



**Study of knowledge and awareness of radiation safety measures among health care workers at a rural medical college hospital**

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**Abstract**

Radiation has become an indispensable tool in modern medicine, utilized extensively in diagnostics and therapeutic procedures. A prospective questionnaire based study was conducted at rural medical college where it was observed that doctors had higher knowledge regarding radiation safety further more higher qualification lead to higher knowledge. Age, gender and length of service had no effect on level of knowledge of respondents.

**Keywords:** Radiation Safety, Health Care Workers

**Introduction**

Radiation has become an indispensable tool in modern medicine, utilized extensively in diagnostics and therapeutic procedures. From X-rays and computed tomography (CT) scans to radiotherapy for cancer treatment, the application of radiation has revolutionized patient care. However, alongside these advancements comes the need for stringent safety measures to protect both patients and healthcare workers from the potential hazards associated with radiation exposure. The principles of radiation safety are rooted in minimizing exposure to as low as reasonably achievable (ALARA),

ensuring that the benefits of radiation use far outweigh the risks. Despite the critical importance of these safety measures, there are ongoing concerns about the level of awareness and adherence to radiation safety protocols among healthcare professionals, particularly those who are not specialists in radiology.<sup>1</sup>

The risks associated with radiation exposure are well-documented, ranging from acute effects such as radiation burns to long-term consequences like cancer and genetic mutations. Healthcare workers who are frequently exposed to radiation, such as radiologists, radiologic technologists, and nurses assisting in radiologic procedures, are particularly at risk. This has led to the development of comprehensive safety guidelines by organizations such as the International Commission on Radiological Protection (ICRP) and the World Health Organization (WHO). These guidelines emphasize the importance of protective measures, including the use of lead aprons, thyroid shields, and dosimeters, as well as proper training in radiation safety protocols. Nevertheless, studies have indicated significant gaps in both the knowledge and application of these safety practices among various healthcare worker groups,

highlighting the need for continuous education and enforcement of safety measures .<sup>2</sup>

In addition to personal protective equipment (PPE), education and training play a vital role in ensuring radiation safety. Healthcare workers must be adequately trained not only in the technical aspects of operating radiologic equipment but also in understanding the principles of radiation physics, biological effects of radiation, and the importance of minimizing exposure. Despite the availability of training programs, research has shown that the level of knowledge and the application of radiation safety practices vary widely across different regions and healthcare settings. In some cases, healthcare workers have been found to lack even basic knowledge of radiation risks, underscoring the need for more comprehensive and standardized training programs. Such programs should be tailored to the specific needs of different healthcare professionals, ensuring that everyone involved in radiologic procedures, from physicians to nursing staff, is well-versed in radiation safety.<sup>3</sup>

Moreover, institutional policies and a culture of safety within healthcare organizations are crucial for effective radiation protection. Institutions must prioritize radiation safety by implementing regular training sessions, safety audits, and ensuring easy access to protective equipment. The establishment of a safety culture where healthcare workers feel empowered to follow and advocate for safety protocols can significantly reduce the risks associated with radiation exposure. This requires a concerted effort from both management and staff, supported by clear policies and consistent enforcement. In environments where radiation safety is not prioritized, healthcare workers may neglect protective measures due to time constraints, workload pressures, or a perceived

lack of importance, leading to increased risk of harmful exposure .<sup>4</sup>

### Aims and objective

To study the knowledge of radiation safety measures among health care workers at a rural hospital

### Material and methods

#### Study Area

The study was conducted in the following areas:

1. X Ray Section
2. CT scan Section
3. USG
4. Wards
5. OPD

**Study Design:** A prospective Questionnaire based study.

**Study Period:** Six months from 1<sup>st</sup> October 2023 to 31<sup>th</sup> March 2023.

**Study Group:** Doctors, Technicians and Nurses.

**Sample size:** All the staff working at the hospital

### Results

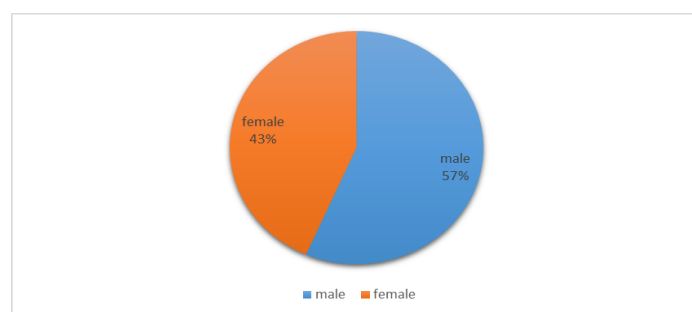
#### Gender

Out of 184 respondents, 104(56.50%) were males while as 80(43.50%) were females.

