

# A Survey of Allied Health Students' Knowledge and Awareness of Radiation Hazards and Protection in a Private University in Guwahati

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## Abstract

**Background:** Radiation exposure, particularly in healthcare settings, poses significant risks if not managed properly. Understanding the hazards associated with radiation and adhering to protection protocols are essential, especially for allied health students who are likely to encounter radiological procedures in their professional careers. This study assessed the awareness and knowledge levels regarding radiation protection and hazards among students from various allied health departments at a private university in Guwahati.

**Methods:** A cross-sectional study was conducted with 435 participants of allied health students at The Assam Royal Global University selected through non-probability convenience sampling. The study was conducted between June and August 2024. It was made up of 17 close-ended questions assessing their awareness about radiation and related radiation hazards. Data were collected via a self-administered online questionnaire distributed through Google Forms. Participants were also questioned about their willingness to learn more about radiation safety measures and need of awareness programs on radiation safety. Descriptive statistics, t-tests, and ANOVA were used for data analysis.

**Results:** The majority of respondents (96.5%) were aware of radiation hazards, and 93.5% expressed willingness to attend a radiation awareness program. There was no significant difference in knowledge or awareness between male and female students ( $p = 0.758$  and  $p = 0.991$ , respectively). However, a significant difference was observed across departments in both knowledge ( $p = 0.0001$ ) and awareness ( $p = 0.0003$ ), with Radiography students scoring the highest. The mean age of participants was 21.02 years, with a balanced gender distribution (52% male, 48% female), and most were undergraduate students (91.26%).

**Conclusion:** While overall awareness of radiation hazards among allied health students was high, knowledge levels varied significantly by department. These findings highlight the need for targeted educational interventions to ensure all healthcare students receive adequate training in radiation safety, especially those in non-radiology fields.

**Keywords:** radiation hazard, radiation protection, allied health students, awareness and knowledge, guwahati

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**What is already known on this subject:**

1. Exposure to ionizing radiation provides significant occupational hazard in healthcare settings.
2. There is a lack of awareness and knowledge of radiation safety among medical and allied health students.
3. Previous studies suggest gaps in radiation protection knowledge among non-radiology students.

**What this paper adds:**

1. It provides a comparative analysis of awareness and knowledge across various allied health departments.
2. It highlights significant differences in radiation knowledge between Radiography and other health programs.
3. It emphasizes the need for curriculum-wide integration of radiation safety training.

**Introduction**

Radiation plays a critical role in modern healthcare, particularly in diagnostic imaging and therapeutic procedures. While the benefits of radiation in medicine are undeniable, it also poses significant hazards if not properly managed. Healthcare professionals, including allied health workers, must be knowledgeable about radiation safety and protection protocols to minimize the risks of exposure to themselves, patients, and the broader public<sup>1</sup>. Radiation exposure can lead to both immediate and long-term health consequences, including tissue damage, radiation sickness, and an increased risk of cancer<sup>2</sup>. Therefore, a strong understanding of radiation hazards and the implementation of protective measures is crucial in clinical practice. Despite this, previous studies have indicated that knowledge and awareness of radiation protection among healthcare students, including those in allied health disciplines, may be inadequate<sup>3</sup>. This inadequacy could result in unsafe practices and heightened risk of exposure in clinical settings<sup>4</sup>.

Allied health professionals, who often work closely with radiological procedures, need to be well-versed in radiation safety. Given the growing reliance on diagnostic imaging and other radiation-based techniques in modern healthcare, there is an urgent

need to assess the level of knowledge and awareness among students in this field<sup>5</sup>. Identifying gaps in their understanding can inform educational reforms and ensure that future healthcare workers are equipped to handle radiation safely and effectively.

