay safe and protect others. It also helps teachers and schools improve their lessons by focusing more on topics that students find difficult. In addition, the study can help healthcare facilities ensure that future radiologic technologists and other related professionals are well-prepared to follow safety rules and reduce radiation risks in the workplace.

The purpose of the study is to evaluate radiologic technological students' knowledge of radiation safety, particularly because they will come into contact with radiation in educational, research, and healthcare settings. It can assist in enhancing safety training and educational initiatives by identifying knowledge gaps. The findings will help institutions like other healthcare-oriented schools improve safety procedures and foster a safety-conscious culture among students, which will ultimately lower the health risks associated with radiation exposure in educational and occupational settings.

The results of this study will help both the students and the academic institute on how to approach and impart radiation safety knowledge and techniques to students, in order for all year levels to have approximately equal knowledge on radiation safety despite the disparity of year level, experience, and subjects taken. This will prove beneficial as no matter the academic level the students will learn how to handle radiation safety even if they have not accomplished the subjects of Quality assurance quality control, and Radiation protection.

Scope and Limitation

The study focused on evaluating the level of awareness that radiologic technology students of Medici Di Makati have on radiation safety in regard to ionizing radiation during the second semester of the academic year 2024-2025. The respondents of the study consist of the students enrolled in the radiologic technology course. The results of the study would be helpful to current respondents and future students in the course of radiologic technology.

The researchers considered working on this study to gauge and learn the level of awareness that radiologic technology students of Medici di Makati possess regarding radiation safety that pertains to the harmful effects of ionizing radiation.

THEORETICAL REVIEW

Health Belief Model

This study will use the health belief model. In the 1950s, the USPHS developed the HBM, a popular conceptual framework for health behavior. The model addressed the underutilization of services in the community, the necessity of vaccination, and the difficulties associated with TB screening with chest x-rays. The model is based on the psychologists' hypothesis that the public expects a perceived benefit from vaccinations, such as a reduction in fear, and perceives health risks when undergoing chest X-rays for diagnosis (Barley E, Lawson V., 2016)

Practically speaking, people weigh the advantages of altering their behavior to reduce health risks and make decisions based on their assessment. Interpersonal decision-making regarding a range of health behaviors, including screening, immunization, surgery, and quitting any unhealthy behaviors, is frequently examined using this model (Brewer NT, Fazekas KI. 2007)

As stated by (Orji R, Vassileva J, Mandryk R.,2012)., the HBM comprises 4 primary cognitive constructs; Perceived susceptibility to illness, perceived severity of illness, perceived benefits of behavior change, and perceived barriers to action are the four main cognitive constructs that make up the HBM as a theoretical framework As research has progressed, psychologists have come to recognize the importance of self-efficacy as a crucial component of health behavior decision-making, and as a result, they have included it in the model. (Bandura A.,1977) In the 1970s, the "cues to action" construct was added to the model to incorporate the stimuli of starting the action for the change. By addressing the factors that encourage people to act on their beliefs about health behaviors, this addition improved the predictive power of the model.

This theory applies to the present study because it may serve as a basis for conceptualizing the motivations behind ghosting to further understand why individuals choose to participate in this method of relationship dissolution.

Theory of Planned Behavior

Ajzen (1985) introduced the idea of the Theory of Planned Behavior. According to the theory, behavioral intention and perceived behavioral control have a direct impact on an individual's behavior. Subjective norms, attitudes, and perceived behavioral control all influence behavioral intention (Jing et al., 2016). Complex psychological, economic, and other decision-making processes influence behavior. The potential for a subject to carry out a specific behavior is known as behavioral intention. The subject's expectations and assessment of the outcomes of a particular behavior are reflected in their attitude. The expectations and attitudes of the significant other or group of people regarding the subject are referred to as subjective norms. The degree of control and difficulty of carrying out a task are referred to as perceived behavior

The first construct is behavioral intention, which refers to the driving forces behind the behavior (Ajzen, 1991). The likelihood of engaging in a particular behavior increases with the strength of the intention to do so. The second construct is the attitude toward the behavior, which is the degree to which an individual views a particular behavior favorably or unfavorably. Behavioral beliefs and outcome assessments make up an attitude. The third construct is the subjective norm, which is social pressure to engage in or refrain from engaging in a particular behavior. Subjective norms are made up of normative beliefs and compliance motivation. Another important component of the TPB is perceived behavioral control, which describes how easy or difficult people believe it to be.