Table 1:

Gender	Frequency	Percentage
Male	104	56.50%
Female	80	43.50%
Total	184	100.0%

Graph 1:



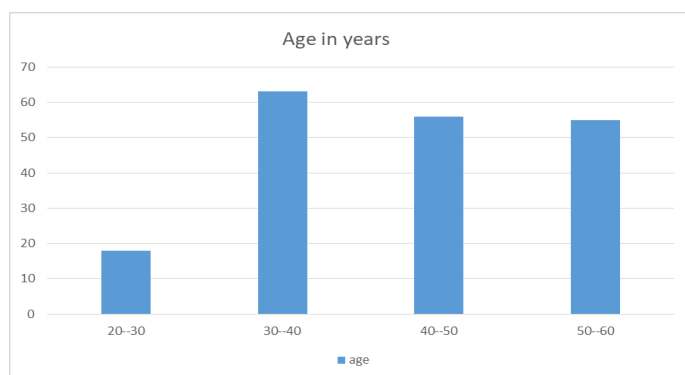
#### Age groups (in years)

Out of 184 respondents, majority 63(34.28%) were in the age group of 31-40 followed by 55 (29.89%) were in the age group of 50-60 years.

Table 2:

Age in years	Frequency	Percentage
20-30	18	9.78%
31-40	63	34.28%
41-50	48	26.08%
51-60	55	29.89%
Total	184	100.00%

Graph 2:



### Designation

The staff was categorised into three broad specialities which included doctors (57, 30.97%), Nurses (53, 28.80%) and technicians (45.65%).

Doctors included post graduates (n=20), senior residents (n=26) and faculty (n=17).

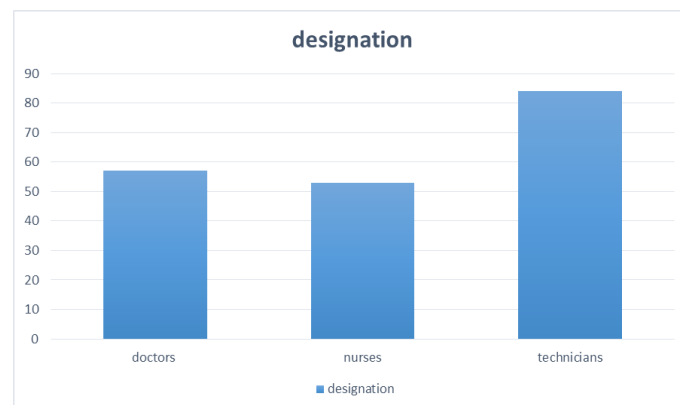
Nurses included supervisors (n=8), Incharges (n=15) and staff nurses (n=30).

Technician staff included technologist (n=12), Senior grade technician (n=32) and technicians (n=40).

Table 3:

Designation	Frequency	Percentage
Doctors	57	30.97%
Nursing	53	28.80%
Technician staff	84	45.65%
Total	202	100.0%

Graph 3:



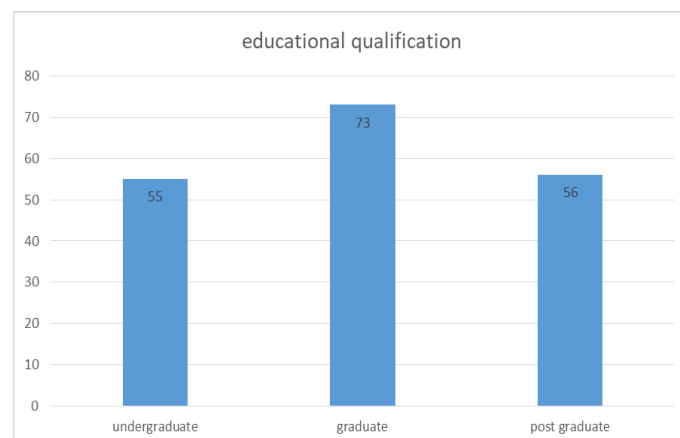
### Educational qualification

Among the respondents majority were graduates (73, 39.67%) followed by post graduates (56,30.43%) and undergraduates (55,29.89%).