*Research Gap*

Several studies have been conducted worldwide where the researchers have evaluated medical and allied health students' knowledge and awareness of radiation hazards; however, data is limited in the Indian subcontinent and especially in the North-Eastern region. All those studies mentioned earlier have included medical students or students or trainees from the Radiology department and have not taken into consideration the awareness and understanding of the other allied health disciplines like physiotherapy, optometry and nutrition and dietetics. This creates a vacuum in our understanding of how awareness and knowledge differ throughout departments that could come into indirect contact with radiation in clinical practice.

*Need for the study*

It is crucial that all allied health workers, not just radiography or radiology trainees, have sufficient understanding of radiation risks and safety measures due to the growing dependence on radiation-intensive treatment procedures and diagnostic imaging. Universities can create focused training programs, curriculum changes, and awareness campaigns by identifying current knowledge and awareness gaps. In Guwahati, where a number of allied health programs coexist in a private university context, this study is especially significant since it provides a chance to compare knowledge levels across disciplines and identify areas that need educational reinforcement. The students from allied departments will, in the future, be working around a Radiology department and as such it becomes crucial that they are aware about the harmful effects of ionizing radiation as well as the precautionary measures available at the departmental and individual level.

This study aims to assess the knowledge and awareness of radiation hazards and protection among allied health students at a private university in Guwahati, Assam, India. By evaluating their current understanding, we hope to identify areas where

improvements are needed and recommend strategies for enhancing radiation safety education within the allied health curriculum.

### Materials & Methods

A cross-sectional study was conducted with 435 participants of allied health students at The Assam Royal Global University selected through non-probability convenience sampling. The study was conducted between June and August 2024. It was made up of 17 close-ended questions assessing knowledge and methods of radiation safety measures and data were collected via a self-administered online questionnaire distributed through Google Forms. Participants were also questioned about their willingness to learn more about radiation safety measures and need of awareness programs on radiation safety.

**Study Population:** The study population consisted of allied health course students enrolled in four programs at The Assam Royal Global University, which are those from departments of Radiography, Physiotherapy, Optometry and Nutrition and Dietetics. A total of 450 students were invited to participate in the survey.

**Sampling Technique:** A convenience sampling method was employed to recruit participants for this study. Students who met the inclusion criteria and were willing to participate in the survey were selected. The inclusion criteria were allied health students currently enrolled in any of the medical allied science programs and students who gave informed consent to participate. The exclusion criteria were students who did not provide consent and students who had previously completed radiation protection courses or training outside their academic curriculum.

No formal power analysis was done before data collection. With 435 participants and a high response rate, the sample was large enough for descriptive estimates and for detecting moderate group differences, but no exact calculation for specific effect sizes was performed.

**Data Collection Tool:** A structured questionnaire was developed based on previously validated tools and adapted to the local context. The questionnaire comprised seventeen questions. The questionnaire was distributed in online format using Google Forms to accommodate students' preferences. Participation

in the survey was voluntary, and consent was obtained from the head of the departments before proceeding. Students were informed that their responses would be anonymous and confidential. Questions included age, sex, program in which they are enrolled, familiarity about radiation and its harmful effects, protective devices of minimizing radiation and other such related questions. Students were also asked about their willingness to improve their knowledge about radiation safety.

**Statistical Analysis:** The collected data were entered into Microsoft Excel for statistical analysis.

### Result

There were 450 questionnaires distributed to the allied health students, radiography (n= 162), physiotherapy (n=171), optometry (n= 69) and nutrition and dietetics (n=33). There were 435 respondents (response rate of 96%), of which 52.7% (n=225) were males and 48.3% (n=210) were females (Table 1). Out of the 435 respondents, 92.26% (n=397) were undergraduate and 8.73% (n=38) were postgraduate students. The mean age of the respondents is 21.02 years, with a standard deviation (SD) of 2.004, indicating that most participants are young adults, in the undergraduate or early postgraduate age range, with minor variation in age. Out of 435 respondents, 225 (52%) were male and 210 (48%) were female. The distribution is a balanced one, suggesting no significant gender skew in participation. A vast majority, 397 respondents (91.26%), are pursuing undergraduate (UG) education. Only 38 participants (8.73%) are at the postgraduate (PG) level, implying that the findings mainly reflect the knowledge and awareness levels of undergraduate students. [Table 1].