Conceptual Framework

Using the IPO model (Figure 1) the evaluations of students will be conducted through questionnaires. The data that has been collected will be analyzed using inferential statistics t-tests. Data gathered from the questionnaires will be consolidated and compared to show levels of awareness, input collected will be used to give suggestions on how to raise awareness of radiation safety through outlets like programs, seminars, subjects, and student organizations that future researchers could develop.

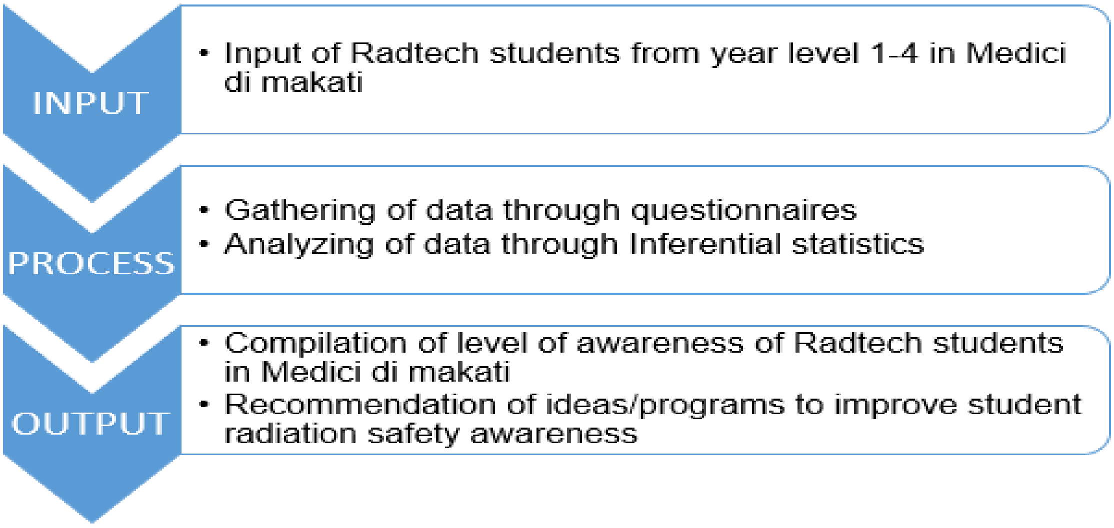

Figure 1. Research Paradigm

Hypotheses

Ho1: There is no significant relationship between the demographic profile of the respondents and the level of awareness of radiation safety in the context of ionizing radiation facilities.

Ho2: There is no significant relationship between the demographic profile of the respondent's knowledge of the whole Radiologic Technology program regarding radiation safety and ionizing radiation in healthcare facilities.

METHODOLOGY

The study will utilize a quantitative research design to evaluate the level of awareness among students regarding radiation safety in the context of ionizing radiation exposure. Specifically, this will be a descriptive research design that focuses on assessing students' current knowledge, attitudes, and awareness regarding radiation safety practices. Additionally, it will use a correlational approach to explore any relationships between factors such as exposure to ionizing radiation and students' awareness levels.

According to Trefry (2017), it focuses on objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys and the manipulation of pre-existing statistical data using computation. Quantitative research focuses on gathering numerical data and generalizing it across groups or explaining a particular phenomenon.

Research Procedure

First, the researchers will formulate the research questionnaires then, which will be validated by the validators.