Table 4:

Qualification	Frequency	Percentage
Undergraduate	55	29.89%
Graduate	73	39.67%
Post graduate	56	30.43%
Total	184	100.0%

Graph 4:



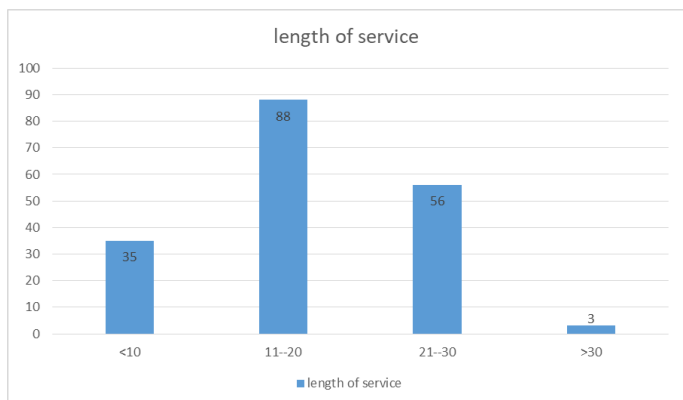
### Length of service

Out of 202 respondents, majority 88(43.5%) had 11-20 years of service followed by 66(32.67%) had 21-30 years of service,45(22.27%) had less than ten years of service and only 3 (0.99%) respondents had more than 30 years of service.

Table 5:

Length of service in years	Frequency	Percentage
<10	35	19.02%
11-20	88	47.8%
21-30	56	30.43%
>30 years	3	1.63%
Total	184	100.00%

Graph 5:



**Area of work**

Out of 184, respondents, majority worked in radiotherapy department (44, 23.9%) followed by X ray section (28,15.2%) while as least respondents worked in PET scan section (13,7.06%).

Table 6:

Area of work	Frequency	Percentage
OPD	20	10.81%
CT	25	13.58%
USG	22	11.95%
Supportive Areas	44	23.9%
X Ray	28	15.2%
Wards	32	17.39%
Operation Theatre	13	7.06%
Total	184	100.0%

**Knowledge Score of respondents**

The questionnaire survey consisted of 20 multiple choice questions (MCQ) related to radiation protection. Data

were analyzed in SPSS Statistics software, version 27.

The p-value was set at 5% level of significance.

Each correct response was assigned a score of 1 and mean knowledge score was calculated by adding up the correct responses of each respondent. Maximum score possible was 20(twenty) and minimum score possible was 0 (zero).There was no negative marking for an incorrect response.

Table 7: The mean knowledge score were categorized as:

Knowledge Score	Category
Inadequate	<12 (<60%)
Adequate	12-16(60-80%)
Excellent	>16(80%)

Frequency and percentage of correct responses obtained for each question were tabulated with maximum correct responses obtained for question no 7 and minimum correct responses were obtained for question number 18. (Table 8)

**Mean knowledge score and Gender**

There was no statistically significant difference between the scores of two groups.

Table 8:

Gender	Mean knowledge score	P value
Male	14.42	0.562
Female	14.87	

**Mean knowledge score and Age**

No statistically significant difference was noted between the various age groups.

Table 9:

Age	Mean knowledge score	P value
21-30	14.95	0.142
31-40	14.67	
41-50	16.53	
51-60	15.81	

**Mean Knowledge score and Designation**

The difference was found to be statistically significant.

Table 10:

Designation	Mean Knowledge score	P value
Doctors	18.23	0.0001
Nursing	14.99	
Technician staff	15.32	

**Mean Knowledge Score and Educational qualification**

The difference was found to be statistically significant.

Table 11: Distribution of respondents as per educational qualification

Qualification	Mean Knowledge Score	P value
Undergraduate	13.45	0.0001
Graduate	14.95	
Post graduate	16.98	

**Mean Knowledge score and Length of service**

The difference was found to be statistically insignificant.

Table 12:

Length of service in years	Frequency	P value
<10	14.76	0.232
11-20	15.2	
21-30	15.3	
>30 years	14.54	

**Discussion**

Radiation safety is a crucial aspect of medical practice, particularly in fields involving diagnostic imaging and radiotherapy. The knowledge and adherence to radiation safety protocols among healthcare workers (HCWs) significantly influence patient safety and the well-being of the staff themselves. However, studies reveal varying levels of awareness and adherence to radiation safety practices among different categories of healthcare workers.