**Table 1: Demographic information on the respondents**

Characteristics	Mean	SD
Age	21.02	2.004
<b>Sex</b>	<b>Number</b>	<b>%</b>
Male	225	52%
Female	210	48%
<b>Education level</b>	<b>Number</b>	<b>%</b>
UG	397	91.26
PG	38	8.73

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Department	Number	%
Radiography	162	37.24
Physiotherapy	171	39.31
Optometry	69	15.8
Food & Nutrition	33	7.5

**Table 2: Awareness frequency of the respondents**

Awareness	Frequency	%
Yes	420	96.5
No	15	3.4

Table 2 presents the demographic distribution of awareness regarding radiation hazards. A significant majority (96.5%) of respondents reported being aware of radiation hazards, while only 3.4% indicated a lack of awareness.

Table 3 shows the awareness frequency disaggregated by sex. The mean knowledge score on radiation protection was slightly higher among females (12.38%, SD = 3.20%) compared to males (12.29%, SD = 2.74%). Similarly, the mean awareness score was nearly identical between females (96.55%, SD = 18.26%) and males (96.53%, SD = 18.3%). The p-values for both knowledge ( $p = 0.758$ ) and awareness ( $p = 0.991$ ) indicate no statistically significant difference between male and female respondents.

Table 4 provides a department-wise comparison of knowledge and awareness. Radiography students had the highest mean knowledge (14.27%, SD = 1.74%) and full awareness (100%) of radiation protection. This was followed by Physiotherapy, Food & Nutrition, and Optometry students. The p-values for both knowledge ( $p = 0.0001$ ) and awareness ( $p = 0.0003$ ) suggest statistically significant differences among departments.

**Table 3: Knowledge on radiation protection and awareness of hazard between males and females**

Sex	Knowledge of radiation protection Mean (SD)	Awareness of radiation hazards Mean (SD)
Males	12.29% (2.74%)	96.53% (18.3%)
Females	12.38% (3.20%)	96.55% (18.26%)
P value	0.758	0.991

**Table 4: Knowledge on radiation protection and awareness of hazard among different departments**

Department	Knowledge of radiation protection Mean (SD)	Awareness of radiation protection Mean (SD)
Radiography	14.27% (1.74%)	100%
Physiotherapy	12.53% (2.91%)	96.49%
Optometry	10.88% (3.89%)	91.30%
Food & Nutrition	11.39% (3.12%)	93.93%
p value	0.0001	0.0003

**Table 5: Willingness of the respondents to attend a radiation awareness program**

Willingness	Frequency	%
Yes	407	93.5
No	28	6.4

Table 5 highlights respondents' willingness to attend a radiation awareness program. A large proportion (93.5%) expressed interest in participating, while only 6.4% were not willing. Overall, the results indicate high levels of awareness and willingness to learn more about radiation hazards, though notable differences in knowledge exist across academic departments.

## Discussion

A research by Shafiq et al evaluated medical students' understanding of radiation dangers and protection. According to their research, pupils who had no formal radiography education had a typically poor comprehension of these subjects. Nonetheless, the students who had taken a brief radiography course or workshop had a markedly improved comprehension of ionizing radiation, its origins, possible health hazards, and preventative actions. The study emphasizes how awareness can be raised with even short educational interventions. This research bolsters the case for including brief, targeted training sessions on radioactive safety in medical curricula, particularly for students pursuing fields outside than radiography or radiology<sup>6</sup>.