Second, the researcher sought permission to conduct the said study with the approval from the institution for the target respondents, the conduct schedule, and the questionnaire.

Third, the respondents will be given questionnaires through Google Forms. Respondents who will participate in the research will be given ample time to respond to the questionnaires given to them to avoid errors and inaccuracies in their answers. The identity of the respondents will remain confidential.

Finally, the survey questionnaires will be retrieved, and the results will be tabulated, analyzed, and interpreted using the appropriate statistical tools.

Ethical Consideration

In conducting research, several ethical principles must be adhered to. Informed consent is most important, ensuring participants are fully aware of the study's purpose, risks, and their right to withdraw at any time without penalty. Confidentiality is crucial, with personal data anonymized and securely stored to protect participants' privacy. Efforts should be made to minimize harm, particularly in avoiding distress or anxiety related to radiation, ensuring no physical or psychological harm occurs. The principle of beneficence requires that the study should benefit both participants and society, especially in improving radiation safety awareness and practices. Fair selection of participants is essential, with an emphasis on inclusivity and the avoidance of bias. Transparency is necessary, with clear communication regarding the study's goals, data use, and anticipated outcomes. Finally, a thorough risk assessment is essential to identify and mitigate any potential risks, maintaining the study's safety and ethical integrity.

Statistical Treatment of Data

In this study, the data will be analyzed quantitatively using statistical tools. The first section, which contains the demographic profile of the students, will be analyzed by using percentages and frequencies.

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This will be used by taking the category's frequency in the students' demographic profile, dividing it by the tidal population, and multiplying it by 100%

1. Frequency count and percent distribution were used to describe the profile of the student respondent.

Fr = f/n; % = f/n x 100 Where: % = percentage
f = frequency
n = total number of students

2. Weighted Mean: This statistical tool was used to compute for the weight of the respondents in the questionnaire assigned during the actual data gathering procedure. The formula for the weighted mean is as follows:

wm = ∑ FW /n
Where: WM = Weighted Mean
∑ = Summation Symbol
F = Frequency
W = Assigned Weight
N = Total number of frequencies

The corresponding verbal interpretations for the weighted mean:
4.20 - 5.00 Strongly Agree; 3.40 - 4.19 Agree; 2.60-3.39 Neutral;
1.80-2.59 Disagree; 1.00-1.79 Strongly Disagree

ANOVA statistical method was employed to determine the significant difference in the level of Awareness of Radiation Safety in the Context of Ionizing Radiation Exposure among the respondents.
F=MST/MSE.

RESULTS AND DISCUSSION

Demographic Profile

The following tables present the demographic profile of the respondents in terms of sex, year level, and clinical training attended. The researchers analyzed and tabulated the data to obtain the frequency and percentage values necessary for interpretation.

Table 1. Frequency Distribution of the Respondents According to Sex

Gender	Frequency	Percent
Male	21	38.9
Female	33	61.1
Total	54	100.0

Table 1 shows a total of 54 Radiologic Technology students participated in this study evaluating their level of awareness of radiation safety in the context of ionizing radiation facilities. Of these participants, 33 students (61.1%) were female, while 21 students (38.9%) were male.

This indicates a higher representation of female students in the sample, which may provide valuable insight into the gender composition of the program and its potential influence on radiation safety awareness.

Table 2. Frequency and Percentage of the Profile Respondents According to Year Level

Year level	Frequency	Percent
First year	27	50.0
Second Year	13	24.1
Third Year	6	11.1
Fourth Year	8	14.8
Total	54	100.0

Table 2 shows the distribution of respondents by year level shows that half of the Radiologic Technology students (27 out of 54, or 50.0%) are first-year students. The second- year students comprise 24.1% (13 students), while third-year students make up 11.1% (6 students) of the sample. Fourth-year students represent 14.8% (8 students) of the total participants. This distribution indicates that the majority of respondents are in the early stages of their program, with fewer students in the more advanced years. Understanding this composition is important as it may influence the overall level of awareness and knowledge regarding radiation safety among the students.