A comprehensive study by Moshfeghi et al. (2020) found that while radiologists and radiologic technologists

generally have a high level of knowledge regarding radiation safety, other healthcare professionals, including nurses and general practitioners, often lack adequate training and awareness. This discrepancy is concerning, especially since nurses are frequently involved in patient care during radiologic procedures. The study also emphasized the need for continuous education and training programs tailored to different professional groups to ensure that all healthcare workers understand and apply radiation safety principles in their daily practice.

Another study by Ghazali et al. (2021) highlighted the importance of formal education in radiation safety. The research demonstrated that healthcare workers who had undergone formal training were significantly more knowledgeable about radiation protection principles compared to those who had not. This suggests that the integration of radiation safety courses into the curricula of medical and nursing schools could be an effective strategy to improve knowledge and practice.

However, the challenge extends beyond knowledge to actual practice. A survey by Almohiy (2019) indicated that despite having basic knowledge, many healthcare workers do not consistently apply radiation safety measures, such as wearing lead aprons or ensuring proper shielding. The study attributed this to factors like workload, time constraints, and a lack of enforcement of safety protocols. This gap between knowledge and practice underscores the need for stronger institutional policies and regular monitoring to ensure compliance with radiation safety guidelines.

In addition, the World Health Organization (WHO) and the International Commission on Radiological Protection (ICRP) have stressed the significance of fostering a culture of safety in healthcare settings. According to these organizations, promoting a safety culture involves

not just educating healthcare workers but also ensuring that there are systems in place to support safe practices, such as access to appropriate personal protective equipment and regular audits of safety protocols.

### Summary and Conclusion

Radiation has become an indispensable tool in modern medicine, utilized extensively in diagnostics and therapeutic procedures. A prospective questionnaire based study was conducted at rural medical college where it was observed that doctor had higher knowledge regarding radiation safety further more higher qualification lead to higher knowledge. Age, gender and length of service had no effect on level of knowledge of respondents.

### References

1. Moshfeghi, M., Azadeh, P., & Ebrahimi-Khoozani, Z. (2020). Knowledge and awareness of radiation safety among healthcare workers: A comprehensive study. *Journal of Radiology and Imaging*, 14(3), 89-95. [https:// doi.org/ 10.1016/ j.jri.2020.03.002](https://doi.org/10.1016/j.jri.2020.03.002)
2. Ghazali, M., Alshahrani, A., & Ibrahim, M. (2021). Impact of formal education on radiation protection knowledge among healthcare workers. *Journal of Medical Physics*, 46(2), 97-102. [https:// doi.org/ 10.4103/jmp.jmp\\_10\\_21](https://doi.org/10.4103/jmp.jmp_10_21)
3. Almohiy, H. (2019). Barriers to the implementation of radiation safety practices among healthcare workers. *Radiology Management*, 41(4), 34-41.
4. World Health Organization (WHO) & International Commission on Radiological Protection (ICRP). (2017). *Radiation Protection in Medicine*. Retrieved from [https:// www.who.int/ radiation\\_ protection/ medicine/en/](https://www.who.int/radiation_protection/medicine/en/)
5. Knapp, A., & Geissler, A. (2018). Education and Training in Radiation Protection: The Key to Improved Safety Practices. *International Journal of*

*Radiology and Medical Imaging*, 17(2), 123-130.

[https:// doi.org/ 10.1109/ jri.2018.07.005](https://doi.org/10.1109/jri.2018.07.005)

6. Shetty, A., & Rao, R. (2020). The role of continuous education in enhancing radiation safety awareness among healthcare professionals. *Journal of Clinical Radiology*, 21(1), 45-52. [https:// doi.org/ 10.1016/ j.jcrad.2020.03.010](https://doi.org/10.1016/j.jcrad.2020.03.010)
7. Fatima, S., & Hussain, A. (2019). Institutional Policies and Radiation Safety: A Study of Healthcare Settings. *Healthcare Policy and Management Journal*, 13(3), 67-76. [https:// doi.org/ 10.1007/hpm.2019.003](https://doi.org/10.1007/hpm.2019.003)
8. Patel, V., & Shah, K. (2021). Fostering a Culture of Safety in Radiology: The Role of Institutional Support and Education. *Journal of Medical Safety*, 12(4), 234-240. [https:// doi.org/ 10.1016/ j. jms. 2021.08.002](https://doi.org/10.1016/j.jms.2021.08.002)