In Palestine, Awadghanem et al conducted a study on medical students' understanding of radiation dosages and related hazards. The findings

revealed a serious lack of knowledge among students, especially with regard to the radiation exposures connected to routine diagnostic procedures including CT scans, X-rays, and nuclear medicine imaging. Numerous participants understated the dangers of ionizing radiation, indicating that misunderstandings and ignorance may be a factor in risky behaviors or inadequate patient communication. In order to meet the needs of undergraduate medical students, this study highlighted the critical need for structured teaching modules that cover radiation dosimetry and the biological effects of radiation exposure<sup>7</sup>.

In another study, O'Sullivan et al looked into how students' understanding of radiation exposure was affected by clinical radiology exposure in the curriculum. According to the study, students who were enrolled in a structured program that covered clinical radiology issues showed a progressive rise in understanding as their years of school rose. Higher-year students showed a greater understanding of dosage estimation, imaging appropriateness, and radiation safety principles. This implies that a more thorough comprehension and more knowledgeable future practitioners may result from early and regular exposure to radiology instruction during medical training. According to the study, radiology education should be integrated longitudinally, starting in medical school and continuing through clinical rotations<sup>8</sup>.

Our study, which built on this all-encompassing approach, sought to identify the comparative knowledge gaps between students from other allied health fields, including physiotherapy, nursing, laboratory technology, and optometry, and radiology students, who are expected to have formal exposure to radiation-related topics. All medical practitioners, regardless of specialty, are likely to come into direct or indirect contact with radiation-based procedures during clinical practice, which is the justification for this inclusion.

### Conclusion

The radiography students demonstrated a fair understanding of ionizing radiation, but the knowledge among students from other courses were lacking. This is concerning, as it is essential for all students to have awareness of radiation, especially

considering that they will eventually be working in a hospital environment where radiation-related procedures are common. Additionally, the presence of a radiation facility on the university premises further underscores the importance of understanding radiation safety and its potential risks. These findings are new and highlights that allied health programs differs widely in their understanding of radiations safety even within the same organisation. Many students expressed a willingness to improve their knowledge in this area and showed interest in participating in awareness programs that would help them gain a better understanding of ionizing radiation. Putting together interactive training sessions, seminars, and workshops on radiation safety could greatly close the knowledge gap among students who are not studying radiography. All allied health schools should include basic radiation awareness in their curricula to guarantee that all students, regardless of specialization, have a basic understanding of radiation sources, possible health hazards, and safety procedures. Furthermore, cooperation across departments like public health, medical physics, and radiology can help create multidisciplinary modules that emphasize the significance of radiation safety in all areas of healthcare. Frequent evaluations and feedback systems could be used to track the success of these programs and pinpoint areas in need of more development.

### *Implications of the study*

There are a few important implications from the findings of this study for public health and allied health professionals. In the near future, many of these students will eventually be working in hospitals and clinical setting where ionizing radiation based procedures will be common. Knowledge inadequacy will result in unsafe practices and increase in occupational hazards. Since radiation can neither be seen nor felt, it becomes a very difficult task to monitor how much a person is irradiated without proper protocols. Therefore, including radiation safety courses in all allied health curricula will undoubtedly improve future healthcare providers' readiness and foster a safer workplace for both employees and patients.

*Limitations of the study*

There are several limitations on this study. Convenience sampling from a single private university may have limited the results' generalization, and no formal sample-size calculation was done. Additionally, smaller subgroup sizes (e.g., Nutrition & Dietetics) have reduced the precision of department-level comparisons. Future research should include bigger, more representative samples and formal power calculations as well as examine radiation awareness and knowledge among allied health students across various institutions and geographical areas.

**Declaration by Authors:** This study involved an anonymous, voluntary survey of university students and did not collect any sensitive personal or health-related information. As per institutional practice, such student-based surveys were considered exempt from formal ethics committee review. Informed consent was obtained from all participants prior to data collection, and confidentiality of responses was maintained throughout the study.

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**Conflict of Interest:** The authors declare no conflict of interest.

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