Table 3. Frequency and Percentage of the Profile Respondents According to Clinical Training Attended

Clinical Training Attended	Frequency	Percent
>8 weeks greater	8	13.0
<8 weeks less	6	11.1
None	41	75.9
Total	54	100.0

Table 3 shows the majority of Radiologic Technology students (41 out of 54, or 75.9%) reported that they have not yet attended any clinical training. Meanwhile, 7 students (13.0%) have attended clinical training for more than eight weeks, and 6 students (11.1%) have completed less than eight weeks of clinical training. This indicates that most of the participants are still in the theoretical or early stages of their program and have limited practical experience in clinical settings. This factor may affect their level of awareness and knowledge related to radiation safety in healthcare facilities.

Table 4. Weighted Mean and Interpretation of Respondents in the Evaluation of Radiation Safety Awareness in Terms of Radiation Protection Knowledge

Responses to Practice Related to Radiation Safety	Mean	Std. Deviation	Verbal Interpretation
Ionizing radiation can damage the process of normal cell division, while non-ionizing radiation does not affect the molecular level.	2.26	0.915	Agree
Radiation-induced skin burns and cataracts are examples of deterministic effects.	2.30	0.768	Agree
Justification, optimization, and dosimetry limitations are the three general principles of radiation protection	2.13	0.778	Agree
You know the concept of As Low as Reasonably Achievable (ALARA) and its 3 principles: time, distance, and shielding.	2.07	1.061	Agree
The eyes, thyroid, and gonads are the most sensitive organs when exposed to radiation	1.74	0.828	Strongly Agree
X-ray, computed tomography (CT) scan, and fluoroscopy examinations use ionizing radiation.	1.80	0.959	Agree
Ultrasound and Magnetic Resonance Imaging (MRI) examinations do not use ionizing radiation.	1.85	1.017	Strongly Agree
As the distance from the source increases, the intensity of radiation decreases.	1.93	0.887	Agree
Barriers of lead and concrete protect from penetrating gamma rays and X-rays.	1.83	0.885	Strongly Agree
Average Weighted Mean	1.99		Strongly Agree

The table 4 responses gathered from the Radiologic Technology students regarding their knowledge of radiation protection indicate a generally high level of awareness, as reflected in the overall average weighted mean of 1.99, which corresponds to the verbal interpretation of "Strongly Agree." This suggests that, on average, students are well-informed about key concepts in radiation protection. The highest-rated statement was "The eyes, thyroid, and gonads are the most sensitive organs when exposed to radiation" with a mean of 1.74, showing a strong agreement among respondents. This was followed by knowledge of imaging modalities that use or do not use ionizing radiation, as well as understanding of physical barriers like lead and concrete for protection, all receiving strong agreement. Meanwhile, slightly lower but still positive agreement was observed on more technical concepts such as deterministic effects and the principles of justification, optimization, and dose limitation. Despite some variation in individual item scores, the consistent pattern of agreement indicates that the students possess a solid foundational understanding of radiation safety measures.

Table 5. Weighted Mean and Interpretation of Respondents in the Evaluation of Radiation Safety Awareness in Terms of Practice Related to Radiation Safety

Responses to Practice related to Radiation Safety	Mean	Std. Deviation	Verbal Interpretation
I wear a lead apron and thyroid shield when working with radiation.	2.04	0.776	Agree
During the x-ray procedure, if I must remain in the room for some reason, I will step back at least 2 meters from the beam.	2.20	0.762	Agree
During fluoroscopic exposures, I wear a lead apron and thyroid shield.	2.11	0.744	Agree
When the x-ray room warning sign is on, I do not enter the room.	1.46	0.665	Strongly Agree
I will spend less time near radiation sources.	2.04	1.009	Agree
I will use the ALARA principle to minimize radiation exposure.	1.85	0.920	Agree
I am familiar with the biological effects of ionizing radiation, which include deterministic effects and stochastic effects.	2.35	0.914	Agree
I am aware that radiation dose limits for public exposure are 1 mSv per year.	2.33	0.911	Agree
I know the use and purpose of personal radiation monitors such as TLDs, OSLs, pen dosimeters, and ring badges.	2.22	0.904	Agree
I am aware that different types of ionizing radiation have different penetrating capabilities; for example, alpha radiation can be stopped by a sheet of paper, while beta radiation can be stopped by a sheet of aluminum.	2.17	1.005	Agree
I know the benefits of radiation to health, energy, and industry.	2.00	0.824	Agree
I am aware that different body parts have different equivalent dose limits.	2.33	0.932	Agree
During pregnancy, radiation risks are most significant during organogenesis and the early fetal period.	2.15	0.763	Agree
I know the difference between natural sources of radiation and man-made sources of radiation.	1.93	0.843	Strongly Agree
I know the difference between ionizing and non-ionizing radiation.	1.83	0.906	Strongly Agree
If medically justified, a pregnant woman can undergo an X-ray examination.	1.96	0.823	Strongly Agree
Average Weighted Mean	2.12		Agree

The table 5 presents the responses of Radiologic Technology students regarding their actual practices related to radiation safety. The average weighted mean of 2.12, which falls under the "Agree" category based on the Likert scale, indicates that students generally practice radiation safety measures, although there is still room for stronger compliance. The highest-rated item was "When the x-ray room warning sign is on, I do not enter the room" with a mean of 1.46, interpreted as "Strongly Agree," showing a strong adherence to fundamental radiation precautions. Similarly, the statements "I know the difference between ionizing and non-ionizing radiation" (1.83) and "I know the difference between natural sources of radiation and man-made sources" (1.93) also received "Strongly Agree" interpretations, highlighting students' awareness of core radiation concepts. On the other hand, the lowest-ranked item was "I am familiar with the biological effects of ionizing radiation..." with a mean of 2.35, suggesting a weaker understanding in that area. Overall, the results reflect a positive, yet improvable, level of practice regarding radiation safety among the respondents. Strengthening knowledge-based practices could further enhance safety awareness in clinical and laboratory environments.

Table 6. Breakdown of the Assessment of the Respondents on the Level of Awareness and Practice of Radiation Safety in the Context of Ionizing Radiation Facilities When Grouped According to Their Sex

ANOVA							
		Sum of squares	df	Mean square	F	Sig.	Decision
Knowledge Mean	Between groups	4.318	1	4.318	0.158	0.692	Fail to reject H0
	Within groups	1417.385	52	27.257			
	Total	1421.704	53				
Practice Mean	Between Groups	29.293	1	29.293	0.263	0.61	Fail to reject H0
	Within Groups	5787.688	52	111.302			
	Total	5816.981	53				

Table 6 shows the ANOVA test was conducted to determine if there is a significant difference in the level of awareness and practice of radiation safety among respondents when grouped according to their sex. For the knowledge of radiation safety, the results showed an F-value of 0.158 with a significance level (p-value) of 0.692. Similarly, for the practice of radiation safety, the F-value was 0.263 with a p-value of 0.610. Since both p-values are greater than the 0.05 threshold, the results indicate that there is no statistically significant difference in both the level of awareness and practice of radiation safety between male and female respondents. Therefore, the null hypothesis, which states that there is no significant difference between gender groups in terms of radiation safety awareness and practice, is accepted.

Table 7. Breakdown of the Assessment of the Respondents on the Level of Awareness and Practice of Radiation Safety in the Context of Ionizing Radiation Facilities When Grouped According to Their Demographic Variable

ANOVA							
		Sum of squares	df	Mean square	F	Sig.	Decision
Knowledge Mean	Between groups	698.14	3	232.713	16.081	0	Reject H0
	Within groups	723.564	50	14.471			
	Total	1421.704	53				
Practice Mean	Between Groups	2747.066	3	915.689	14.914	0	Reject H0
	Within Groups	3069.916	50	61.398			
	Total	5816.981	53				

The results of the ANOVA test reveal in table 7 that there are significant differences in the level of knowledge and practice related to radiation safety among respondents when grouped according to the demographic variable. Specifically, the analysis shows that the mean knowledge scores differ significantly across the groups ($F = 16.081$, $p < 0.001$), as do the mean practice scores ($F = 14.914$, $p < 0.001$). Since the p-values for both variables are below the 0.05 significance level, the null hypothesis that there is no significant difference between the groups is rejected. This indicates that the demographic characteristic has a meaningful impact on how respondents understand and apply radiation safety measures in the context of ionizing radiation facilities

Table 8. Breakdown of the Assessment of the Respondents on the Level of Awareness and Practice of Radiation Safety in the Context of Ionizing Radiation Facilities When Grouped According to Their Clinical Year Attended

ANOVA							
		Sum of squares	df	Mean square	F	Sig.	Decision
Knowledge Mean	Between groups	151.966	2	75.983	3.052	0.056	Fail to reject H0
	Within groups	1269.738	51	24.897			
	Total	1421.704	53				
Practice Mean	Between Groups	724.329	2	362.165	3.627	0.034	Reject H0
	Within Groups	5092.652	51	99.856			
	Total	5816.981	53				

The ANOVA results in table 8 show that there is no significant difference in the level of knowledge about radiation safety among the groups being compared

(F(2, 51) = 3.052, p = 0.056), leading us to fail to reject the null hypothesis for knowledge. This suggests that the different groups have similar knowledge levels regarding radiation safety. However, for the practice of radiation safety, the results indicate a significant difference between the groups (F(2, 51) = 3.627, p = 0.034). Therefore, we reject the null hypothesis for practice, meaning that the groups differ significantly in their radiation safety practices. In summary, while knowledge levels appear consistent across groups, their actual practices related to radiation safety show significant variation.

Summary of Findings Profile of Respondents

The majority of respondents were female, comprising 33 students or 61.1% of the total participants. Male respondents made up the remaining 21 students, or 38.9%. This indicates a higher participation rate among female students in the study.

First-year students represented the largest group in the study, accounting for 27 respondents or 50.0%. Following them were second-year students with 13 participants (24.1%) and fourth-year students with 8 (14.8%). Third-year students had the lowest representation, with only 6 respondents or 11.1%. This breakdown clearly shows that most of the study's participants were in the early years of their academic program.

A significant majority of the respondents, specifically 41 students or 75.9%, had not yet attended clinical training. Among those who had, 7 students (13.0%) reported having over 8 weeks of clinical exposure, while 6 students (11.1%) had less than 8 weeks of training.

Regarding clinical training, a substantial majority of the respondents, 41 students (75.9%), had not yet attended any clinical training. Of those who had, 7 students (13.0%) reported having over 8 weeks of clinical exposure, while 6 students (11.1%) had less than 8 weeks of training. This reflects that many respondents had limited hands-on clinical experience.

Awareness on Radiation Protection Knowledge

The average weighted mean was 1.99, which is interpreted as "Strongly Agree," indicating that students generally possess a high level of awareness concerning radiation protection. The highest-rated item, "The eyes, thyroid, and gonads are the most sensitive organs when exposed to radiation," received a mean score of 1.74, also interpreted as "Strongly Agree." Additionally, topics such as ionizing versus non-ionizing radiation, imaging modalities, and physical barriers garnered high levels of agreement. Meanwhile, technical topics like deterministic effects and radiation protection principles showed slightly lower, yet still positive, agreement, highlighting a strong overall understanding among students in these areas as well.

Practice Related to Radiation Safety

The average weighted mean was 2.12, which can be interpreted as "Agree," suggesting that students generally practice radiation safety but there is room for improvement. The highest-rated item was "When the x-ray room warning sign is on, I do not enter the room," with a mean of 1.46, reflecting a strong agreement. Additionally, strong agreement was observed in understanding the differences in radiation types and sources. However, the lowest-ranked item was "I am familiar with the biological effects of ionizing radiation," with a mean of 2.35, indicating simple agreement and revealing a gap in understanding advanced radiation effects.

CONCLUSIONS AND RECOMMENDATIONS

The study shows that Radiologic Technology students possess a strong foundational awareness of radiation protection, even though many are still in the early stages of their academic journey and have limited clinical exposure. Their high level of knowledge, paired with generally positive safety practices, reflects a solid starting point for developing competent and safety-conscious future radiologic technologists.

However, the results also highlight that the practical application of radiation safety improves as students advance in their year level and gain hands-on clinical experience. While sex does not influence their knowledge or practice, both academic progression and clinical training play meaningful roles in shaping how effectively students apply radiation safety principles in real settings.

Generally, the findings emphasize the importance of aligning educational strategies with students' developmental stages. Strengthening clinical exposure and reinforcing practical applications can help bridge the gap between what students know and how confidently they practice radiation safety, ultimately supporting safer and more informed engagement with ionizing radiation in their future professional roles.

Recommendation

1. Integrate Enhanced Clinical Exposure Early in the Program

Given that a majority of respondents have not yet attended clinical training and that practice-related awareness significantly varies depending on clinical experience, it is recommended that the Radiologic Technology curriculum incorporate early and progressive clinical immersion. This will help bridge the gap between theoretical knowledge and real-world application of radiation safety practices.

2. Strengthen Practical Training in Radiation Safety Protocols

While students demonstrated good theoretical knowledge, practical application remains an area with room for improvement. The institution should enhance simulation-based learning and hands-on workshops focused on personal protective equipment use, proper distance and shielding techniques, and familiarity with radiation monitoring devices such as TLDs and dosimeters.

3. Conduct Regular Seminars and Refresher Courses on Radiation Protection

To address weaker areas such as understanding of biological effects and regulatory dose limits, periodic seminars and mandatory refresher courses should be organized. These should cover both basic and advanced topics in radiation protection, aligned with the current guidelines of regulatory bodies like the DOH, DOLE, and IAEA.

4. Implement a Peer Mentoring Program Across Year Levels

Since statistically significant differences were observed across year levels, a peer mentoring system may be introduced. Senior students with higher clinical exposure can guide junior students, thereby enhancing their awareness and encouraging safe practices even before formal clinical assignments.

5. Regular Evaluation and Monitoring of Student Practices

Establish a system of ongoing assessment and feedback on students' adherence to radiation safety protocols during laboratory or clinical sessions. This will help reinforce positive behaviors and identify gaps that need targeted intervention.

6. Institutionalize Gender-Neutral Training Approaches

As there was no significant difference in awareness and practice when grouped by sex, training modules should remain inclusive and standardized, focusing on competency rather than demographic characteristics. This ensures uniform delivery of safety knowledge and practices across all students.

7. Promote a Culture of Radiation Safety within the Campus

The university should promote a radiation safety culture by displaying informative posters, offering short online modules, and encouraging faculty and staff to model proper safety behavior. This fosters awareness beyond the classroom and into students' daily academic environment.

FURTHER STUDY

Future studies are recommended to expand the scope of this research by involving a larger and more diverse sample from different educational institutions and radiation-related facilities. Further research may also explore additional variables such as training effectiveness, safety culture, and regulatory compliance to gain a more comprehensive understanding of students' awareness of radiation safety. Moreover, the use of mixed methods approaches, combining quantitative and qualitative data, is suggested to provide deeper insights into behavioral aspects and practical challenges in implementing radiation safety practices.

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